



Incidence of Cystic Echinococcosis in the East Azerbaijan, Iran, During 2011-2017: A Retrospective Epidemiological Study

Salar Zarrabi Ahrabi ¹ , Rasoul Madani ^{1,2} , Majid Montazer Bavili ³ , Ahmad Babazadeh Bedoustani ^{4,5}

¹ Department of Parasitology, Faculty of Veterinary Medicine, Science and Research Branch, Islamic Azad University, Tehran, Iran.

² Department of Biotechnology, Razi Vaccine and Serum Research Institute, Karaj, Iran.

³ Department of Surgery, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran.

⁴ Department of Biotechnology Research Center, Tabriz Branch, Islamic Azad University, Tabriz, Iran.

⁵ Department of Animal Biology, Faculty of Natural Science, University of Tabriz, Tabriz, Iran.

Correspondence Author: Salar Zarrabi Ahrabi

E-mail: salar.zarrabi1984@gmail.com

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ABSTRACT

Objective: Cystic echinococcosis has been recognized as one of the most common zoonotic diseases in many parts of the world, which is caused by the larval stage of *Echinococcus granulosus*. The aim of this study was to investigate the incidence of Cystic echinococcosis cases in human in East Azerbaijan Province, Iran, during 2011-2017.

Methods: This cross-sectional descriptive epidemiologic study included seven-year period and investigated variables such as age, gender, involved organs, mortality, residential place types of patients and relations between these data. Data of the patients who had referred to the referral hospital in the East Azerbaijan, Iran with hydatid cysts were evaluated.

Results: The highest percentage of the cases were females (56.2%). The most common age range was 18-35 (33.5%). Liver was the highly involved organ, in 918 cases (60.2%). The highest case number was detected in the year 2015 (17.0%), while the year 2012 (11.4%) had the least rate of cases. The rural population with the highest rate of 62.2% had the most incidence. A survey of occupations showed that housewives (19.6%) had the highest rate in terms of variety among other occupations.

Conclusion: The results of this study confirmed the increasing incidence of this disease in the East Azerbaijan region. Because the disease in the region is endemic, public awareness and knowledge about the disease need to be increased in order to reduce related health problems and increase the level of prevention at the community level.

Keywords: Hydatid cyst, epidemiology, East Azerbaijan, *Echinococcus granulosus*.

1. INTRODUCTION

Cystic echinococcosis is a common parasitic disease which infects both human and animals and has global distribution. Echinococcosis is a recurrent disease and a serious public health challenge. This parasitic disease is present in most tropical and temperate regions around the world, and is particularly important in areas such as North Africa, South America, China, and the Middle East. (1). Cystic echinococcosis which is a larval stage, is mainly caused by accidental eating of the eggs spread by the stools of *Echinococcus granulosus* infected dogs. The disease can be widely spread in the regions where sheep breeding is considered as a major industry (2). This disease, which has several hosts (the final and intermediate hosts), is one of the most important infectious diseases affecting public health worldwide, especially in Iran (3). According to the World Health Organization, Iran is among the countries with moderate infection (4).

Most infections occur among ruminants and livestock breeders who directly contact the infected dogs (3). Cows do

not play an important role in the transmission of the disease, because of the interaction between host and parasite in most cases, the cattle have the ability to calcify the parasite and do not play an important intermediate host role (1,2). Various studies have shown that the common strain in the Middle East and Arabic North Africa is the sheep strain (G1, G3), which causes disease in humans (1). The rate of infection in Iran was high among ruminants, and this rate was reported to be 11.1% among sheep in East Azerbaijan (4).

Studies in Turkey indicated that Cystic echinococcosis occurs throughout Turkey, the number of humans affected by the disease during the years 1987-1994 was 2663. The incidence of infection in the dogs found in Turkey was between 32%-40%. The rate and incidence of Cystic echinococcosis in domestic livestock in Turkey was 18.2% to 50.7% (5).

Cystic echinococcosis has no specific clinical symptoms. Therefore, it usually remains unknown to animals until slaughter, and it is randomly detected in humans. In

order to diagnose the disease, it is advised to use several diagnostic methods, which include the use of radiography, ultrasonography, tomography, and immunological techniques (4,6).

Seroepidemiological study of the disease in different regions of Iran has shown different results (7,8). The rate of infection among people in Shemiranat region was 0.22% (9), while the rate of infection in Yasuj was reported to be 2%-18% (10). Human infection has been reported in Isfahan, Fars, Khorasan and Arak provinces more than other parts of Iran (3). In a study, conducted in Tabriz between 2011 and 2012, 206 cases of hydatid cysts were reported among people, indicating an increase in human cases in Tabriz (11).

In this study, we aimed to investigate the incidence of Cystic echinococcosis in the East Azerbaijan, Iran, during 2011-2017.

2. METHODS

This was a cross-sectional descriptive epidemiological study. For this study, all reports of the patients with hydatid cyst were collected from the central office of medical documents in the East Azerbaijan, over a period of 7 years (from winter 2011 to autumn 2017). After access to the patient records, information on the variables (age, gender, place of residence, occupation, involved organ, relapse, etc.) were collected and arranged. The sensitivity and specificity of each statistical method employed for evaluation of the results were investigated separately. Data were analyzed by SPSS software version 16.0, based on chi-square test followed by Fischer Advanced Test.

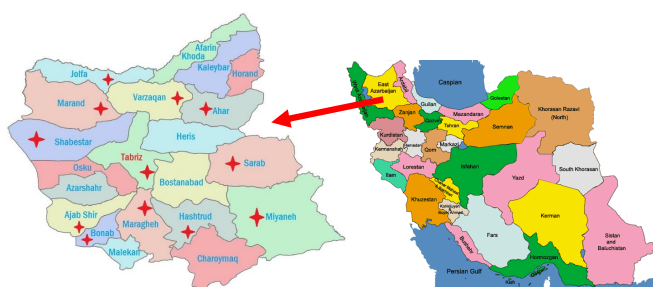


Figure 1. Distribution of referral hospitals in cities of East Azerbaijan province

Ethical Standards

An ethics committee approval was not provided in this study because the regulation on clinical research entered into force on 22 June 2016 (Official announcement NO:703/d/1152 of Deputy of Research and Technology – Ministry of Health and Medical Education) in Iran, and ethics committees within the scope of this regulation began to be formed thereafter. In this study archive data used for all patients.

3. RESULTS

In total, 857 female patients (56.2%) and 668 (43.8%) male patients with hydatid cysts with clinical findings and definite cases during a seven-year period were collected from referral hospitals in the central office of medical documents, East Azerbaijan (Table 1). Of 1525 patients studied, 918 cases (60.2%) had the liver form, 587 (38.5%) had the pulmonary form, and 20 cases (1.3%) had the brain form of the disease. In the liver form of the disease, females were more involved than males (561 females and 357 males). In the lung form of the disease, in contrast to the liver form, the incidence of disease in males was higher (301 males and 286 females). In the brain form, the number of cases in both sexes was equal (10 females and 10 males) (Table 2). According to the chi-square results, there was a significant difference in gender between the patients. In other words, more women than men had exposed to the disease (Tables 1).

Table 1. Number and percentage of patients by gender (n=1525)

	Frequency	%
Female	857	56.2 ^a
Male	668	43.8

P=.000; a. 0 cells (.0%) have expected frequencies less than 5.

Table 2. Number and percentage of affected organs by gender

	Female, n (%)	Male, n (%)	Total, n (%)
Brain	10 (%0/56)	10 (%0/56)	20 (1.3)
Liver	561(%36/7)	357(%23/5)	918 (60.2)
Lung	286(%18/7)	301(%19/8)	587 (38.5)
Total			1525

P=.000

The patients were in the age range of 0 to 65, and the patients were mostly in the age range of 18-35 (33.5%) (Figure 2). In addition, a significant correlation was observed between the involved organs and the gender. The results showed that the highest and the lowest incidence was related to 2015 (17.0%) and 2011 (11.4%) (Figure 3).

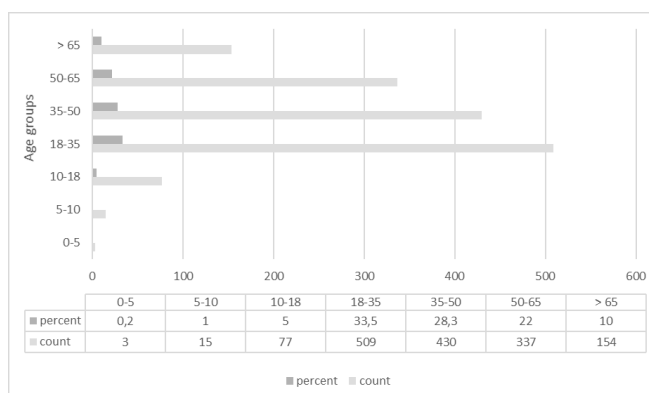


Figure 2. Percentage and count of age groups in patients

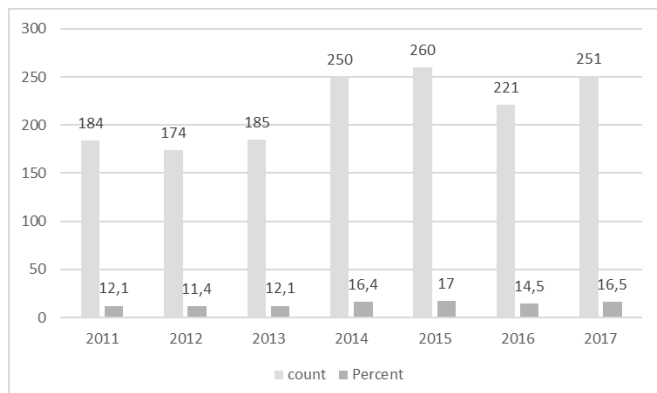


Figure 3. Percentage and count of patients in different years

The studied population were either urban or rural, with 62.2% of the population in the rural area and 37.8% in the urban area. The comparison between urban and rural population showed a significant difference, the number of rural patients referred to referral hospitals in this study was significantly more than the number of urban patients referred to these centers (Figure 4).

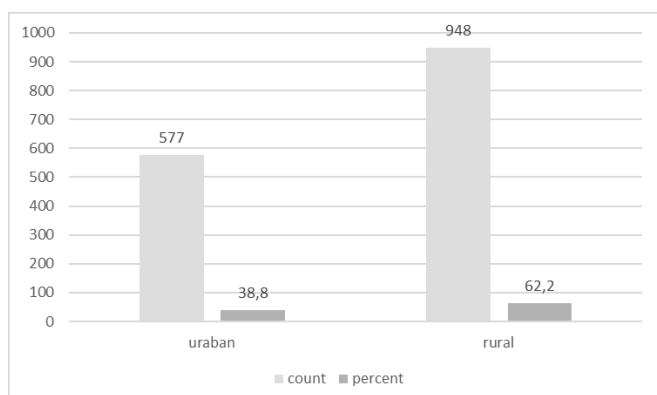


Figure 4. Percentage of patients living in urban and rural areas

Gender differences in the patients with brain disease and the patients with pulmonary lesions were not significant. However, there was a significant gender difference in the patients with hepatic impairment (Table 2). People with this disease had different scattering in occupations. But housewives, farmers and workers had a larger population than other occupations. (other occupations included more than 800 different jobs). Of all cases examined, 299 cases (19.6%) were housewives, 100 (6.5%) were farmers, 67 (4.4%) were workers, and 1059 had (69.5%) other businesses (Table 3).

The average referral of each patient to the hospital was 1.43. The number of the days when people were hospitalized varied from 3 to 95, with an estimated average number of 6.97 days per patient, based on the number of the patients (Table 4).

Only 8 cases (0.52%) of deaths were reported (4 cases of liver lesions, 4 cases of brain lesions). Recurrence of illness was seen in 63 cases, 4.13% of the patients (Table 5). 88 patients

with liver form of disease, 114 patients with pulmonary form of disease, and 5 patients with brain form of disease were admitted to the intensive care unit in this study.

Table 3. Occupations of patients (n=1525)

Occupation	n	%
Housewife	299	19.6
Farmer	100	6.5
Worker	67	4.4
Others	1059	69.5

P=.000

Table 4. Descriptive statistics (n=1525)

	Min	Max	Sum	Mean
Admission times	1	7	2177	1.43
Hospitalized days	2	95	10623	6.97

P=.000

Table 5. Descriptive statistics of mortality and recurrence of illness (n=1525)

	n	%
Mortality	8	0.52
Recurrence of illness	63	4.13

P=.000

4. DISCUSSION

Hydatid cyst is one of the most common disease of humans and animals in Iran (3). Recently, the World Health Organization (WHO) has placed *Echinococcus granulosus* in the subgroup of neglected tropical diseases (NTDs) (12). Public health related, social and economic issues of this disease are of critical importance. Iran, especially rural areas, has been recognized as an endemic region for the disease, with high levels of infection. According to the WHO, Iran is among the countries with moderate rate of infected population. Echinococcosis is a recurrent disease and a serious public health challenge. *Echinococcus granulosus* has a high prevalence due to its large intermediate hosts in Iran and echinococcosis is one of the most important zoonotic parasitic diseases, the diagnosis of which has always been of great importance (3,13).

In regard to the results of the infective organs, several studies report that the liver in the first rank of involved organ, lung is in the second and brain in the third rank but there are reports about infection in different organs such as, spleen, bones, peritoneum and kidney. These reports support that *Echinococcus* larva has a primary tendency to infect the liver and secondarily to the lung. According to the results of the present study, 60.2% of the patients had liver, 38.5% had lung and only 1.3 % had brain involvement respectively. These localization rates of the disease in our study region has in conformity with other studies (6,9,10,11).

In correlation of the gender and involved organs, results showed that the most of the liver cases are in females and males have a high risk for lung form of the disease. The rate

of infection with hydatid cyst in each gender group depends on the local conditions within the area such as contact with vegetables contaminated with infected dog faces. It was reported in previous studies that the infection is higher in women as well (7,13). A 10 year-study conducted in Tehran reports that females (56.8%) had higher infection than males (43.2%) (14). According to the results of the present study females (56.2%) showed higher rate of infection than males (43.8%). These consequences showed that women have the highest chance of contact with sources of infection such as infected dogs, soil, vegetable etc. Furthermore, genetic differences between two genders may be responsible for a part of this difference (3,15).

Hydatid disease is generally considered to be a rural disease. Iranian women, especially in rural areas, have more contact with domestic animals and infected products. They are also in more contact with unwashed raw vegetables, which may be more contaminated with *Echinococcus* eggs. The results of present study showed that housewives were more prone to the disease, followed by workers and farmers, suggesting the major role of contaminated vegetables in spreading and increasing the disease. Results that were found in the other occupations showed that all people in the community were at risk of disease but because of variety of jobs (more than 800 different occupations) the results has not been made for all occupations that have been affected by the disease.

Epidemiologic studies conducted across Iran shows that the disease has an increasing trend (16).

According to the statistics, hydatid disease has been reported from 23 provinces of the country in several years (2002-2018) (7). Rokni integrated several reports of hydatidosis from 1981 to 2006 and reports showed that the highest risk in terms of age belong to 20-40 (3). A study in Sindh and Hyderabad, Pakistan that examined cystic echinococcosis in human, of the 43,656 cases inspected for 11 years, only 44 cases of hydatid cysts were recorded and age group of 21-40 years old, including 22 cases, had the highest rate of disease (17). Based on present study, most patients were in the age range of 18-35, which agreed with other studies in Iran. The prevalence of this disease in this age group could be due to the infections of children at an early age, which, given their limited and slow growth, are eventually marketed at this age (3).

Gholami in 2018 conducted a meta analyse beetwen 1995-2015 among 40 different study (totally 3090 cases). Results showed that spread of the disease in rural regions is more abundant than in urban areas(18). But in the other study in northern of Iran between 2005-2015 showed that the infection rates in urban population were higher than the rural people (19). High rate of infection in rural areas (62.2%) in present study can be related to the quality of life and social structure of rural areas, infected dog population in the region and culture of vegetables consumption; as a result, each region has different risk factors. The presence of infection in urban areas can also be an indicative of social health problem; therefore, preventive protocols in urban areas

should be followed. Pet keeping, the presence of stray dogs in cities, and the lack of compliance between personal and public health can increase the risk of spread of the disease. In addition to the role of stray dogs in the spread of disease and their proximity to human societies, high survival of *Echinococcus* eggs in the environment (2.5 years), as well as high potential for the infection with parasite eggs are other factors involved in the spread of disease (20). The lack of a trend to reduce the incidence of disease over the years, has caused a lack in any preventive and controlling program in the region; therefore, effective preventive protocols should be followed. Patients usually notice their disorder when there is no choice except for surgical treatment. Hence, it seems that in addition to preventive protocols, screening tests must be designed in high-risk areas.

5. CONCLUSION

The hydatid cyst disease is endemic in our study region. One of the key ways to tackle this problem is to increase the level of awareness to prevent the disease. Control of the disease in different animals can play role as source of infection in human. The production of healthy vegetables can also be achieved through the control of disease in human. Considering all the above mentioned, the necessity of fundamental and applied studies simultaneously in endemic regions necessitates conducting this research.

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