

# Surgery for Pulmonary Hydatidosis in Turkey in 2014: A Nationwide Study

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## Abstract

**OBJECTIVES:** Turkey remains among the countries where hydatid disease is endemic. In this study, it was aimed to determine the number of operations performed for the treatment of pulmonary hydatid disease in Turkey during 2014 and to present the distribution of these operations according to the different regions of the country.

**MATERIALS AND METHODS:** The Turkish Thoracic Society Thoracic Surgery Study Group connected with the thoracic surgeons in each city through telephone. A data set was sent by email. The age, sex, contact with animals that might be a risk of gaining the hydatid disease, the side of the disease, the type of surgical method, other organ involvement were recorded and collected from each data set to form the final data, and the results were evaluated. Turkey comprises of 81 cities that are grouped in seven different regions. The number of operations was calculated for each city and region to present the distribution.

**RESULTS:** Overall, 101 centers from 81 cities were considered in the study. A total of 715 pulmonary hydatid cyst operations were performed in 690 patients during the study period. The most common operation technique was cystotomy and capitonnage through thoracotomy (76%). The highest incidence rate of operated patients was in the Eastern Anatolian Region (2.15 patients per 100 000 person-years).

**CONCLUSION:** Pulmonary hydatid disease still has a high incidence rate particularly in the southeast and east of Turkey, which are mainly rural areas and where stockbreeding is very common. Cystotomy and capitonnage is still the most common surgical method used to treat pulmonary hydatid cysts. Preventive methods should be performed strictly in these cities and regions to decrease the risk of infection.

**KEYWORDS:** Nationwide survey, pulmonary hydatidosis, surgery

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## INTRODUCTION

Hydatid disease is a parasitic disease caused by the genus *Echinococcus*. The two most common forms of this genus, which cause infection in humans are *Echinococcus granulosus* and *Echinococcus alveolaris*. Cystic echinococcosis is distributed worldwide, especially in Australia, New Zealand, Africa, South America, and Asia. Alveolar echinococcosis is confined in the Northern hemisphere, in some regions of China, the Russian Federation, and countries in continental Europe and North America [1,2].

In the endemic regions, the incidence rates of cystic echinococcosis can reach up to 50 per 100000 person-years, and a prevalence as high as 5%-10% may occur in parts of Argentina, Peru, East Africa, Central Asia, and China. In livestock, the prevalence of cystic echinococcosis in slaughtered animals in hyper endemic areas of South America varies from 20%-95%. Globally, there may be an excess of a million people living with this disease at any given point of time. The annual costs with cystic echinococcosis were estimated to be 3 billion US\$ for treating cases and for losses to the livestock industry [1].

Turkey remains one of the endemic countries for hydatid disease. It was found that the incidence rate of cystic echinococcosis between 2001 to 2005 was 6.3 per 100,000 persons-years. The lung is the second most common organ involved in human echinococcosis. Although there have been many reports about the incidence rate of cystic echinococcosis in Turkey, the situation of patients with pulmonary echinococcosis throughout the country is not known. The present study was performed from an epidemiological perspective by analyzing the surgical data from all tho-

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racic surgery centers of the state and university hospitals in 2014 to reveal the status of pulmonary echinococcosis in Turkey.

## MATERIALS AND METHODS

Turkey has 81 cities that are grouped in seven different regions. The Turkish Thoracic Society Thoracic Surgery Study Group designed a questionnaire and contacted thoracic surgeons in the state and university hospitals in each city (all thoracic surgery clinics of Turkey) to collect and share the data of pulmonary hydatid cyst operations performed during 2014. A data set was sent by email. The age, sex, contact with animals that might be a risk of gaining hydatid disease, the side of the disease, type of surgical method,

and other organ involvement were recorded and collected from each data set to form the final nationwide data. The data were analyzed retrospectively by the study group. The number of operations was calculated for each city and region to present the distribution. The patients have been followed up by their thoracic surgeons, and as the study period was extremely short, the recurrence rate calculation was not possible.

This study was approved by Clinical Researches Ethical Committee 27/07/2016 2012-KAEK-15, decision number: 1183.

## RESULTS

Seventy-eight centers from 81 cities participated in the study. A total of 715 pulmonary hydatid cysts operations were performed in 690 patients during the study period. The population of Turkey was 77,695,904 according to the data of Statistical Institution of Turkey [2]. There were 359 female (52%), and 331 male (48%) patients in the study group. The mean age was  $35.61 \pm 17.89$  (3-84) years. The demographics of the study population are shown in Table 1.

The most common operation technique was cystotomy and capitonnage through thoracotomy (76%). Videoassisted thoracoscopic surgery (VATS) was also used in 5% of the operations (Figure 1). Pre and postoperative albendazole was applied to 9% and 72.8% of the patients, respectively.

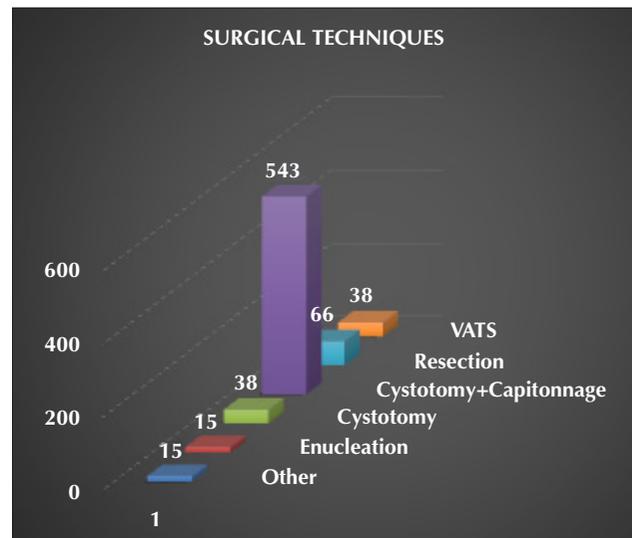
The highest rate of operations was performed in Central Anatolian region (25.50%). The distribution of the percentage of operations performed is shown in Figure 2.

The incidence rate of patients that were operated for pulmonary hydatid disease in Turkey for 2014 was 7.07 patients per 100,000 person-years. Although the highest number of operated patients was in the city of Ankara ( $n=81/690$ ), the highest incidence rate of operation due to hydatid disease was in Erzurum ( $6.02/100,000$ ) [3]. The number of operations and incidence rates of the ten cities are shown in Figure 3.

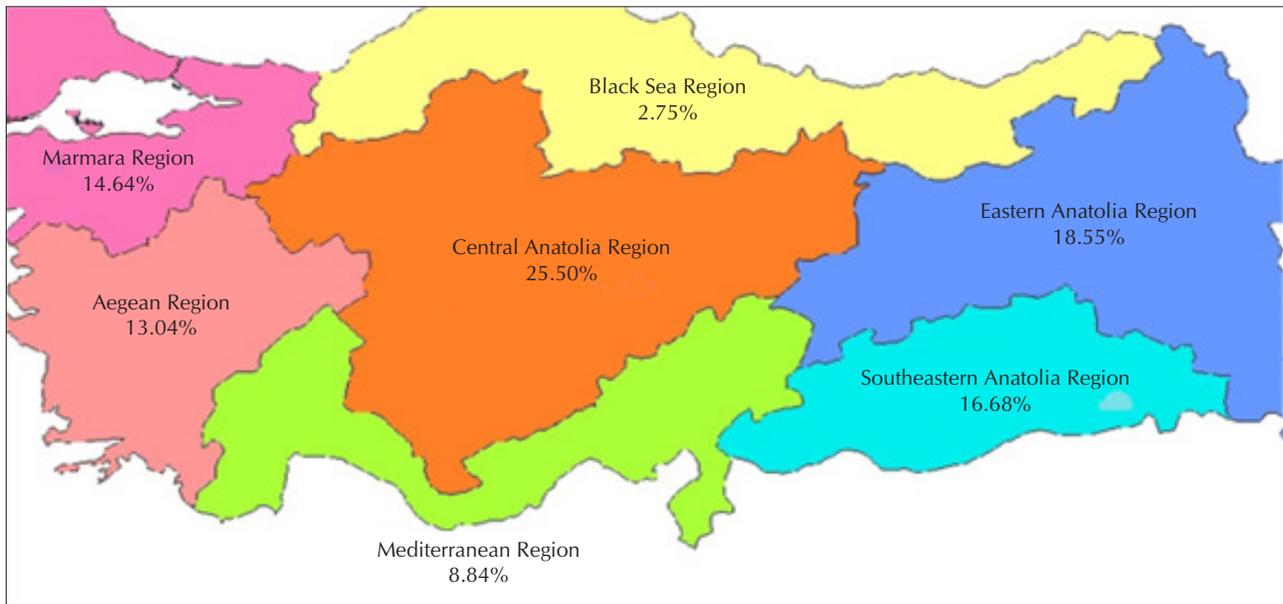
**Table 1.** Sociodemographic characteristics of the patients

	n	%
Gender		
Female	359	52
Male	331	48
Mean age, years	35.61±17.89 (3-84)	
Age groups		
0-18	111	16
19-40	313	45
41-60	187	28
61-84	79	11
Animal contact history		
Yes	496	72
No	194	28
Preoperative medical treatment		
Yes	76	9
No	614	91
Postoperative medical treatment		
Yes	503	72.8
No	187	27.2
Cyst side		
Right	357	52
Left	239	35
Bilateral	98	13
Cyst status		
Intact	475	67
Perforated	207	29
Intact+Perforated	32	4
Types of surgery		
Enucleation	15	2
Cystotomy	38	5
VATS	38	5
Resection	66	9
Cystotomy+Capitonnage	543	76
Other	15	2

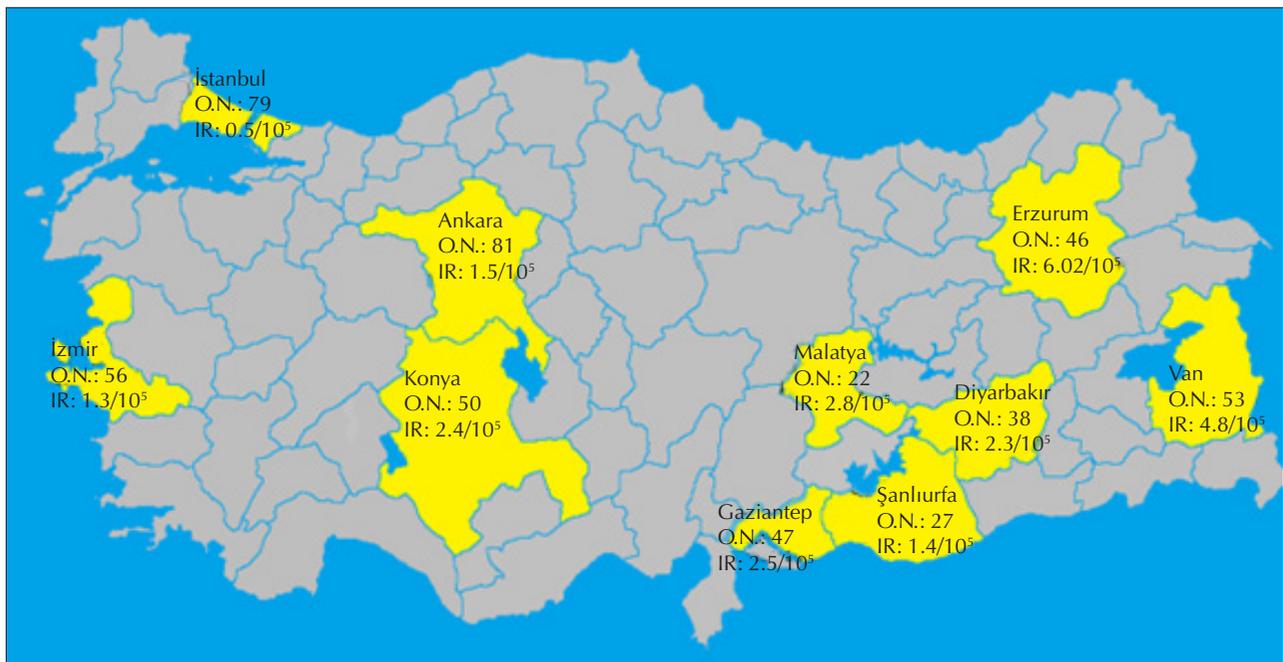
VATS: video assisted thoracoscopic surgery



**Figure 1.** Types of surgical techniques performed



**Figure 2.** Percentages of operations due to hydatid disease according to regions across the country



**Figure 3.** The first 10 cities with highest number of operations performed (O.N) and incidence rates (IR/ $10^5$ )

## DISCUSSION

Hydatid disease remains a common health problem in Turkey. According to the Turkish Ministry of Health, there were 40242 surgical operations for the treatment of hydatid disease between 1975 and 1994. The operative mortality rate was 2.2% (n=909) in this series. The number of operations was 2000 per year [4].

The distribution of cases according to gender is almost similar. Yazar et al. [3] revealed that 54.08% of the cases were females and 45.92% were males in their series, which was similar to findings in our study population (52% females and 48% males).

Cystotomy and capitonnage has still been the most common surgical technique to be used for the surgical treatment of

pulmonary hydatid cysts. Yaldiz et al. [5] revealed that they performed cystotomy and capitonnage in 92.2% of their patients in their series. Isitmangil et al. [6] also reported that they performed cystotomy and capitonnage in 63.3% of their cases. In our study population, the rate of cystotomy and capitonnage as the most common surgical method to be applied was 76%. VATS can also be used as a minimally invasive surgical approach and is getting more common. Alpay et al. [7] described the VATS technique that they performed successfully in 77 pulmonary hydatid cyst operations. VATS was used only in 5% of our patients; hence, open surgery is still the most common approach.

Pre and postoperative albendazole was applied to 9% and 72.8% of the patients, respectively, in our series. Usluer et al. [8] revealed that preoperative albendazole treatment may

cause the cysts to become complicated, and it was suggested to avoid using medical treatment before the operation. Post-operative albendazole treatment is generally applied for preventing the recurrence, but there is still not much evidence about this topic.

The distribution of the cystic echinococcosis cases in Turkey has been evaluated by Yazar et al. [3]. According to their study results, between 2001 and 2005, the distribution of cases was as follows: Central Anatolia region, 38.57%; Aegean region, 16.94%; Mediterranean region, 16.09%; Marmara region, 13.13%; East Anatolian region, 6.80%; Black sea region, 5.70%; and Southeast Anatolian region, 2.75%. In our study, the result of the distribution of pulmonary hydatid disease cases were Central Anatolian region, 25.50%; East Anatolian region, 18.55%; Southeast Anatolian region, 16.68%; Marmara region, 14.64%; Aegean region, 13.04%; Mediterranean region, 8.84%; and Black sea region, 2.75%. The difference of some regions between the two studies can be explained, as there are more thoracic surgeons now in the East and Southeast regions, which ensures that the patients do not have to apply to another bigger city to be operated.

The incidence rate of the pulmonary cystic echinococcosis patients of Turkey was reported as 6.3 per 100,000 persons-years [3]. It was calculated as 0.9 per 100,000 persons-years in our study, which was about one out of six patients with pulmonary echinococcosis. The highest incidence rates of pulmonary hydatid cyst operation were in East Anatolian region, 2.15 per 100,000 persons-years; Central Anatolian region, 1.40 per 100,000 persons-years; and Southeast Anatolian Region, 1.37 per 100,000 persons-years. The three regions mentioned above are mainly the rural areas of Turkey where livestock is very common. The incidence rate was less in regions, such as Marmara and Aegean, because there are more cosmopolitan cities in those areas, and the number of livestock is less common.

In our study, the highest incidence rate of operated on patients for pulmonary hydatid disease was in the city of Erzurum (6.02 operations per 100,000 persons-years). There were several clinical and serological studies conducted to determine the incidence rate of hydatid disease in different cities of Turkey, such as Kars, Denizli, Mersin, Diyarbakir, Kocaeli, Sivas, and Kayseri [9-16]. There is only one study other than the present that analyzed the data of Turkey for determining the real incidence rates of the complete disease [3]. Our study is the first one to specify the operated cases of pulmonary hydatidosis.

In the endemic regions, human incidence rates can reach more than 50 per 100 000 person- years [17]. Kavukcu et al. [18] reported that the incidence of cystic echinococcosis was 18-20 per 100 000 person-years. There are many reasons for this relatively high incidence of cystic echinococcosis in this country:

1. In Turkey, livestock is slaughtered for daily meat requirement, and this procedure is usually not under the control of local authorities.

2. Turkey is located in the Middle East region, and there is continual migration of huge number of populations both from the neighboring countries, few of which are in the civil war and migration states throughout the country.

3. Stray dogs are numerous and prevention and treatment of infection in these dogs is very difficult [19].

4. People in Turkey are generally poorly educated with regard to health and preventive medicine issues, and this status is also a hindering factor toward disease control and prevention [19].

5. A nationwide control policy has not been made yet for controlling the cystic echinococcosis.

Sanli et al. [20] revealed that in Aegean region, uncontrolled dogs in the city and urban environmental pollution might be the causes of hydatidosis rather than livestock.

This is a retrospective and multicenter study. The surgical approaches to the disease were different among surgeons. Another limitation of the study was that we could only record the cases that were treated by surgery; hence, the exact incidence of the pulmonary hydatid disease could not be determined.

In conclusion, pulmonary hydatid disease still has a high incidence rate especially in central, southeast, and east of Turkey, which are mainly rural areas and with stockbreeding common among people. Cystotomy and capitonnage remains the most common surgical method used to treat the pulmonary hydatid cysts. Because the proportion of operated cases represent only about one out of six pulmonary echinococcosis cases, careful screening is important to find the asymptomatic patients. To decrease the incidence of the infection, appropriate preventive methods should be performed strictly to take the slaughtering of livestock, stray dogs, and human movements under control throughout country and particularly in the rural regions to decrease the risk of infection.

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## REFERENCES

- World Health Organization (WHO) Echinococcosis fact sheet, April 2016, Available from: <http://www.who.int/mediacentre/factsheets/fs377/en/>.
- Available from: <http://www.tuik.gov.tr>. Retrieved on 8th of January, 2017.
- Yazar S, Ozkan YT, Hökelek M, et al. Cystic echinococcosis in Turkey from 2001-2005. *Turkiye Parazitoloj Derg* 2008; 32: 208-20.
- The results of population registration system based on address in 2014. [tuik.gov.tr](http://www.tuik.gov.tr). Retrieved on the 6th of June, 2015.
- Yaldiz S, Gursoy S, Ucvet A, et al. Capitonnage results in post-operative morbidity in the surgical treatment of pulmonary echinococcosis. *Ann Thorac Surg* 2012; 93: 962-7. [\[CrossRef\]](#)
- Isitmangil T, Gorur R, Yiyit N, et al. Evaluation of 308 patients surgically treated for thoracic hydatidosis. *Turk Gogus Kalp Damar Cer Derg* 2010; 18: 27-33.
- Alpaly L, Lacin T, Ocakcioglu I, Evman S, et al. Is video-assisted thoracoscopic surgery adequate in treatment fo pulmonary hydatidosis? *Ann Thorac Surg* 2015; 100: 258-62. [\[CrossRef\]](#)
- Usluer O, Kaya SO, Samancilar O, et al. The effect of preoperative Albendazole treatment on cuticular membranes of pulmonary hydatid cysts: should it be administrated preoperatively? *Kardiochir Torakochirurgia Pol* 2014; 11: 26-9. [\[CrossRef\]](#)
- Mor N, Diken TA, Anuk T. The situation of cystic echinococcosis in Kars State Hospital for the last five years. *Turkiye Parazitoloj Derg* 2015; 39: 108-11. [\[CrossRef\]](#)
- Akalin S, Kutlu SS, Caylak SD, et al. Seroprevalence of human cystic echinococcosis and risk factors in animal breeders in rural communities in Denizli, Turkey. *J Infect Dev Ctries* 2014; 8: 1188-94. [\[CrossRef\]](#)
- Aksu M, Sevimli FK, Ibioglu I, et al. Cystic echinococcosis in the Mersin province (119) cases. *Turkiye Parazitoloj Derg* 2013; 37: 252-6. [\[CrossRef\]](#)
- Ozekinci S, Bakir S, Mizrak B. Evaluation of cystic echinococcosis cases given an histopathological giagnosis from 2002 to 2007 in Diyarbakir. *Turkiye Parazitoloj Derg* 2009; 33: 232-5.
- Sonmez TG. Determination of the incidence of toxoplasmosis and cystic echinococcosis in Kocaeli. *Turkiye Parazitoloj Derg* 2009; 33: 125-30.
- Gonlugur U, Ozcelik S, Gonlugur TE, et al. The retrospective annual surgical incidence of cystic echinococcosis in Sivas, Turkey. *Zoonoses Public Health* 2009; 56: 209-14. [\[CrossRef\]](#)
- Yazar S, Yaman O, Cetinkaya F, et al. Cystic echinococcosis in Central Anatolia, Turkey. *Saudi Med J* 2006; 27: 205-9.
- Cağlayan K, Celik A, Koç A, et al. Unusual locations of hydatid disease: diagnostic and surgical management of a case series. *Surg Infect (Larchmt)* 2010; 11: 349-53. [\[CrossRef\]](#)
- Craig PS, McManus DP, Lightowers MW, et al. Prevention and control of cystic echinococcosis. *Lancet Infect Dis* 2007; 7: 385-94. [\[CrossRef\]](#)
- Kavukcu S, Kilic D, Tokat AO, et al. Parenchyma-preserving surgery in the management of pulmonary hydatid cysts. *J Invest Surg* 2006; 19: 61-8. [\[CrossRef\]](#)
- Altintas N. Past to present: echinococcosis in Turkey. *Acta Trop* 2003; 85: 105-12. [\[CrossRef\]](#)
- Sanli A, Onen A, Karapolat S, et al. Social factors associated with pulmonary hydatid cyst in Aegean, Turkey. *Afr Health Sci* 2011; 11(Suppl 1): 82-5.