



A retrospective study of human cystic echinococcosis in Basrah province, Iraq



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ABSTRACT

Human cystic echinococcosis (CE) is a parasitic zoonosis with serious clinical burden and constitutes a challenge to public health in endemic areas worldwide. We performed a retrospective study to investigate the occurrence of CE in patients at six hospitals in Basrah province, Iraq. In the current study setting, data retrieval and validation of the quality of hospital records was very challenging considering the difficult situation Iraq is unfortunately facing. Hospitalization records were reviewed from January 2005 to December 2015. A total of 748 cases of human with CE were diagnosed and operated in Basrah hospitals, equivalent to an annual clinical incidence of approximately 4.5 cases per 100 000 people. Hospital records show that, cystic echinococcosis affected more females (61.2%) than males (38.8%). Descriptive review of recorded CE cases in the surveyed hospitals revealed that more cases were reported in the age group of 21–30 years than in the other age groups. Based on the reviewed recorded clinical reports, cysts were mainly found in the liver (46.3%) and lungs (28.1%) of the patients. Hospital reports demonstrate that females had more hepatic cysts (63.9%) than males (36.1%). This study found that CE continues to pose a threat to public health in Basrah, and there is a need for more epidemiological investigations of CE in humans in order to determine risk factors and the economic impact of the disease in this province of Iraq.

1. Introduction

Human cystic echinococcosis (CE) is caused by the larval stage of *Echinococcus granulosus*, a helminth belonging to the cestode group. A number of herbivorous and omnivorous animals act as intermediate hosts of *Echinococcus*. They become infected by ingesting the parasite eggs in contaminated food and water, and the parasite then develops into larval stages in the viscera. Carnivores act as definitive hosts for the parasite, and host the mature tapeworm in their intestine. They are infected through the consumption of viscera of intermediate hosts that harbor the parasite (Budke et al., 2006). CE is principally maintained in a dog–sheep–dog cycle. Humans are an accidental intermediate host for this parasite, and are infected through ingestion of eggs released from dogs or other canids (Eckert and Deplazes, 2004). CE demonstrates a high predilection for the liver and lung. Clinical symptoms vary depending on the size and position of the cysts in the organ (Eckert et al., 2016; McManus et al., 2003). In the liver, the pressure effect of the cyst can produce symptoms of obstructive jaundice and abdominal pain.

Involvement of the lungs produces chronic cough, dyspnea, pleuritic chest pain, and hemoptysis (Larrieu and Frider, 2001; Schantz, 2006).

The World Health Organization identifies human CE as one of the most important neglected zoonoses, as the disease continues to pose a serious socio-economic problem in many parts of the world (Budke et al., 2006). CE is highly endemic in most of the countries of the Mediterranean basin, including North Africa and the Middle East. The high endemicity of echinococcosis in the Mediterranean region has been attributed to many risk factors, such as a lack of adequate public health education, insufficient application of control programs, and the common practice of home slaughter of small ruminants (Dakkak, 2010).

The zoonotic nature and the serious clinical burden of CE make it important from public health and economic perspectives worldwide. High annual incidences of CE have been reported in Levant, the Persian Gulf, and Middle East countries (Sadjjadi, 2006) and the costs associated with the disease have a great impact on affected individuals, their families, and the community as a whole (McManus et al., 2003). For example, in Morocco, 1700 human surgical cases of CE (5.5 cases

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per 100 000 inhabitants) were recorded in 2003 and the average cost for surgical intervention was US \$1500 per case (Azlaf and Dakkak, 2006). The overall annual cost of CE in Iran was estimated at US\$232.3 million (95% CI US\$103.1–397.8 million), including both direct and indirect costs (Rokni, 2009).

Human CE is endemic in Iraq, and the disease has been recognized from the number of patients that were admitted to the hospitals and treated surgically (Faraj and Muhsin, 2013; Jarjees and Al-Bakeri, 2012; Maktoof and Abu Tabeeh, 2015; Saida and Nouraddin, 2016). Higher number of cases of human CE have been recorded in the southern provinces of Iraq (Abdul Ameer et al., 2013; Thweni and Yassen, 2015), and in particular Basrah province (Thamir et al., 2015). Despite the substantial burden of the disease, national surveillance programs for CE do not exist in Iraq. The fragile health services in Iraq, after years of international economic sanctions and ongoing political and ethnic conflicts, are challenging for any organized efforts to combat endemic tropical and zoonotic diseases (Barnett-Vanes et al., 2016).

In common with several other neglected zoonoses, little is known on the prevalence and incidence of human CE in Iraq, and the resulting lack of awareness generates little interest for developing and implementing appropriate control programs. The aim of this study was to compile data from hospital records on human CE in Basrah province, as an attempt to characterize aspects of the disease in an endemic setting in southern Iraq.

2. Materials and methods

2.1. Study area and population

Basrah is the third largest province in Iraq and lies in the south of the country and borders Iran, Kuwait, and Saudi-Arabia. Its economy is largely dependent on the oil industry with some of Iraq's largest oil fields located in the province, and most of Iraq's oil exports leave from there. Basrah province has a desert climate with great temperature variations between the seasons and maximum temperatures of 50 °C in summer. Basrah is in a fertile agricultural region, with major products including rice, maize corn, barley, pearl millet, wheat, dates, and livestock. The province had an estimated population of 1.5 million in 2012, with 20.1% of this rural (The NGO Coordination Committee for Iraq, 2013).

In Basrah province, there are 14 public and 5 private hospitals primarily located in urban areas. Only 8 of these hospitals offer surgical services, and of these 6 (5 public and 1 private) are equipped with the technical facilities and skilled surgeons to perform operations on human cases of CE. The study outlined in this manuscript was conducted at these 6 hospitals (Al-Sadar general hospital, Al-Basrah general hospital, Al-Faihaa general hospital, Al-Shifa general hospital, Al-Mawana general hospital, and Abin-Albaitar private hospital).

2.2. Data collection

Clinical records were reviewed for the 11 year period from 2005 to 2015 at the 6 hospitals. Data retrieval was very challenging; the majority was handwritten paper-based reports, there was no harmonized data collection style or forms, and there was not system in place to validate the quality of the kept hospital clinical records. The following data were extracted from the records and entered into excel sheets; age, gender, occupation, residency (urban vs. rural), and localization of cysts. Descriptive data analysis was performed using the software STATA Ver.11 for Windows (Stata Press, College Station, TX, USA). Categorical variables were analyzed using the chi-square test for independence at a critical probability of $P < 0.05$.

2.3. Ethics statement

This research study was approved by the Human Ethics Review

Table 1

Age and gender of patients with CE in Basrah, Iraq, between 2005 and 2015.

Age (years)	Female (%)	Male (%)	Total (%)
> 10	17 (42.50)	23 (57.50)	40 (5.3)
11–20	75 (62.50)	45 (37.50)	120 (16.04)
21–30	120 (59.70)	81 (40.30)	201 (26.87)
31–40	88 (61.1)	56 (38.9)	144 (19.25)
41–50	73 (68.87)	33 (31.13)	106 (14.17)
51–60	51 (64.56)	28 (35.44)	79 (10.56)
61–70	32 (64.00)	18 (36.00)	50 (6.68)
> 70	2 (25.0)	6 (75.0)	8 (1.07)
Total	458 (61.23)	290 (38.77)	748 (100.00)

Committee of Murdoch University, Perth, Australia (Permission number: 2016/034). Official written approval forms the Ministry of Health in Iraq and from Basrah Health Directorate were obtained before commencement of the field work.

3. Results

Reviewing the available clinical records revealed that a total of 748 human patients with CE were diagnosed and surgically operated at the 6 hospitals in the 11-year period from 2005 to 2015 (Table 1) giving an average of 68 cases per year. Using 2012 population data for Basrah (United Nations Development Program (Iraq Country Office), 2013) as an estimate of the hospitals catchment area, an annual clinical incidence of 4.5 cases/100 000/year was calculated. The highest number of CE cases (12.7%, 95% confidence interval (CI): 10.4, 15.3) was recorded in hospital reports of the year 2014, while the lowest (4.3%, 95% CI: 2.9, 5.9) was in 2005.

The age and gender distributions of patients with CE are summarized in Table 1. The largest share of patients with CE (26.9%) was in the 21–30 year-age-group. Based on our data, cystic echinococcosis was recorded more in females (61.2%) than males (38.8%). Housewife was the most frequently reported occupation listed for cases revealed from the hospitals records, and represented 53.9% of CE cases. The average age of patients with CE was 34.6 years (SD 16.6 years) (Table 2). The youngest patient operated on was only 6 months of age and the oldest 85 years.

The distribution of cysts in the body is summarized in Table 3. The two anatomical sites most commonly affected were the liver (46.3%) and lung (28.1%). Surprisingly, the reviewed hospital data indicate that 15.7% of CE cases among female patients were recorded in ovaries. Recorded cases in females had more hepatic cysts (63.9%) than males (36.1%), and both genders were equally affected by pulmonary cysts (Table 3). Our data show that the majority of CE cases featured with single organ involvement and with solitary cysts. Cysts were found in multiple organs of only 3.2% of patients and livers of male patients was commonly (7/24) involved (Table 3). Involvement of various atypical organs was evident, for instance 6 patients received surgery in the neck and 4 patients in vertebral column. Three patients received surgery due

Table 2

Occupation, gender and age distribution of patients with CE in Basrah, Iraq, between 2005 and 2015.

Occupation	Number (%)	Female (no.)	Male (no.)	Age (Mean ± SD)
Child	22 (2.94)	9	13	4.26 ± 1.68
Employee ^a	49 (6.55)	11	38	37.93 ± 11.26
Housewife	403 (53.88)	403	0	37.90 ± 15.25
Retired	10 (1.34)	0	10	59.6 ± 10.27
Student	70 (9.36)	33	37	14.52 ± 5.60
Teacher	2 (0.27)	2	0	34.00 ± 5.65
Unemployed	192 (25.67)	0	192	36.23 ± 15.15
Total	748 (100.00)	458	290	34.58 ± 16.64

^a Employee referred to people working as public servant.

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