

*Original Research Article*

**Human Hydatidosis in Duhok – Kurdistan Region – North of Iraq**

Adel Talib Mohammed Al \_Saeed<sup>1\*</sup> Khoshi Salim Abdulhafith Almufty<sup>2</sup>

<sup>1</sup>College of Medicine, University of Duhok, Duhok, IRAQ

<sup>2</sup>Azadi Teaching Hospital, Directorate of Health, Duhok, IRAQ

\*E-mail: safa\_adel96@yahoo.com

Accepted 25 January, 2016

**Abstract**

Forty eight sera were collected from patients with suspected Hydatid cyst (HC) admitted to Duhok public and private hospitals and from apparently hydatid cyst free people during the period from 1/ October 2010 to 30 / April 2011.

All sera were examined for the presence of specific antihydatid antibodies by ELISA IgG (DRG kit - Germany) and Indirect Hemagglutination test (IHA). The liver was the most common site of HC in 26 (54.2%) of cases followed by the lung HC in 12 (25.0%) of cases. Regarding the residency of examined patients, most of the HC cases were found to be from rural or semi-rural areas such as Sinjar 17 (35.4%), Sumel 11 (22.9%), Talfer 6 (12.5%), Telkif 5 (10.4%) and Shekhan 2 (4.2%) of cases.

The HC cases reported from patients of Duhok and Zakho were 4 (8.3%) and 3 (6.2%) respectively. The highest rate of infection was among housewives 25 (52.1%) followed by free workers 12 (25.9%) and the lowest rates were recorded from the government employed, children and students groups. The highest rate was found in age groups 11-20 and 21-30 years at a rate of 11(22.9%) for each from the total number of cases followed by the age group 31-40 years at a rate of 10(20.8%) of the cases. The highest percentage was among females 31(64.4%) of the cases. Out of 48 patients, it was found that 34 (70.8%) had a history of contact with dogs and animals, and 14 (29.1%) did not have any contact with dogs and animals.

**Key words:** Hydatidosis, *Echinococcus granulosus*, Hydatid cyst, Echinococcos

**الأكياس المائية للإنسان في دهوك – كردستان العراق**

**الخلاصة**

تم جمع ٤٨ مصلاً من المرضى المصابين بالأكياس المائية الراقدين في المستشفيات الحكومية والأهلية في دهوك والأشخاص السويين خلال الفترة من ١ تشرين الأول ٢٠١٠ إلى ٣٠ نيسان ٢٠١١.

جميع المصول فحصت للكشف عن المضاد الخاص ضد الأكياس المائية بفحص IgG ELISA و IHA. كان الكبد من أكثر الأعضاء شيوعاً للأكياس المائية حيث وجدت الأكياس الكبدية في ٢٥ (٥٤,٢%) من الحالات وتلتها الأكياس المائية الرئوية في ١٢ (٢٥%) من الحالات. ان مرض الأكياس المائية أكثر شيوعاً بين الأميين حيث وجد في ٢٨ (٥٨,٣%) حالة بينما وجد في ٢٠ (٤١,٧%) حالة بين المتعلمين.

بالنسبة الى محل السكن ، وجدت أكثر حالات الأكياس المائية من المناطق الريفية أو شبه الريفية مثل سنجان ١٧ (٣٥,٤%) و سميل ١١ (٢٢,٩%) و تلعفر ٩ (١٢,٥%) و تلكيف ٥ (١٠,٤%) والشبخان ٢ (٤,٢%).

كانت حالات الأكياس المائية في دهوك وزاخو هي ٤ (٨,٣%) و ٣ (٦,٢%) على التوالي. وجدت أعلى نسبة للإصابة بين ربات البيوت بلغت ٢٥ (٥٢,١%) وتلاها ذوي الاعمال الخاصة ١٢ (٢٥,٩%) بينما سجلت أقل النسب في مجاميع الموظفين الحكوميين و الاطفال والطلبة.

وجدت أعلى نسبة في المجاميع العمرية (١١ - ٢٠) و (٢١ - ٣٠) سنة وبلغت ١١ (٢٢,٩%) حالة لكل مجموعة من العدد الكلي للحالات تلتها المجموعة العمرية (٣١ - ٤٠) سنة سجلت فيها ١٠ (٢٠,٨%) من الحالات. كان عدد الاناث من مجموع ٤٨ مريضاً بالأكياس المائية هو ٣١ (٦٤,٤%) و ١٧ (٣٥,٤%) من الذكور. بالنسبة للتماس مع الكلاب وجد ان ٣٤ (٢٨,١%) من الحالات كان لديهم تماس مع الكلاب والحيوانات بينما ١٤ (٢٩,١%) لم يكن لديهم تماس مع الكلاب والحيوانات.

## **Introduction**

**H**ydatic cyst (HC) or hydatidosis is a helminthic zoonotic disease that results from infection with the cyst stage of *Echinococcus granulosus* [1-2]. This disease is a chronic disease and highly endemic in most of the world countries including Mediterranean region [3]. HC is regarded as one of the world's major zoonosis affecting both man and domestic animals with cyst (larva) while dogs affected by adult stage [4]. Globally many studies have been carried out on different aspects such as prevalence, epidemiology, immunology, diagnosis and treatment [5-8]. In Iraq, also many studies have been conducted on various aspects of hydatidosis [9-11]. Hydatidosis in Iraq is still a major economic and public health problem because there is no national control program (9). The surveillance and epidemiology are essential for knowledge of the transmission cycles and control measures [12]. Hydatid cyst develop in various organs, the commonest site of infection is the liver, the lung, followed by other organs such as kidneys, spleen, heart, and the brain, may also be infected. Infection may even take place in the bone marrow cavities, but here the cysts are generally sterile and differ in their structures [13].

In the light of this information, the present study was adopted to Assess the cases of human hydatidosis in Duhok – Kurdistan Region – North of Iraq.

## **Materials and Methods**

This prospective study was conducted in Duhok City and the samples were collected from 48 patients suspected of HC who attended and hospitalized in six hospitals. The patients included in this study were examined by physicians. The HC cases were confirmed by one of the following methods, imaging diagnosis (CT scan, Ultrasound, X ray), histopathology and serology. The period of samples collection extended 6 months from 1 / October 2010 to 30 /April 2011. The data compiled on special form for each patients included: age, sex, educational status, occupation,

area of residence, history of contact with dogs and animals, previous infection with HC, location of cyst, result of imaging diagnosis and main complaints.

The blood samples were taken from 48 patients who suffered from HC. The blood samples of patients with HC who underwent surgery immediately or after a period of 2 days were collected.

The blood samples were collected from all of the patients by venipuncture, 5 ml. of blood was obtained, with plain tube for serological tests, each sample was centrifuged, the serum collected and aliquot, then stored at -20°C until used for serological tests.

The serological method used for the diagnosis of patients with HC in the current study included Indirect Hemagglutination test (IHA) and Enzyme Linked Immunosorbant Assay (ELISA IgG, DRG-Germany commercial kit).

Sera from patients suspected of HC (48) were examined by previous mentioned serological tests.

Data analysis was performed utilizing the Statistical Package for Social Sciences (SPSS version 16.0 for Window). For categorical variables, frequency and proportions were computed and assessed.

## **Results**

Regarding the location of hydatid cysts in organs among patients with HC, table (1) shows the distribution of hydatid cysts in various organs in studied cases with HC. It is obvious from the results that the liver and lungs were the most common sites involved in the infection. The first frequent site of infection was the liver which was involved in 26 (54.2%) followed by the lungs which were affected in 12 (25%). Regarding the multiple organs involvement, the liver was the commonest organ involved with other organs 6 (12.5%). The liver-spleen-kidney was involved in 2 (4.2%), while lung-spleen- kidney, liver- spleen- lung and liver-lung-heart were involved in 1 (2.1%). On the other hand, single organ infection was recorded in one case for each of abdomen, brain and ovary.

**Table 1 :** Cyst Locations

%	No. of patients	Cyst location
٥٤.٢	٢٦	Liver alone
٢٥	١٢	Lungs alone
٤.٢	٢	Liver--Spleen-Kidney
٢.١	١	Lung --Spleen-Kidney
٢.١	١	Liver--Spleen-Lung
٢.١	١	Liver-Lung-Heart
٢.١	١	Liver-Spleen
٢.١	١	Liver- Pelvis
٢.١	١	Abdomen
٢.١	١	Brain
٢.١	١	Ovary
١٠٠	٤٨	Total

Table (2) shows the distribution of HC cases according to residence indicating that most of the patients were from rural or semirural areas surrounding Duhok city. It was recorded that 17 (35.4%) from Sinjar

area followed by 11 (22.9%) from Sumel, 6 (12.5%) from Talfer, 5 (10.4%) from Telkif, 4 (8.3%) from Duhok, 3 (6.2%) from Zakho and 2 (4.2%) from Shekhan.

**Table 2 :** The Distribution of Patients with HC According to Residence (n = 48 )

%	No. of patients	Residency
٣٥.٤	١٧	Sinjar
٢٢.٩	١١	Sumel
١٢.٥	٦	Tal'fer
١٠.٤	٥	Telkif
٨.٣	٤	Duhok
٦.٢	٣	Zakho
٤.٢	٢	Shekhan
١٠٠	٤٨	Total

The results related to the number and percentages of patients with HC according to the occupation were shown in table (3). The highest rate of infection was among housewives in 25 (52.1%), followed by free

workers in 12 (25.9%). On the other hand, the lowest rates of infection were among the government employed in 3 (6.2%) and 1 (2.1%) in a child.

**Table 3 :** The Distribution of Patients with HC According to Occupation (n = 48)

%	No. of patients	Occupations
٥٢.١	٢٥	Housewives
٢٥.٠	١٢	Free workers
١٤.٦	٧	Student
٦.٢	٣	Government employee
٢.١	١	Child
١٠٠	٤٨	Total

The distribution of patients with HC according to age groups is shown in table (4). Out of the total number of cases, 11 (22.9%) of cases were reported in (11-20)

and (21 - 30) year age group, followed by 10 (20.8%) in (31 - 40) year age group. On the other hand, 6 (12.5%) were in (41-50) year age group and 4 (8.3%) in (1-10) and

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 (51-60) year age groups. The lowest year age group.  
 number of cases 2 (4.2%) were in (61-70)

**Table 4 :** The Distribution of Patients with HC According to Age Groups (n = 48)

%	No. of patients	Age groups
8.3	4	1 10 –
22.9	11	11 20 –
22.9	11	21 30 –
20.8	10	31 40 –
12.5	6	41 50 –
8.3	4	51 60 –
4.2	2	61 70 –
100	48	Total

Table (5) shows the distribution of patients with HC according to sex. The most frequently infected patients were

females, 31 (64.6%) in females, while males less frequently encounter the disease, as it's reported in 17 (35.4%).

**Table 5 :** The Distribution of Patients with HC According to Sex (n = 48)

%	No. of patients	Sex
35.4	17	Males
64.6	31	Females
100	48	Total

Regarding the number(s) of hydatid cysts reported in patients. It was found that 26 (54.2%) were infected with single cyst and

22 (45.8%) were infected with multiple cysts (Table 6).

**Table 6 :** The Distribution of Patients with HC According to the Number of Cysts (n = 48)

%	No. of patients	Number of cysts
54.2	26	Single
45.8	22	Multiple
100	48	Total

Table (7) shows the history of patients related to contact with dog and livestock. The highest number and percentage of

cases were reported from patients which have contact with dogs and animals. It was found that 34 (70.8%) have a history of contact with dogs and animals, while the

remaining 14 (29.1%) were reported from patients that do not have any contact with

dogs and animals.

**Table 7 :** The Distribution of Patients with HC in Relation to History of Contact with Dogs

%	No. of patients	Contact with dogs
70.8	34	Yes
29.2	14	No
100	48	Total

### **Discussion**

In Iraq, including Kurdistan region, HC is one of the serious public health problems, where sheep, cattle and goats are still slaughtered traditionally especially in the rural areas with absence of national or local control program. In addition to that, low education of individuals on the disease leads to a high prevalence rate of infection while illegal home slaughtering of animals lead the infected organs to be at the access of the definitive hosts (stray dogs) for completing the life cycle of the parasite. These hosts act as a source of infection to the intermediate hosts by discharging huge numbers of eggs with feces.

The current study represents the first report about HC in patients attending hospitals of Duhok city and provides an update of little knowledge on the variables associating with the disease with special emphasis on the validity of different serological tests in the detection of anti-hydatid antibodies in patients suffering from HC.

Concerning the site of the HC, it was found from the results that various organs were affected, but as it is expected from the life cycle and the circulation of the parasite in the body of their intermediate hosts, the present study showed that the involvement of the liver was at the highest degree 26 (54.2%). That is in agreement with most other similar studies, in Iraq [14] showed the liver was the most frequent site of infection involved in 67 (64.42%) and the lung was affected in 21 (20.19%) from 104 hydatid patients of Mosul City. In Iraq during January 1986 to January 2006, 763 patients underwent surgery for thoracic

hydatidosis at Ibn-Alnafis Teaching Hospital in Baghdad, during these 20 years, hepatic hydatid cysts occur in 70% and pulmonary cysts in 20% [15]. In a study conducted by [16] showed that all the patients admitted to the main hospitals in Erbil with surgically and/or histopathologically proved hydatid cysts over the period 1980-1989 were 153 patients, Liver were 63 (41.2%) and lung 21 (13.7%).

The same results were found in various parts of the world, a total of 390 surgically confirmed HC cases were found in the records of surgical hospitals of the West Bank of the Palestinian Authority for an 8-year period 1990-1997, the liver was the most common site of HC infection, accounting for 58.2% of the cases and the lung was the second most frequently involved site of infection 20.8% [17]. A total of 117 patients were admitted with the diagnosis of HC during the five year study period in Saudi Arabia from December 1999 to December 2004 [18], Liver was the primary site in 93 (79.5%) patients, this result was higher than the result of the current study may be due to the long period of study.

The liver acts as the primary filter for the parasite, on the contrary, the lungs acts as the secondary filter but in few studies some researchers found that the lungs were the predominant site of HC. During the years 1986-1990 in Iran 4.850 cases of HC were operated, the lung cysts was with a rate of 46.2% while liver cysts were 42% [18]. Most of the authors confirmed that this is an unusual consequence and the reason for such differences in different areas is not

clear but might be due to easy diagnosis of hydatid cysts in the lungs and frequent prescription of chest X-ray imaging technique by physicians for those patients suffering from respiratory disorders [19]. In many cases, the resistances shown by the liver tissue surrounding the cyst determines a slow growth or even avoids the growth for many years. On the other hand, the lungs show lower resistance to the growth of the hydatid cyst due to their elasticity. This state allows an increase of the cyst size [20-21].

A retrospective study of patients with HC was conducted in the University College London Hospitals Committee on the Ethics for Human Research. Cysts were confined to the abdomen in 19 patients (hepatic 14, splenic 2, multiple organs 3), were intrathoracic in three patients, and were present in both the thorax and abdomen in four patients; pelvic disease and spinal disease each occurred in one patient [22]. In a study of [23] when examined 204 patients, showed that 156 (76%) had pulmonary cysts, 43 (21%) had liver cysts, and 12 (6%) had spleen cysts, 2 (1%) brain, 2 (1%) had pericardium, 2 (1%) had myocardium and 1 (0.5%) had breast.

The results of the relation between the educational status and the occurrence of HC showed a higher frequency of HC 27 (69.2%) among the patients with illiterate status than those with literate level 21 (30.8%). These results were consistent with these reports from many studies. Among 1,227 cases of HC in Iran, 838 (68.3%) were illiterate. While educated cases were the least 0.5% [20-14], also showed 43 (41.3%) of the patients were illiterate from 104 cases.

Although hydatid disease may be found in any areas, but people who are living in rural area are at higher risk for acquiring the infection and HC is generally considered a rural disease because of its characteristics of transmission, which involves dogs and domestic animals such as sheep, cattle and goats. A study performed in Mosul City in Iraq [14] stated that out of 104 HC patients, 79.9% were living in rural areas and 20.1% lived in urban areas.

Regarding the distribution of HC cases according to residency, the results of this study indicate that most of the patients were from outside Duhok centre such as Sinjar, Sumel, Talfer and Telkif with few cases from Shekhan. These areas constitute agricultural regions with abundant breeding of animals. This situation made people of these areas to be in close contact with animals and dogs. In addition to that home slaughtering of animals for human consumption and feeding dogs with their infected organs leads to the maintenance of the life cycle. These results were in agreement with most of the previous studies in Iraq and other countries. From January 1986 to January 2006, 763 patients underwent surgery for thoracic hydatidosis at Ibn-Alnafis Teaching Hospital in Baghdad, Iraq. During those 20 years, hydatid cyst was found in the left ventricular myocardium in 4 patients. All 4 patients lived in rural areas and had direct contact with infected animals. A study reported that from Forty-nine patients with pulmonary hydatidosis, thirty nine of them (81%) were from the rural areas of the Sistan and Baluchistan Province in Iran [15-24].

However, the results of this study do not coincide with those reported by [25], in which was the sample size of the population studied in the 3 areas was 439 (rural, urban and suburban semirural) in Basra governorate, southern Iraq. The prevalence of hydatidosis (19.0%–35.5%) was relatively high in all the 3 areas. The results of this study disagree with those of [23] in which they found higher cases of HC among urban residence (61.4%) in Argentina south-eastern region of Buenos Aires province, also they found that hydatid disease is considered a rural disease because of the characteristics of the parasite life cycle which involve domestic herbivores and omnivore's sheep, cattle, pigs. The reason of HC cases recorded from urban areas might be due to poor sanitary conditions in slaughter houses and illegal home slaughtering of animals.

The association between the occupation and occurrence of HC was studied by many authors. In all of them the highest rate of

infection was among housewives. The present study found that the highest infection among the housewives in 25 HC cases was (52.1%) followed by self-employed in 12 cases (25.9%). This observation was in agreement of other studies. A study of [26] showed that housewives were the most infected group (47%) ( $P < 0.05$ ) from 85 patients of HC in Hospital-based study in Iran.

In Iran a study found the highest rate of infection (51.3% – 75%) was among Housewives, especially in rural areas, where the most infected cases can be found, because they have the highest chance of contact with the sources of infection, such as contact with contaminated vegetables, cleaning the houses containing the dog feces and the desire to eat soil [27]. A study reported that the number of women which underwent surgery were more often than men, and that housewives had the highest rate of surgery [20]. The high rates of women and housewives might be due to sweeping their yards, where the dust contains *E. granulosus* eggs from dogs in rural areas, and cleaning and eating raw vegetables in urban situations [20].

The finding of a low frequency of HC in children during this study may not reflect the real situation as HC is a chronic disease with a slow rate of growing of the hydatid cyst. The majority of patients in the present study attended public hospitals, this could be attributed to the fact that most of patients with HC were from low socio-economic level. This factor plays an important role in the distribution of the disease. In Sana'a City, in Yemen, public hospitals had a higher proportion of infected people (79%) with HC than private hospitals which accounted for only 21% [4].

The highest number of HC cases in the present study was among the age groups ranging from (11 - 20) and (21 - 30) years followed by (31-40) year. Similar findings were reported in several studies. In which the age groups 11-20 and 21-30 were the most affected groups and constituted 27.4% and 21.5% respectively of the total number of cases in an annual surgical incidence of HC cases of the West Bank of the

Palestinian Authority for an 8-year period 1990-1997 [17] also showed the same findings.

This may be due to the long period required for the growth and development of hydatid cysts. The low rate of infection in young age group is also due to the same reason. As the cysts grow slowly, and a cyst is rarely diagnosed during childhood or adolescence unless the brain is affected. HC is a disease of younger adults, with an average age at diagnosis of 30-40 years [28].

With regard to sex in, the present study higher cases were reported females as compared with males. This agrees with many reports. A retrospective study was undertaken to determine the incidence of HC among patients hospitalized in Kashan during 1993-2000 in Iran. From 85 patients, 47 females (55.3%) and 38 males (44.7%) had hydatid cysts [29]. In another study, it was found that the seropositivity rate of females was higher than that of males 17.2% and 9.4% respectively in prevalence study of HC in Turkey [30]. In northern Iraq, a study of [31] found that the HC is endemic, and that females appear to be at the greatest risk of infection.

However, these findings disagree with few studies that found that the number of HC in adult men is higher than that in women. In Saudi Arabia, from December 1999 to December 2004 an observational study showed that seventy four (63.24%) were males giving a male to female ratio of 1.7:1 [19].

The differences in studies related to females and males' ratio could be attributed to the difference in socio-economic factors from country to country. Regarding the number of cysts, it was noted that most of the HC cases had single cysts in each of the affected organ followed by multiple cysts. These findings were in accordance with those of other studies which reported that most of the patients were affected with unilocular hydatid cyst. A total of 66 HC patients were identified in Yemen. With regards to the number of cysts, 40 (61%) had a single cyst in each affected organ, while 26 (39%) had multiple cysts [4]. In the majority of cases from 117 patients, 103

(88%) hydatid cysts were present in one organ, while 14 (12%) had two involved organs [19]. The presence of multiple cysts in such patients may be related to re-exposure to the infection, or ingestion of many scolices in the same time.

With respect to the contact or without contact with dogs, it is obvious that the disease was most common (70.8%) among the patients who had direct contact with dogs. A similar pattern was observed by other studies in Iraq, [14] showed that among 104 patients 85 (82%) had animal contact and 19 (18%) patients had no animal contact. The same investigations were found in other countries. Infections are more common in humans and typically occur in poor pastoral communities where livestock are slaughtered in open areas with little or no veterinary management practices [32]. In general, all of the persons living in rural areas are at higher risk of occurrence of HC because they are in close contact with dogs. These dogs contaminate the pasture and the environment with eggs of the parasites.

In conclusion, hydatid disease is endemic in Duhok – Kurdistan region of Iraq, so further sero-epidemiological studies should be performed to detect HC cases in rural and urban areas of Kurdistan region by using serological tests.

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