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Research Article

Investigating Hydatid Diseases Cases in Mosul Hospitals

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ABSTRACT

Background: Hydatid disease, a zoonotic parasitic infection, remains a significant public health concern in Iraq. This study aimed to investigate the epidemiological and clinical characteristics of hydatid disease cases in major hospitals in Mosul, Iraq.
Methods: A retrospective study was conducted between June 2024 and June 2025 on 50 patients diagnosed with hydatid cysts. Data on age, gender, cyst location, number, and size were collected and analyzed using SPSS version 21. Statistical significance was set at a p-value ≤ 0.05. An independent samples t-test was used to compare the mean number of cysts between patient groups.
Results: The highest infection rate was observed in the 1-10 years age group (22%, 11/50), followed by the 21-30 years age group (20%, 10/50). The infection rate was slightly higher in males (52%, 26/50) than in females (48%, 24/50). The liver was the most commonly affected organ (61.29%, 38/62 cysts), followed by the lungs (29.03%, 18/62 cysts). A significant difference was found between the number of patients with a single cyst (78%, 39/50) and those with multiple cysts (22%, 11/50) ($p = 0.006$).
Conclusion: This study confirms the endemicity of hydatid disease in Mosul, with a higher incidence among younger age groups and a slight male predominance. The liver is the primary target organ, with most cases involving a single cyst. These findings highlight the urgent need for robust public health interventions focused on source control and public awareness.

1. INTRODUCTION

Hydatidosis, or echinococcosis, is a globally prevalent zoonotic disease caused by parasitic tapeworms of the genus *Echinococcus*. These organisms belong to the phylum Platyhelminthes, class Cestoda, and order Cyclophyllidea. Among the known species, *Echinococcus granulosus* is the primary causative agent of hydatid disease in both humans and animals [1]. Hydatidosis is one of the major zoonotic diseases that causes extensive economic damages and public health complications worldwide. The condition is endemic in numerous parts of the world, and large areas of Asia, particularly Iraq. Hydatid disease is an infectious disease in Iraq, as previous studies have confirmed, and the disease may worsen due to the absence of a strong national control program [2]. *Echinococcus granulosus* produces unilocular hydatid cysts, which represent the larval stage of the parasite. Hydatidosis is a disease of considerable medical importance due to its potential to cause serious health problems. Humans are accidental intermediate hosts, while herbivores are natural intermediate hosts, in which the larval cysts develop. In contrast, dogs and other canids act as definitive hosts, harboring the adult tapeworms in their small intestines. Human infection occurs primarily through the accidental ingestion of parasite eggs, which are typically spread via contaminated food, water, or surfaces [3]. Once inside the human host, the parasite enters a prolonged asymptomatic phase during which the cysts grow silently. Clinical symptoms, when they eventually develop, vary depending on the size and anatomical location of the cysts. Hydatid cysts can grow to substantial sizes, occupying several liters in volume and containing thousands of viable protoscolices [4]. Although national surveillance data are limited, a recent national study at Sulaimaniya Government indicated a high seroprevalence in livestock, exceeding 1.5% in sheep and 0.2% in cattle. In humans, hospital-based studies from different regions have reported surgical incidence rates as high as 2.5% of the population; this underscores the substantial burden of the disease at the national level [5]. According to findings by [6], approximately 50–75% of hydatid cysts localize in the liver, while about 25% are found in the lungs. The remaining 5–10% are distributed throughout other regions of the body via the arterial system. In many instances, the disease is detected incidentally during imaging conducted for unrelated reasons. Diagnostic imaging plays a crucial role in

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confirming the presence of hydatid cysts. Ultrasonography and computed tomography (CT) scans are highly sensitive techniques used for diagnosis. In some scenarios, plain radiography may offer supportive findings. For suspected cerebral involvement, magnetic resonance imaging (MRI) is the modality of choice due to its detailed anatomical resolution and multiplanar imaging capabilities [7]. Current treatment strategies for hydatidosis primarily involve surgical intervention, which remains the standard approach for managing sizable or symptomatic cysts. In select cases, percutaneous aspiration techniques are employed, and pharmacological therapy is used as an adjunct or alternative treatment. Benzimidazole compounds are the most commonly administered antiphrastic agents. These medications exhibit broad-spectrum activity, including vermicidal, ovicidal, and larvicidal effects, and are effective against a variety of intestinal and systemic cestodes. Despite the endemicity of hydatid disease in Iraq, recent epidemiological data for Mosul remain scarce. Recent socioeconomic disruptions and conflicts in the region have likely affected veterinary control programs due to the increased stray dog population and unsanitary slaughterhouse practices, potentially altering the disease's epidemiology and prevalence. Therefore, there is an urgent need for contemporary studies to determine the current clinical and epidemiological situation of hydatid disease in Mosul. Our study aims to fill this gap by providing a detailed analysis of hospital-based cases, which is crucial for designing targeted public health interventions and updating local control policies.

1. 1 Importance of the Study:

- Analyze prevalence hydatid disease in Nineveh Hospitals, by gathering and reviewing information directly from affected individuals.
- The research seeks to provide a descriptive diagnostic pathway, and cyst size and number and related disease with age.
- This analysis may contribute to a better understanding of hydatidosis burden and help inform public health measures and future clinical practices.
- The observation and epidemiology are important for understanding of the transmission cycles and control processes.

2. MATERIALS AND METHODS

2.1 Study Design and Cases

The study was conducted for a retrospective, hospital-based case series. The data were collected by reviewing the medical records and surgical logs of patients in Mosul city hospitals in the Department of Surgery of Al-Jomhory, Al-Salam, Al-Askary, and Al-Khansaa after being admitted due to infection by hydatid disease. From June 2024 to June 2025, fifty cases in the age range from 1–10 years to 71–80 years were examined. The clinical manifestation and investigation, which included a thorough blood picture examination, liver and renal function tests, chest x-rays, sonography, abdomen CT scans, and MRIs, served as the basis for the diagnosis. Every identified hydatid cyst's diameter was measured and noted. Surgery was performed on every verified instance of cystic echinococcosis. All confirmed instances had surgery to remove the cyst. The standard surgical approach involved cyst aspiration, instillation of a scolicidal agent (e.g., hypertonic saline), evacuation of cyst contents, and management of the residual cavity according to standard surgical practice. [8]. Addressing the remaining cavity with simple closure, leaving a drain inside the cavity, omentoplasty, marsupialization, and, in certain situations, such as a splenic cyst, the complete resection of the organ. as well as The data collected on special formula for each patients involved: age, gender , site of cyst position, numbers and size of hydatid cysts , preceding infection with Hydatid Cyst, main complaints and Complications.

2.2 Sample Size

The sample size was determined a priori using G Power software (version 3.1.9.7) [9]. A sample size of 44 was determined to be adequate for an independent t-test to identify a substantial effect size ($d = 0.8$) with an alpha error probability (α) of 0.05 and a power ($1-\beta$) of 0.95. Our final sample of 50 patients meets and exceeds this requirement.

2.3 Statistical analysis:

For continuous variables, data were shown as mean ± standard deviation (SD), while for categorical variables, they were shown as frequencies and percentages. An independent samples t-test was used to compare the mean cyst diameter between groups. Chi-square (χ^2) test was used to compare categorical variables (e.g., gender distribution, mode of diagnosis). Fisher's exact test was employed when more than 20% of the expected cell counts were less than 5. Furthermore, binary logistic regression was performed to assess the influence of age and gender on the outcome of having multiple cysts. A p-value of ≤ 0.05 was considered statistically significant. All analyses were performed using SPSS version 21 [10].

3. RESULTS

In the present study, an investigation into the widespread hydatid disease in Nineveh Hospitals is conducted. Fifty echinococcosis patients have been included, with the age groups 1-80 years (26 male and 24 female). (Figure 1) showed that echinococcosis infections were more commonly found in the age group of 1-10 with 11 cases (22%) and age 11-20 years old with 10 cases (20%), otherwise there is low prevalence in patients of the age groups 71-80 years 3 cases (6%) and equal result was found between age 3-40 and 51-60 years old with 4 cases at 8%. (Fig. 1).

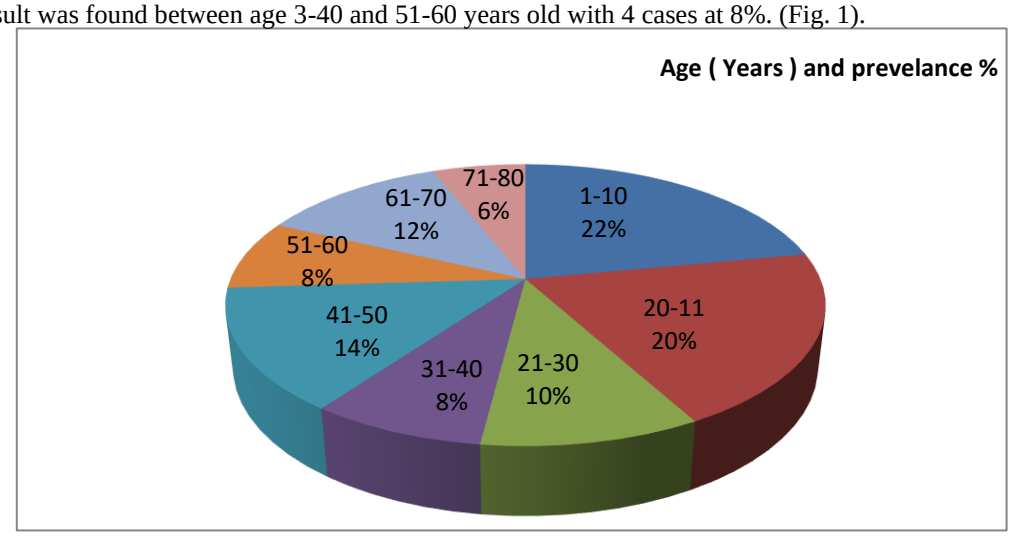

Fig. 1. Distribution of hydatid disease cases by age group. Values above bars represent the number of cases (n) and the percentage. Error bars represent the 95% confidence interval for the proportion.

In current research revealed that unilocular echinococcosis were more prevalent in males 52% than in females 48% (Table 1).

TABLE. I. DISTRIBUTION OF HYDATID CYSTS AMONG PATIENTS (N=50) BY GENDER AND AGE GROUP.

Age (years)	Gender	
	Male (n,%)	Female (n,%)
1-10	4 (8%)	7 (14%)
11-20	5 (10%)	5 (10%)
21-30	2 (4%)	3 (6%)
31-40	3 (6%)	1(2%)
41-50	4 (8%)	3 (6%)
51-60	2 (4%)	2 (4%)
61-70	5 (10%)	1(2%)
71-80	1 (2%)	2 (4%)
Total	26 (52%)	24 (48%)

(Fig. 2) showed, 62 hydatid cysts were identified, the most corporate site of the echinococcosis infection was the liver: 38 cysts (61.29%), lungs were the second most common site with 18 cysts (29.03%) while the least targeted sites were the kidney 3 cysts (4.84) and lesser spleen and pancreas; one cyst to 2 cyst and (3.23%) (1.61%) respectively.

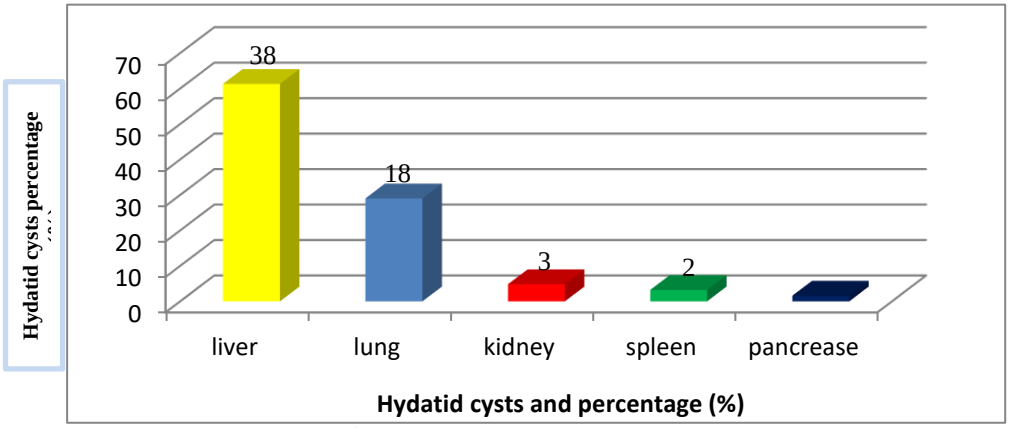

Fig. 2. Number and percentage (%) of hydatid cysts present in the 50 patients bestowing to the body organ.

(Table II) showed range and (mean of cyst) diameter (cm), in this study found that the mean cyst is: (7.12± 2.97) and the mainly site of distribution is in the liver and lung.

TABLE. II. NUMBER OF CYSTS ACCORDING TO DIAMETERS GROUPING AND LOCATION FOR PATIENTS (N=50).

Range and (mean of cyst) diameter (cm)	Number of cyst according to diameters grouping	Number of cysts within patients' bodies according to diameters located in:				
		Liver	Lung	Spleen	Kidney	Pancreas
2-4 (3.5)	14	6	6	1	0	1
4.1-6 (4.9)	18	13	3	0	2	0
6.1-8 (7.1)	17	12	4	1	0	0
8.1-10 (9.5)	7	3	3	0	1	0
10.1-12 (10.6)	6	4	2	0	0	0
Total	62	38	18	2	3	1
Percentage of cysts within patients' bodies (%)		61.29%	29.03%	3.23%	4.84%	1.61%

(Table III) shows that the most common type of infection in our current study was a single hydatid cyst, which was present in 78% of cases. In contrast, only 22% of cases showed numerous cysts. Interestingly, multiple cyst infections were more frequent among children (1-10 years) and elderly patients (> 50 years) compared to other age groups. On the contrary, young and middle-aged adults (11-30 years) often showed one-sac infections, indicating a limited primary parasite or stronger host resistance. These results confirm that the host's age may affect not only the spread but also the pattern. Interestingly, multiple cyst infections were more frequent among children (1-10 years) and elderly patients (> 50 years) compared to other age groups.

TABLE. III.THE NUMBER OF HYDATID CYST B INFECTION TYPES (SINGLE OR MULTIPLE CYSTS) WITH RESPECT TO THE AGE OF PATIENTS (N=50).

Age (years)	Number of cases	Infection	
		Single cyst	Multiple cysts
1-10	11	7	4
11-20	10	10	0
21-30	5	5	0
31-40	4	3	1
41-50	7	6	1
51-60	4	2	2
61-70	6	4	2
71-80	3	2	1
Total, Percentage %	50	39, (78%)	11, (22%)
Standard Deviation (SD)		2.75	1.30
Mean ±SE*		(4.88±0.97)	(1.38±0.46)
Standard Error (SE*) = Standard Deviation (SD) ÷ Square Root of Sample Size (√n). The smaller the SE, the more accurate and reliable the average.			

According to Table IV, a total of 24 cases (39%) of hydatid cysts were detected incidentally, 21 cases (34%) were identified following pressure pain, and 17 cases (27%) were diagnosed due to complications such as pneumonia, jaundice, or hemoptysis. In the liver, 53% of cysts were discovered incidentally, 32% after pressure pain, and only 15% following complications. In contrast, pulmonary hydatid cysts showed a different pattern: only 6% were detected as incidental findings, while 39% were identified after pressure-related symptoms and the majority (55%) were diagnosed following complications.

TABLE. IV. DIAGNOSIS OF HYDATID CYST BASED ON DISCOVERY (ACCIDENT, PRESSURE PAIN, OR COMPLICATION: HEMOPTYSIS, PNEUMONITIS, ETC.).

The infected organ	Total Number of cyst /organ	Hydatid cyst discovered by:		
		Incidental	Pressure pain	Complications like jaundice, hemoptysis, pneumonitis, etc.
Liver	38	20 (53 %)	12 (32 %)	6 (15%)
Lung	18	1 (6%)	7 (39 %)	10 (55%)
Spleen	2	1(50%)	1 (50%)	0 (0%)
Kidney	3	2 (67%)	1 (33%)	0 (0%)
Pancreas	1	0 (0%)	0 (0%)	1(100%)
Total (HC)	62	24 (39%)	21 (34%)	17 (27%)

4. DISCUSSION

This study has several limitations that should be considered when interpreting the findings:

1. Although the sample size was small (n = 50), there may be a risk of limited statistical power to examine smaller associations or less frequent clinical presentations.
2. As a hospital-based study, our cohort of patients likely represents more severe or symptomatic cases, and there may be selection bias, which could lead us to overestimate the clinical severity of the disease in the community. Community-based serosurveys would provide better estimates of actual prevalence.
3. The study was done in just one city (Mosul) may limit the ability to generalize these findings to other parts of Iraq that may have different ecological and cultural practices.
4. Due to the retrospective design and no long-term follow-up information, we were unable to assess surgical outcomes and the corresponding recurrence rates, and therefore, cannot assess the long-term effectiveness of medical therapy. Future prospective, multi-center studies with larger sample sizes will address these limitations.

Sheep, cattle, and goats are still regularly killed in rural regions of Iraq, particularly the Mosul region, where there is no national or local control program in place. HC is one of the major public health issues in this country. Furthermore, a high prevalence rate of infection is caused by a lack of knowledge about the disease, and stray dogs, the definitive hosts for the parasite's life cycle, can access contaminated organs due to unlawful home slaughter of animals. By releasing large quantities of eggs along with their excrement, these hosts serve as a source of infection for the intermediate hosts.

Infection with unilocular hydatid disease is one of the most public parasitic diseases wide-reaching, including Iraq [11]. In the current study, an examination into the widespread hydatid disease in Nineveh Hospitals involved fifty echinococcosis patients with age groups 1 to 90 years (26 males and 24 females). In current study found that the percentage of male infected with hydatid cyst (52%) slightly arise from women (48%), these findings of the current study are in alignment with prior research suggested that the number of hydatid cysts in men is higher than that in women in Saudi Arabia, observational study showed that infection in male to female ratio of (1.7 to 1) [12]. But result of present study disagree in other study that found , the housewives had the highest rate of infection, particularly in countryside areas where the majority of infested cases are found. This is because they are more likely to come into contact with the sources of infection, such as contaminated vegetables, dog feces found in the house, and the desire to eat soil [13].

Sweeping their courtyards, where the dust includes *E. granulosus* eggs from dogs in countryside regions, and cleaning and consuming uncooked vegetables in urban settings may be the causes of the high rates of women and housewives [14].

The current study showed that echinococcosis infections were most widespread found in the age group of 1–30 years old, and on the other hand, there is a low occurrence in patients with age groups 71–80. This result in this age group may be due to the recent increase in dog breeding in Mosul city, which has led to an increase in hydatid disease infections. Another suggested cause of the increase in infections among this age group may be due to the frequent consumption of fast foods from restaurants with poorly cooked. This finding is consistent with previous research suggested that improperly cooked food, which are produced and delivered in rapid manner with minimal processing for cooking time and poor hygiene practices during food preparation have been associated with development of severe health disorder, like Echinococcus, because Humans serve as an intermediate host if they ingest tapeworm eggs in contaminated water or on raw contaminated vegetables. In the liver, lungs, and other organs of intermediate hosts, the larval tapeworms develop fluid-filled cysts known as hydatid cysts, which may result in tissue damage [15].

Bad Hygiene, which facilitates the transmission of the disease. This result is in line with [11]. The greatest common site of echinococcosis infection was the liver and lung (61.29%) and (29.03%), respectively, as shown in the present study. This result was in agreement with those of Gun [16, 17]. Regarding the HC site, the data indicated that a number of organs were impacted; however, as would be predicted given the parasite's life cycle and circulation inside the bodies of

its intermediate hosts, the current investigation demonstrated that the liver was most heavily involved. Although the lungs serve as the secondary filter for the parasite, the liver serves as its primary filter. However, in a few investigations, some academics discovered that the lungs were the main location of hydatid cyst. That is in parallel with most other similar studies, in Iraq [18].

The present investigation revealed a statistically significant difference at $P \leq 0.01$ between cases with a single cyst infection (78%) and those with multiple cyst infections (22%). Furthermore, the findings indicated that the majority of patients were affected by a single cyst, and that males exhibited a marginally higher susceptibility to parasitic infection compared to females, a result consistent with the observations conducted by [19]. In terms of the quantity of cysts, it was observed that the majority of HC patients had one cyst in each damaged organ, followed by many cysts. These results were consistent with those of earlier research that found unilocular hydatid cysts afflicted the majority of individuals. Multiple cysts in these patients might be caused by simultaneous ingestion of numerous scolices or re-exposure to the illness.

In this study, the hydatid cysts were diagnosed accidentally more than the hydatid cysts that diagnosed do to pressure pain, and least diagnosed by complications such as jaundice, pneumonia, etc. Previous research has shown that hepatic hydatid cysts may be identified by complications such compressing the bile ducts, which can result in blockage that causes symptoms including pruritus, anorexia, stomach discomfort, and obstructive jaundice [20]. On patients hospitalized with a diagnosis of hydatid disease infection, pulmonary hydatid cysts might irritate the lung membranes, resulting in hemoptysis, pleuritic chest pain, persistent cough, and dyspnea [21].

High prevalence in childhood, early adulthood, or ages 1–10 years and 21–30 years may stem from behavioral causes with geophagia (ingestion of soil), more contact with soil and dogs (major risk factors for egg ingestion), as well as increased chances of exposure by activities and lifestyle in Mosul that are more likely from a nomadic lifestyle to potential toxic environments with stray dogs. Other possible explanations for high prevalence in older adults could be inherent at age, true or innate, or acquired immunity with age resulting in abortive infection and slow cyst development.

The mild predominance of males (52%) in our study can be covered by cultural and occupational norms in Mosul. Farming, slaughtering animals, shepherding, etc., are more common in males, especially in the rural fringes or suburbs of the city, and these activities of the males represent heightened opportunities for exposure to E. granulosus eggs from definitive hosts.

5. CONCLUSION AND RECOMMONDATION

Hydatid cyst disease is widespread in the hospitals of Mosul city, and the most aged infected is younger category. Moreover, the infection rate in males was higher than that in females. After hydatid cysts were diagnosed, the most common site of echinococcosis infection was the liver, and the lungs were attaining second-degree, meanwhile the least targeted sites were the kidneys.

Based on the presented study, it can be concluded that foodborne diseases (FBD) are responsible for millions of cases of illness and thousands of deaths on a daily basis. Therefore, it is imperative to adopt comprehensive measures to mitigate their impact. These measures include: employing appropriate personal protective equipment (PPE) when handling high-risk hydatid cysts, particularly during slaughtering and the preparation of ready-to-eat foods, as food contamination contributes to illnesses that incur billions of dollars annually in healthcare costs and lost productivity; implementing public health interventions aimed at reducing the prevalence of foodborne pathogens in animal reservoirs, including apparently healthy animals, while ensuring the safety of the feed and environment provided to these animals; conducting targeted research to expand our understanding of the pathophysiology of hydatid cysts and emerging infections, and to enhance diagnostic methods, clinical management, and therapeutic strategies; and educating consumers on the principles of food safety, which constitute a vital component of disease prevention.

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Conflicts of Interest:

The authors declare that there are no conflicts of interest.

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