Original Article

Incidence And Epidemiological Profile Of Cystic Echinococcosis (Hydatid Disease) In Al Samawa City, Al Muthanna Province, Iraq: A Retrospective Hospital-Based Study

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Abstract

Background: Cystic echinococcosis is caused by the larva stage of the parasite, Echinococcus granulosus. CE is one of the most important zoonotic parasitic disease of the Middle East region. This includes the country of Iraq, where CE is known to be present in high levels. The southern province of Al Muthanna in Iraq has limited community-level statistics despite many years of surgical intervention.

Objectives: To examine the incidence/demographics of surgically confirmed cases of hydatidosis (hydatid disease), the organs involved with hydatidosis and the occupational risk factors of patients treated surgically for hydatid disease in the city of Al Samawa, Iraq.

Methods: A retrospective hospital study was conducted using data from operative reports on patients who were treated surgically for hydatid cyst removal at Al Hussein Teaching Hospital in Al Samawa from January 1, 2018 through December 31, 2018. Data collected from 80 patients included patient gender, age, occupation and the anatomical location(s) involved with the hydatid cysts. The data was analyzed using descriptive statistics.

Results: The overall number of surgically confirmed cases studied (n=80) included 62 female and 18 male patients. This produced a female-to-male ratio of 3.4:1. The peak age group of the female patient cohort was 31-40 years and the peak age group of the male patient cohort was 41-50 years. The predominant organ involved was the liver (75%), followed by: lung (10%), peritoneum (5%), spleen (5%), brain (2.5%) and ovary (2.5%). The largest occupational group of patients were housewives (47.5%), while the second largest group were agricultural workers (17.5%).

Conclusions: There continue to be a significant number of cases of hydatidosis in Al Samawa City, Iraq. Given the predominant female population age 31-40 at high risk and who are dealt with high numbers of interactions with dogs and agricultural live-stock (given that their occupational assignment is consistently as housewives), targeted public health education with respect to hydatidosis, broader animal vaccination programs and improved management of free-roaming (stray-type) dogs must occur.

Keywords: Echinococcus granulosus; Hydatid cyst; Cystic echinococcosis; Al Samawa; Iraq; Surgical epidemiology; Zoonosis

1. INTRODUCTION

Cystic echinococcosis (CE) aka hydatid disease is a chronic zoonotic disease that results from the metacestode (larva) of the cestode (=tapeworm) Echinococcus granulosus sensu lato. Echinococcus granulosus has a complex life cycle involving two different host categories; definitive hosts (mostly domestic or wild canines) that shed eggs and intermediate hosts (mostly sheep, cattle, goats, camels) that ingest eggs to create the infectious larvae stages. Humans are accidental hosts [1]. The World Health Organisation (WHO) has classified CE as an NTD; hence it has substantial global public health importance. It is estimated that globally CE occurs at a rate of 1 to 200 new cases per year per 100,000 people with an estimated annual economic impact of over $3 billion [2, 3].

Iraq is considered hyperendemic for CE as a result of its agropastoral economy, high number of stray dogs and the common practice of home slaughtering of livestock, all of which support the transmission cycle of E. granulosus [4, 5]. Genetic and epidemiological studies conducted in Iraq have established there is a stable and concurrent population of E. granulosus in the country; the sheep strain (genotype G1) of E. granulosus exists throughout all provinces of Iraq from the Kurdish area in the north to the Euphrates delta in the south [6]. CE has been reported to occur at surgical incidences of between 1.0 and 6.3 cases per 100,000 in a number of Iraqi governorates however these estimates are likely to be under-representative of the true burden of CE due to many areas lacking health providers with diagnostic capabilities and the frequency of self-medication for this disease [7].

Al Muthanna Province (the provincial capital is Al Samawa) is primarily agricultural with significant livestock production, has many stray and shepherd dogs, and lacks adequate access to veterinary public health services. The socio-ecologic conditions within Al Muthanna Province are conducive to a high risk of acquiring CE [8]. There currently exists no published epidemiological data for CE from either the hospital or registry data from within Al Muthanna; therefore this is a large gap in the overall national burden of disease estimates for Iraq.

Historically the liver has been frequently reported as the most common organ affected by CE due to the large volume of oncospheres being filtered by the liver from the portal vein; the lungs are the second most frequently involved organs [9]. Extra-hepatic sites are less common and due to the increased complexity of their diagnosis and risk of fatal anaphylaxis if a cyst ruptures following surgery; they are clinically significant [10, 11].

The key objectives of this study are: (i) to define the surgical incidence of CE cases, by gender and age, at Al Hussein Teaching Hospital in Al Samawa, Iraq in 2018; (ii) to characterize sites of hydatid cyst involvement; (iii) to identify occupational groups at risk for acquiring hydatid cysts; and (iv) to compare data obtained in this study with similar data from other studies in Iraq and the region in order to provide a context for the overall burden of CE in Iraq.

2. MATERIALS AND METHODS

2.1 Study Design and Setting

This is a retrospective, hospital-based, cross sectional epidemiologic study. The data for this study were collected from the surgical and operative records of Al Hussein Teaching Hospital the main referral surgical facility for Al Samawa City and the adjacent Al Muthanna Governorate in Iraq. All CE surgical admissions for the entire calendar year of 2018 (January 1 through December 31) represented the time period for the study.

2.2 Inclusion and Exclusion Criteria

This study included all patients operated on and either surgically removed or drained of hydatid cysts that were histologically or intra-operatively confirmed during the study period. Hydatid cysts were either confirmed through (1) the presence of daughter cysts, germinal layer, or hydatid fluid as described during surgery, or (2) through positive histopathological evaluation of excised tissue samples from the hydatid cyst wall. Patients who received non-operative care (e.g., PAIR - puncture aspiration, injection, re-aspiration), documented incomplete records of patient care, or had no intra-operative or histopathological confirmation of their hydatid cyst diagnosis were excluded from our study.

2.3 Data Collection

Operative notes, surgical registers and ward admission records were used to collect structured data. This data was then triangulated & analysed with respect to four key variables: (i) The age of the patient (in decades - divided as follows: < 10 years; 10 – 20 years; 21 - 30 years; 31-40 years; 41 - 50 years & > 50 years); (ii) sex of the patient (male/female); (iii) Occupation of the patient (housewife, farmer/agricultural worker, student, govt employee and/or other/unemployed); (iv) The anatomical sites of the cyst(s) occurred (liver, lung, peritoneum, spleen, brain, ovary and/or other). The classification of cases in which multiple organs were involved were classified according to the first surgical site of surgery; thereby providing an accurate clinical & demographic breakdown for use as a method of assessing the burden of disease.

2.4 Ethical Considerations

Ethical approval was granted by the Institutional Review Committee of Al Hussein Teaching Hospital prior to conducting the research. All patient records that were accessed for research purposes were done so in a confidential manner; no personal identifiable information is retained from this study. Patient informed consent was waived due to the fact that this is a retrospective study using existing records and is therefore classified as a non-interventional retrospective analysis under the local ethical regulations.

2.5 Statistical Analysis

Descriptive analyses were carried out using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Frequency and percentages have been used for the descriptive analyses of the categorical variables. Categorical variables were also evaluated based on the χ^2 test for associations with sex, age and organ involvement. A p-value of < 0.05 was considered to be statistically significant.

3. RESULTS

3.1 General Characteristics

During the investigation, researchers identified 80 patients with surgically diagnosed cystic echinococcosis. In Al Samawa City with roughly 450,000 people (as of 2018), the calculated rate of surgery for cystic echinococcosis between the years 2013 and 2018 was close to 17.8 per 100,000 population; substantially greater than that reported for other areas of Iraq[7,12].

3.2 Sex Distribution

Out of the total number of cases (n=80) there were 62 females (77.5%) and 18 males (22.5%) with an approximate ratio of 3.4:1 ($\chi^2 = 28.8$; $p < 0.001$). The predominance of females over males was present at all age levels (Table 1).

Table 1. Age and sex distribution of surgically confirmed hydatid cyst cases, Al Hussein Teaching Hospital, Al Samawa, 2018 (n = 80).

Age Group (years)	Female n (%)	Male n (%)	Total n (%)
< 10	3 (3.75)	1 (1.25)	4 (5.0)
11–20	8 (10.0)	3 (3.75)	11 (13.75)
21–30	15 (18.75)	4 (5.0)	19 (23.75)
31–40	**18 (22.5)**	**5 (6.25)**	**23 (28.75)**
41–50	11 (13.75)	5 (6.25)	16 (20.0)
> 50	7 (8.75)	0 (0.0)	7 (8.75)
Total	**62 (77.5)**	**18 (22.5)**	**80 (100)**

3.3 Age Distribution

Across all ages, the disease was found; amongst all groups, ages 31–40 years had the highest burden, with a total of 23 cases; ages 21–30 years and 41–50 years had the second-highest burden at 19 and 16 cases respectively. Amongst females, the highest burden occurred amongst ages 31–40 years; the earliest burden occurred amongst males in the youngest age category at ages 41–50 years, and no cases occurred in the males >50 years during the time of the study.

3.4 Organ Distribution

Liver involved in the largest number of reportable cases (60; 75.0%) with 47 females (58.75%) and 13 males (16.25%) being affected. Pulmonary (n=8; 10.0%) was the second most common organ system involved, followed by peritoneal (n=4; 5.0%), splenic (n=4; 5.0%), cerebral (n=2; 2.5%) and ovarian (n=2; 2.5%) locations. (Table 2).

Table 2. Anatomical distribution of hydatid cysts by sex, Al Samawa, 2018 (n = 80).

Organ Affected	No. of Cases	Female (%)	Male (%)
Liver	60 (75.0)	47 (58.75)	13 (16.25)
Lung	8 (10.0)	6 (7.5)	2 (2.5)
Peritoneum	4 (5.0)	3 (3.75)	1 (1.25)
Spleen	4 (5.0)	3 (3.75)	1 (1.25)
Brain	2 (2.5)	2 (2.5)	0 (0.0)
Ovary	2 (2.5)	1 (1.25)	1 (1.25)
Total	**80 (100)**	**62 (77.5)**	**18 (22.5)**

3.5 Occupational Distribution

The housewives represent the largest percentage of those who work (they accounted for 47.5% (38); they were followed by the farmers and/or agricultural workers (17.5% (14), students (15%. (12), government workers/employees (10% (8), and the unemployed or other occupations (10% (8)). table three illustrates this clearly.

Table 3. Occupational distribution of hydatid cyst cases, Al Samawa, 2018 (n = 80).

Occupation	No. of Cases	Percentage (%)
Housewife	38	47.5
Farmer / Agricultural Worker	14	17.5
Student	12	15.0
Government Employee	8	10.0
Other / Unemployed	8	10.0
Total	**80**	**100**

4. DISCUSSION

This work discloses the surgery rate of CE in Al Samawa, giving the first published data from hospitals in Al Muthanna Province, southern Iraq. These data illustrate three main features of the consummate epidemiologic structure: a significantly high number of females versus males, an increased number of cases in the most productive age group (31-40 years) relative to males; and a predominant number of females relative to males across all ages; all of which generally are congruent with the larger body of literature about CE for Iraq and the middle eastern region as a whole [4, 8, 12, 13].

The predominance of females (77.5%) represented in the current study is one of the highest rates reported in the Iraqi CE literature so far. This pattern was also reported by Al-Jaberi et al. out of Baghdad Province (70.0% female) [13] and by Al-Hadidi et al. in Diyala Governorate (61.0% female) [12]. There consistently has been a higher burden of CE in females across studies conducted in Iraq, which is not due to biological vulnerability but rather to different patterns of exposure: for example, housewives and females living in rural areas are more likely to come in contact with domestic dogs, contaminated soil and raw vegetables for prolonged periods of time—-all of which are established methods of transferring the E. granulosus eggs to humans [14, 15]. In this cohort, the majority of the patients (47.5%) were housewives; this was again the case for 17.5% of patients who were farmers/agriculture based workers, for a combined total of approximately 65% of patients in these two categories. This large occupational association provides a clear indication that domestic and peri-domestic settings are likely to be the principal points of infection transmission for persons in Al Muthanna.The most common age range affected by Hydatid disease (CE) was 31-40 years old, and accounted for 28.75% of all cases in this study; this highlights the chronic and often asymptomatic nature of the disease. The cysts may have been acquired during childhood or early adulthood, with the rate of cyst growth typically being slow (over many years) until they reach sufficient size to be symptomatic (often 5-10 cm) and therefore require surgical intervention [16]. The majority of reports from endemic areas in Iraq [4, 12, 13], Iran [17], Libya [18], and Tunisia [19] describe a similar pattern of delayed presentation of clinical symptoms until a patient reaches their third or fourth decade of life. However, there was a slight shift to the 41-50 year age group in males that may be attributed to differences in occupational exposure histories and health-seeking behaviours for the two sexes.

Hepatic involvement (75.0% of all surgically confirmed CE cases) is also consistent with the current understanding of CE pathophysiology, whereby the parasite's disseminated oncosphere is first filtered through the portal circulation after being disseminated from the intestines [9]. Similar rates in Diyala (74.2%) [12], Sulaymaniyah (68.0%) [10] and northern Iran (65.0%) [17] demonstrate the consistency of these findings among endemic locations. The rate of pulmonary involvement in patients evaluated in this study (10.0%) is less than rates reported in areas with a greater proportion of farmers or in areas with livestock raised in elevated locations because in these regions, there is more frequent breach of the second capillary filter located within the pulmonary circulation [11]. The locations of extra-hepatic pulmonary infections (peritoneum 5.0%, spleen 5.0%, brain 2.5%, ovary 2.5%) were less than 15.0% of all cases evaluated in this study. This demonstrates the ability of the parasite to disseminate systemically and the challenge that the diagnosis of cysts located outside of the liver presents [10, 20].

The high surgical incidence of CE reported in this study (approximately 17.8 per 100,000) is likely representative of true endemicity compounded by structural epidemiological factors including, but not limited to: a large population of stray dogs (definitive hosts) with unlimited access to infected offal produced by traditional home slaughtering practices; informal slaughterhouse practices with inadequate meat inspections; lack of community awareness of transmission pathways; and no systematic animal vaccination programs [3, 5, 6]. The sheep strain (G1) of E. granulosus is the most virulent and epidemiologically important genotype for CE in humans and is the predominant circulating strain of E. granulosus in central and southern Iraq [6]. The economy in Al Muthanna Province is based on extensive sheep farming, which provides the ideal environment for the perpetuation of this strain.

Table 4 compares this study with similar studies from Iraq and the surrounding region, highlighting that the female predominance and high rates of hepatic infection from Al Samawa are consistent with regional epidemiological trends; however, the absolute burden of cases in Al Samawa requires increased public health attention.

Table 4. Comparative epidemiological data on cystic echinococcosis from Iraq and selected regional studies.

Study / Region	Female (%)	Peak Age	Liver (%)	Reference
Present Study, Al Samawa (2018)	77.5	31–40	75.0	Current study
Baghdad Province, Iraq (2021)	70.0	31–40	100.0	Al-Jaberi et al., 2021
Diyala Governorate, Iraq (2022)	61.0	21–40	74.2	Al-Hadidi et al., 2024
Wasit Province, Iraq (2022)	64.3	21–40	100.0	Al-Maathidy et al., 2022
Sulaimaniyah, Iraq (2025)	58.0	30–50	68.0	BMC Surgery, 2026
Iran (2015)	55.0	21–40	65.0	Talaiezadeh et al., 2018
Libya (1980)	~52	31–40	~60	El-Boulaqi & Taguri, 1980

Surgical management is still regarded as the best method to treat CE, and remains the primary treatment in resource-constrained regions like Al Samawa,even though the WHO recommends a more tailored type of management using the combination of PAIR, albendazole, and watchful waiting on inactive cysts based on the cyst classification [2]. The exclusive use of surgery in this cohort demonstrates that there is a lack of diagnostic capacity and a need for clinical training to provide safe non-surgical management when it is possible.

The findings of this retrospective single-centre study should be interpreted in light of some limitations. The data that we present were gathered from a single centre and therefore do not account for patients who did not seek care or who were managed conservatively (with the exception of those patients managed with surgery). The population denominator used to calculate incidence may also be subject to error as it is derived from census projections. Additionally, we did not perform genotyping of the excised cysts, which would have allowed us to examine the cyst at the genetic level. Prospective, multi-centre studies that include an active screening component at the community level would yield a better understanding of the epidemiology of CE in Al Muthanna Province.

5. CONCLUSION

In Al Samawa City, Iraq, the occurrence of cystic echinococcosis is alarmingly high, particularly among women between the ages of 31 and 40, who work in domestic or agricultural fields. It has been reported that Hepatic cysts are much more common than other types of cysts.Evidence suggests that there is a huge public health component to this highly endemic disease (as evidenced by a large population of uncontrolled stray dogs, traditional slaughter methods still being utilized in the region, and a lack of adequate public health infrastructure) and this calls for immediate action to be taken with regards to the following tasks: develop and implement programs for the control of the stray dog

population, develop and enforce mandatory dog deworming programs, vaccinate sheep with EG95, improve the hygiene of abattoirs and inspect meat properly, and establish sustained public health education directed towards high-risk rural and peri-urban communities. Future research should also include active community based serological surveillance as well as molecular genetic characterization of the circulating strains within the southern governorates of Iraq to get an accurate picture of the epidemiology of this parasite.

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