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Systematic Review

Chest Wall Hydatid Cysts: A Systematic Review

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Abstract

Introduction

Given the rarity of chest wall hydatid disease, information on this condition is primarily drawn from case reports. Hence, this study systematically reviews the disease's manifestation and management.

Methods

Google Scholar was searched with the following keywords: (hydatid OR hydatidosis OR tapeworms OR echinococcosis OR echinococcus OR granulosus AND chest OR wall OR thoracic OR thorax OR rib OR sternum OR sternal OR cartilage OR intercostal OR extra-pulmonary). Inclusion criteria involved a confirmed diagnosis of chest wall hydatid cyst. Only English-language studies published in legitimate journals were included.

Results

The reported cases were primarily from Turkey (41.5%). The mean age of the patients was 39.7 ± 17.1 years, with a male predominance (56.9%). The most common clinical presentations were swelling (47.1%) and chest or abdominal pain (45.1%). Only 10 cases (19.6%) had reported a history of animal contact. Among those with documented residency (35.3%), 16 (31.4%) resided in rural areas. The average mass size on the CT scan was 7.5 ± 2.4 cm. Surgery was the treatment of choice, with thoracotomy performed in 37.3% of cases, video-assisted thoracoscopy in 1.9%, and the surgical technique not specified in 60.8% of cases. The mean hospital stay was 8.6 ± 4.4 days, and no recurrences were reported.

Conclusion

Despite its rarity, chest wall hydatid cyst may have a good prognosis with few complications. Given its often-nonspecific presentation, reviewing the patient's medical history may help establish an accurate provisional diagnosis.

1. Introduction

Hydatid disease, caused by tapeworm parasites, is prevalent in sheep-rearing regions, including the Middle East, Mediterranean areas, Africa, South America, and Australia [1,2]. In humans, three types of echinococcosis are known to occur: cystic echinococcosis caused by Echinococcus granulosus, alveolar echinococcosis caused by Echinococcus multilocularis, and polycystic echinococcosis due to Echinococcus Vogeli or Echinococcus oligarthrus [3]. The most common causative organism of human hydatid disease is *Echinococcus granulosus* [1]. The parasite is a tapeworm with an approximate length of 2

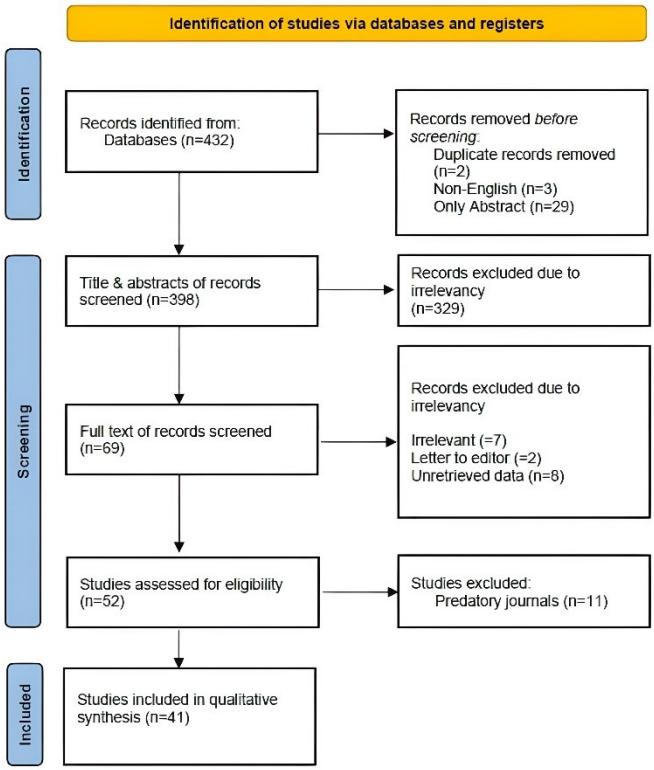

Figure 1. Study selection PRISMA flow chart.

to 7 mm [4]. Hydatid disease or echinococcosis is an old and well-known helminthic disease known since Hippocrates [5]. Rudolphi, in 1808, first used the term hydatid cyst (HC) to describe human echinococcosis [2]. Dogs are the definitive hosts, while farm animals are intermediate hosts. Although humans are not involved in the parasite's life cycle, they may be affected accidentally, either by direct contact with a dog or by ingesting contaminated food and fluid from parasite eggs [6]. After oral ingestion, the cyst hatches in the duodenum and initially spreads to the liver through the portal vein via hematogenous or occasionally lymphogenous routes. It then reaches the lungs through the venous system, and from the lungs, it can disseminate to other organs via the arterial system [7]. The disease can be seen in different body parts, like the thyroid, bladder, heart, and pulmonary artery [7-10]. The chest wall is a very uncommon localization for this disease [6,11]. Therefore, the literature has limited information regarding chest wall HCs. This study aims to systematically review the manifestation and management of the disease.

2. Methods

2.1. Study protocol

This study was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

2.2. Data sources and search strategy

Google Scholar was searched with the following keywords: (hydatid OR hydatidosis OR tapeworms OR echinococcosis OR echinococcus OR granulosus AND chest OR wall OR thoracic OR thorax OR rib OR sternum OR sternal OR cartilage OR intercostal OR extra-pulmonary).

2.3. Eligibility Criteria

Inclusion criteria involved a confirmed diagnosis of chest wall HC. Only English-language studies published in legitimate journals were included [12].

2.4. Data items

One author screened the studies to select those that met the eligibility criteria, and another rechecked his work. Key data, including the first author's name, study design, country and year of publication, sample size, patient demography, clinical presentation, management strategies, and outcomes, were extracted from the included studies.

2.5. Data analysis and synthesis

The data were collected in a Microsoft Excel sheet (2021), and descriptive statistics were performed using the Statistical Package for the Social Sciences (SPSS) version 27. The data were presented as frequencies, percentages, means, and standard deviations.

3. Results

3.1. Study Selection

A systematic search identified a total of 432 articles. After the initial screening, 29 studies presenting only abstracts, two duplicates, and three non-English publications were excluded, resulting in 398 articles for further evaluation. Title and abstract screening excluded 329 studies due to irrelevance, leaving 69 articles for full-text review. Of these, seven were excluded due to irrelevancy, eight due to unretrieved data, and two for being letters to the editor. During the final screening, 11 studies were removed due to publishing in predatory journals. Finally, 41 studies [1–3,5,6,11,13–26,28-48] met the inclusion criteria and were included in the review (Figure 1). The raw data for each included study are detailed in Tables 1, 2, and 3.

3.2. Main findings

The reported cases were primarily from Turkey (41.5%). The mean age of the patients was 39.7 ± 17.1 years, with a male predominance (56.9%). The past medical history for HC was positive in 10 cases (19.6%). The most common clinical presentations were swelling in 24 cases (47.1%) and chest or abdominal pain in 23 cases (45.1%). Only 10 cases (19.6%) had reported a history of animal contact, while one patient (2%) reported no such history. Data on the history of animal contact was unavailable in 78.4% of cases. Among those with documented residency (35.3%), 16 (31.4%) resided in rural areas, while two (3.9%) were from urban settings. The disease was primary in sixteen cases (31.4%), and in nine (17.6%), it was secondary. The disease origin was unknown in 26 cases (51%). The average mass size on the CT scan was 7.5 ± 2.4 cm.

Hydatid serology was performed in 18 patients, yielding positive results in nine (50%). A provisional diagnosis of hydatid disease was considered in 14 cases (27.5%). Pre-operative treatment with albendazole was administered to eight patients (15.7%). Surgery was the treatment of choice, with thoracotomy performed in 37.3% of cases, video-assisted thoracoscopy (VATS) in 1.9%, and the surgical technique not specified in 60.8% of cases. The average hospital stay was 8.6 ± 4.4 days. The ribs (31.4%) were the primary involved sites, followed by the muscles (11.8%). Postoperative medication included albendazole in 25 cases (49%) and albendazole with chemotherapy in one case (1.9%). Twenty-four cases (47.1%) had received no postoperative treatment. Only four cases (7.8%) faced complications. No recurrence was reported after a mean follow-up period of 14.1± 10.3 months (Table 4).

A provisional diagnosis of hydatid disease was considered in 14 (26.42%) of cases. Pre-operative treatment with Albendazole was administered to eight (15.09%) patients (Table 2). In contrast, postoperative medication was more frequently prescribed: Albendazole alone in 25 (49.02%), Albendazole with first-generation cephalosporin in one (1.96%), and Albendazole combined with chemotherapy in one (1.96%).

Surgical intervention remained the primary treatment modality, with 51 (96.23%) of patients undergoing surgery, one patient declined the surgery [21], and another patient from the United Kingdom, whose mass was too large for operation only treated with Albendazole, died [26]. Scoliotic agents were considered in nine patients, hypertonic saline was used in eight (15.09%) surgical cases, and Formalin was used in one (1.96%). Regarding the surgical approach, Thoracotomy was considered in 19 (37.25%), while Video-assisted thoracoscopy was used in one (1.96%). The average hospital stay after the operation was available for 12 patients out of 51 patients who underwent surgery, and it was 8.58 ± 4.44 days.

Regarding the outcome of those who underwent surgery, 30 (58.82%) recovered without complications, and five (9.80%) experienced complications. Notably, no recurrences were reported among patients who underwent surgery (Table 3) (Table 4).

4. Discussion

Human echinococcosis, a prevalent parasitic infection, presents a considerable health and economic burden to society, yet it remains largely neglected as a disease [49]. The findings of this study provide a comprehensive review of chest wall HC, with the majority of the studies conducted in Turkey (41.5%), followed by Morocco (7.3%), Greece (7.3%), India (7.3%), and Iran (7.3%). The higher incidence in these countries may reflect the endemic nature of hydatid disease, likely due to closer contact with livestock and domestic animals [50]. However, it has become a pressing global health issue, primarily attributed to increasing immigration rates and travel activities [7].

The mean age of 39.7 years, with a slight male predominance (56.9%), suggests that both demographic groups are at risk. However, occupational or environmental exposure factors could contribute to the observed gender disparity.

Clinically, the most common presentation was swelling (47.1%), followed by chest or abdominal pain (45.1%). This indicates that chest wall HCs may present as localized symptoms rather than systemic manifestations [51]. The relatively low percentage (19.6%) of patients with a history of animal contact suggests that direct exposure may not always be reported or remembered or that indirect exposure through contaminated water or food could also be significant transmission routes [26,27]. In addition, a review by Possenti and colleagues suggested that the primary route of human cystic echinococcosis transmission may be the direct or indirect contamination of hands with *Echinococcus granulosus* eggs excreted by dogs [52].

Schantz et al. indicated that individuals who own livestock are three times more likely to be diagnosed with this disease compared to those who do not own livestock [53]. In accordance with this finding, 16 (88.9%) of the 18 cases with known residency were from rural areas.

Ten cases (19.6%) had a positive history for HC at other sites, and the primary origin of cysts in 31.4% of patients and secondary origin in 17.6% highlights the importance of considering both primary infection or possible spread from other sites, such as the liver or lungs, as the diagnosis and treatment strategies may be different [1].

In the present study, the average cyst size on the CT scan was 7.5 cm, reflecting potentially large cysts that could cause significant local pressure effects or complications; this might be because the course of infection is slow, and most infected individuals remain either asymptomatic for years or exhibit non-specific symptoms leading to accidental diagnosis [54]. Parasite eggs can remain viable from several months up to a few years in the environment, and diverse conditions [55].

Only nine (50%) out of 18 patients with available data in this systematic review had positive hydatid serology, suggesting that serological tests alone may not be sufficient for diagnosis and imaging, particularly CT scans, plays a crucial role in the diagnostic process [56]. The provisional diagnosis of hydatid disease in only 27.5% of the cases underscores the diagnostic challenges faced by clinicians, especially when the clinical presentation is atypical or when imaging findings are inconclusive [57].

The importance and priority of infection prevention by practicing several preventive actions, especially in developing countries, has been proposed. The most significant of them included self-hygiene practices, proper washing and cooking of foods, and avoiding eating raw foods or groceries [27]. Regarding management, surgical intervention was the primary treatment modality [1,2,7,58]. A study indicated that while VATS has been successfully applied in managing pulmonary HCs, its adoption remains limited. It has been pointed out that many surgeons are still hesitant to use VATS due to a lack of familiarity with the technique and concerns about potential complications, such as cyst rupture or spillage of infectious material [59]. In this review, authors came across similar

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Table 1. Characteristics of the studies and patients' demography with past medical history.

Author/reference	Year	Type of Study	Country	No. of Case	Age	Gender	Residency	Contact with Animal	PMH	PSH	Origin
Althobaity et al. (1)	2023	Case report	Saudi Arabia	1	22	Male	N\A	Yes	Insignificant	N\A	Primary
Goyal et al. (2)	2010	Case report	India	1	30	Female	N\A	N\A	N\A	N\A	N\A
Godazandeh et al. (3)	2020	Case report	Iran	1	40	Male	Urban	No	N\A	No	Primary
Basit et al. (5)	2021	Case report	Afghanistan	1	65	Male	Rural	N\A	N\A	No	Primary
Salih et al. (6)	2017	Case report	Iraq	1	20	Female	Rural	Yes	N\A	N\A	N\A
Döner et al. (11)	2019	Case report	Turkey	1	31	Female	N\A	N\A	N\A	N\A	Primary
MohIeldeen et al. (13)	2013	Case report	Iraq	1	42	Male	Rural	N\A	Hydatid cyst	Pulmonary hydatid cyst surgery	Secondary
Akkas et al. (14)	2016	Case report	Turkey	2	32	Male	N\A	N\A	Hepatic hydatid cyst 2 years ago	N\A	Secondary
					24	Male	N\A	N\A	N\A	N\A	N\A
Alloubi et al. (15)	2012	Case report	Morocco	1	57	Male	Rural	N\A	N\A	N\A	N\A
Al-Qudah et al. (16)	2000	Case report	Jordan	1	24	Male	N\A	N\A	N\A	N\A	Primary
Afghani et al. (17)	2017	Case report	Iran	1	35	Female	N\A	N\A	N\A	N\A	Primary
Yekeler et al. (18)	2010	Case report	Turkey	1	57	Male	Rural	Yes	Insignificant	N\A	N\A
Ulger et al. (19)	2013	Case report	Turkey	1	62	Male	N\A	N\A	Hydatid cyst	Hydatid cyst surgery	N\A
Tulay et al. (20)	2015	Case report	Turkey	1	48	Male	N\A	N\A	Insignificant	No	Primary
Tomos et al. (21)	2005	Case report	Greece	1	26	Female	N\A	N\A	Hydatid cyst	Pulmonary and hepatic hydatid cyst surgery	Secondary
Tezcan et al. (22)	2014	Case report	Turkey	1	55	Male	N\A	N\A	Hydatid cyst	Pulmonary hydatid cyst surgery	Secondary
Tadasa et al. (23)	2023	Case report	Ethiopia	1	65	Male	N\A	N\A	N\A	N\A	N\A
Sevinc et al. (24)	2014	Case report	Turkey	1	31	Male	N\A	N\A	N\A	N\A	N\A
Sarkar et al. (25)	2015	Case report	India	1	58	Female	Rural	Yes	N\A	N\A	Primary
Sabzi et al. (26)	2023	Case report	Iran	1	53	Male	Rural	Yes	N\A	N\A	Secondary
Roman et al. (28)	2015	Case report	Romania	1	25	Male	Rural	Yes	History of trauma	N\A	N\A
Redington et al. (29)	2001	Case report	United Kingdom	1	72	Male	N\A	N\A	History of trauma	N\A	N\A
Raut et al. (30)	2004	Case report	India	1	28	Male	Rural	Yes	N\A	N\A	N\A
Ninos et al. (31)	2010	Case report	Greece	1	50	Male	N\A	N\A	Hydatid cyst	Pulmonary hydatid cyst surgery	Primary

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Table 1. Continued...

Kiliç et al. (32)	2003	Case report	Turkey	1	54	Male	Rural	N\A	Insignificant	N\A	Primary
Karapolat et al. (33)	2012	Case report	Turkey	1	69	Female	N\A	N\A	N\A	N\A	Primary
Karaoğlanoğlu et al. (34)	2001	Case report	Turkey	1	63	Male	Rural	Yes	N\A	N\A	N\A
Kaplanoğlu et al. (35)	2017	Case report	Turkey	1	27	Female	N\A	N\A	N\A	No	N\A
Honda et al. (36)	2010	Case report	Japan	1	9	Female	Rural	N\A	Insignificant	N\A	Secondary
Han et al. (37)	2004	Case report	Turkey	1	N\A	Female	N\A	N\A	Insignificant	N\A	N\A
Gezer et al. (38)	2006	Case report	Turkey	1	57	Female	N\A	N\A	N\A	N\A	N\A
Foroulis et al. (39)	2003	Case report	Greece	1	28	Female	Urban	N\A	N\A	N\A	Primary
Findikcioglu et al. (40)	2010	Case report	Turkey	1	48	Female	N\A	N\A	N\A	N\A	N\A
Faber et al. (41)	2010	Case report	Israel	1	18	Female	Rural	N\A	Thoracic outlet syndrome	N\A	N\A
Demir et al. (42)	2010	Case report	Turkey	1	9	Male	Rural	Yes	N\A	N\A	Primary
Chafik et al. (43)	2009	Case report	Morocco	1	35	Male	N\A	N\A	History of trauma	Undiagnosed swelling drainage	N\A
Sinberg et al. (44)	1936	Case report	United States	1	15	Male	Rural	Yes	Insignificant	N/A	Primary
Rose et al. (45)	1893	Case report	United Kingdom	1	25	Female	N\A	N/A	Bronchitis	N/A	Primary
Machboua et al. (46)	2023	Case series	Morocco	5	26	Male	Rural	N\A	N\A	N\A	N\A
					32	Female	N\A	N\A	N\A	N\A	N\A
					28	Male	N\A	N\A	N\A	N\A	N\A
					57	Male	N\A	N\A	N\A	N\A	N\A
					63	Female	N\A	N\A	Hydatid cyst	Pulmonary and hepatic hydatid cyst surgery	Secondary
					40	Female	N\A	N\A	Hydatid cyst	Pulmonary hydatid cyst surgery	N\A
Özdemir et al. (47)	1994	Case series	Turkey	6	38	Male	N\A	N\A	N\A	N\A	N\A
					26	Female	N\A	N\A	N\A	N\A	N\A
					35	Male	N\A	N\A	Hydatid cyst	Hepatic hydatid cyst surgery	Secondary
					35	Female	N\A	N\A	Hydatid cyst	Pulmonary hydatid cyst surgery	Secondary
					23	Female	N\A	N\A	N\A	N\A	N\A
Avci et al. (48)	2005	Case report	Turkey	1	72	Female	N\A	N\A	History of trauma	No	Primary

N/A: non-available, PMH: past medical history, PSH: past surgical history

Table 2. Presentation and diagnosis of the cases.

Author/ reference	Year	No. of Case	Presentation	Duration (months)	Size of the mass on CT scan (cm)	Hydatid serology	Provisional diagnosis	Pre-operative medication
Althobaity et al. (1)	2023	1	Chest pain	36	N\A	N\A	Hydatid disease	Albendazole
Goyal et al. (2)	2010	1	Swelling, Chest pain	N\A	N\A	N\A	N\A	No
Godazandeh et al. (3)	2020	1	Swelling	5	N\A	Negative	N\A	No
Basit et al. (5)	2021	1	Chest pain	0.66*	N\A	N\A	Chest wall tumor	No
Salih et al. (6)	2017	1	Swelling, Chest pain	60	N\A	N\A	N\A	No
Döner et al. (11)	2019	1	Swelling, Chest pain	N\A	4	N\A	Hydatid disease	No
MohIeldeen et al. (13)	2013	1	Chest pain, Numbness	4	N\A	N\A	Hydatid disease	No
Akkas et al. (14)	2016	2	Chest pain	N\A	10	N\A	N\A	No
			N\A	N\A	10	N\A	N\A	No
Alloubi et al. (15)	2012	1	Chest pain	3	9	N\A	Chest wall tumor	No
Al-Qudah et al. (16)	2000	1	Dyspnea, Cough, Fever, Shoulder pain	12	N\A	Negative	N\A	No
Afghani et al. (17)	2017	1	Swelling, Chest pain	N\A	N\A	Negative	Hydatid disease	Albendazole
Yekeler et al. (18)	2010	1	N\A	N\A	N\A	Positive	Hydatid disease	No
Ulger et al. (19)	2013	1	Chest pain	70	N\A	N\A	Hydatid disease	Albendazole
Tulay et al. (20)	2015	1	Swelling	5	10	N/A	N\A	No
Tomos et al. (21)	2005	1	Chest pain	N\A	N\A	Negative	N\A	No
Tezcan et al. (22)	2014	1	Cough, Dyspnea, Shoulder pain	N\A	8	N\A	N\A	No
Tadasa et al. (23)	2023	1	Cough, Back pain, Heaviness, Paresthesia	12	N\A	N\A	Hydatid disease	Albendazole
Sevinc et al. (24)	2014	1	Swelling	N\A	5	N\A	Hydatid disease	No
Sarkar et al. (25)	2015	1	Swelling	36	N\A	Positive	Hydatid disease	Albendazole
Sabzi et al. (26)	2023	1	Swelling, Chest pain	24	N\A	Negative	Hydatid disease	No
Roman et al. (28)	2015	1	Chest pain	N\A	3	N\A	Hydatid disease	No
Redington et al. (29)	2001	1	Dizziness, Sweating, Horsness of voice, Swelling, Chest pain	24	7	Negative	Hydatid disease	Albendazole
Raut et al. (30)	2004	1	Back pain, Paraparesis	6	N\A	N\A	Hydatid disease	No
Ninos et al. (31)	2010	1	Swelling	N\A	N\A	Negative	Hydatid disease	Albendazole
Kiliç et al. (32)	2003	1	Swelling, Chest pain	3	N\A	N\A	N\A	No

Table 2. Continued…

Karapolat et al. (33)	2012	1	Abdominal pain	48	9	N\A	Chest wall tumor	No
Karaoğlanoğlu et al. (34)	2001	1	Cough	144	N\A	Negative	N\A	No
Kaplanoğlu et al. (35)	2017	1	Swelling	6	N\A	N\A	N\A	No
Honda et al. (36)	2010	1	Fever, General fatigue, Nausea	N\A	6	Positive	N\A	No
Han et al. (37)	2004	1	Swelling	8	N\A	Positive	N\A	No
Gezer et al. (38)	2006	1	Shoulder pain, Numbness, Arm weakness	3	N\A	N\A	N\A	No
Foroulis et al. (39)	2003	1	Swelling	N\A	N\A	Positive	N\A	Albendazole
Findikcioglu et al. (40)	2010	1	Swelling	N\A	N\A	N\A	N\A	No
Faber et al. (41)	2010	1	Shoulder pain, Swelling	12	N\A	N\A	Aneurysmal bone cyst	No
Demir et al. (42)	2010	1	Chest pain	1	N\A	Positive	Ewing sarcoma	No
Chafik et al. (43)	2009	1	Swelling	N\A	N\A	Negative	N\A	No
Sinberg et al. (44)	1936	1	Swelling, Chest pain	18	N\A	N/A	N\A	No
Rose et al. (45)	1893	1	Swelling	N\A	N\A	N/A	N\A	No
Machboua et al. (46)	2023	5	Chest pain, Back pain, Lower limb paresthesia	N\A	N\A	Positive	N\A	No
			Chest pain, Back pain, Dyspnea	N\A	N\A	Positive	N\A	No
			Chest pain, Dyspnea	N\A	N\A	N\A	N\A	No
			Swelling, Chest pain	N\A	N\A	Positive	N\A	No
			Chest pain	N\A	N\A	N\A	N\A	No
			Swelling	N\A	N\A	N\A	N\A	No
			N\A	N\A	N\A	N\A	N\A	No
Özdemir et al. (47)	1994	6	N\A	N\A	N\A	N\A	N\A	No
			Empyema	N\A	N\A	N\A	N\A	No
			Swelling	N\A	N\A	N\A	N\A	No
			Swelling, Shoulder pain	N\A	N\A	N\A	N\A	No
Avci et al. (48)	2005	1	Chest pain	N\A	9	N\A	Hematoma	No

* *Less than a month*

Table 3. Management and outcome.

Author/ reference	Year	No. of Case	Surgical approach	Scolicidal agent	Site of involvement	Post-operative medication	Complication	Recurrence	Follow-up (month)
Althobaity et al. (1)	2023	1	Video-assisted thoracoscopy (VATS)	Hypertonic saline	N\A	Albendazole	Pneumothorax	No	5
Goyal et al. (2)	2010	1	Thoracotomy	Hypertonic saline	Rib and intercostal muscle	No	No	N\A	N\A
Godazandeh et al. (3)	2020	1	N\A	N\A	N\A	Albendazole	No	No	24
Basit et al. (5)	2021	1	N\A	Hypertonic saline	N\A	Albendazole	No	N\A	N\A
Salih et al. (6)	2017	1	N\A	N\A	N\A	N\A	No	No	3
Döner et al. (11)	2019	1	N\A	N\A	Intercostal muscle	Albendazole	No	N\A	N\A
MohIeldeen et al. (13)	2013	1	N\A	N\A	8th rib	Albendazole	No	No	24
Akkas et al. (14)	2016	2	Thoracotomy	N\A	Intercostal muscle	Albendazole	No	No	36
			Thoracotomy	N\A	N\A	Albendazole	No	No	18
Alloubi et al. (15)	2012	1	Thoracotomy	N\A	6th and 7th ribs	Albendazole	No	No	6
Al-Qudah et al. (16)	2000	1	Thoracotomy	N\A	1st rib	No	No	N\A	N\A
Afghani et al. (17)	2017	1	N\A	N\A	N\A	Albendazole	No	No	24
Yekeler et al. (18)	2010	1	Thoracotomy	N\A	6th rib	Albendazole	No	No	10
Ulger et al. (19)	2013	1	N\A	N\A	Sternum	No	N\A	No	12
Tulay et al. (20)	2015	1	N\A	Hypertonic saline	N\A	Albendazole	N\A	No	6
Tomos et al. (21)	2005	1	Thoracotomy	N\A	6th rib	No	N\A	N\A	N\A
Tezcan et al. (22)	2014	1	N\A	N\A	Sternum	No	No	N\A	N\A
Tadasa et al. (23)	2023	1	No	N\A	N\A	No	N\A	N\A	N\A
Sevinc et al. (24)	2014	1	N\A	Hypertonic saline	N\A	Albendazole	No	N\A	N\A
Sarkar et al. (25)	2015	1	N\A	N\A	N\A	Albendazole	No	No	12
Sabzi et al. (26)	2023	1	N\A	N\A	N\A	Albendazole	No	N\A	N\A
Roman et al. (28)	2015	1	Thoracotomy	Formalin	8th rib	Albendazole, Chemotherapy	No	No	1
Redington et al. (29)	2001	1	No	N\A	N\A	No	N\A	N\A	N\A
Raut et al. (30)	2004	1	N\A	N\A	9th rib	Albendazole	No	N\A	N\A
Ninos et al. (31)	2010	1	N\A	N\A	Intercostal muscle	Albendazole	N\A	No	12
Kiliç et al. (32)	2003	1	Thoracotomy	N\A	5th, 6th and 7th ribs	Albendazole	No	N\A	N\A
Karapolat et al. (33)	2012	1	N\A	N\A	N\A	Albendazole	No	No	12
Karaoğlanoğlu et al. (34)	2001	1	N\A	N\A	5th and 6th ribs, Serratus anterior muscle, Latissimus dorsi muscle	Albendazole	No	No	6

Table 3. Continued…

Kaplanoğlu et al. (35)	2017	1	N\A	N\A	Intercostal muscle	No	N\A	No	12
Honda et al. (36)	2010	1	N\A	Hypertonic saline	N\A	Albendazole	N\A	No	16
Han et al. (37)	2004	1	N\A	N\A	7th rib	Albendazole	N\A	N\A	N\A
Gezer et al. (38)	2006	1	Thoracotomy	N\A	1st rib	Albendazole	No	No	15
Foroulis et al. (39)	2003	1	Thoracotomy	Hypertonic saline	10th vertebra, 9th and 10th ribs	Albendazole	No	No	48
Findikcioglu et al. (40)	2010	1	Thoracotomy	N\A	Riband vertebra	No	N\A	N\A	N\A
Faber et al. (41)	2010	1	N\A	N\A	1st rib	No	No	N\A	N\A
Demir et al. (42)	2010	1	N\A	N\A	N\A	Albendazole	N\A	N\A	N\A
Chafik et al. (43)	2009	1	Thoracotomy	N\A	N\A	Albendazole	No	N\A	N\A
Sinberg et al. (44)	1936	1	N\A	Hypertonic saline	Sternum	No	Slight superficial infection	N\A	N\A
Rose et al. (45)	1893	1	N\A	N\A	N\A	No	Hemorrhage	N\A	N\A
Machboua et al. (46)	2023	5	Thoracotomy	N\A	N\A	No	Pleurocutaneous fistula, Disabling parietal pain and neurological pain, Disorder of the Shoulder Girdle.	No	24
			Thoracotomy	N\A	Rib and vertebra	No	No	N\A	N\A
			N\A	N\A	N\A	No	No	N\A	N\A
			Thoracotomy	N\A	N\A	No	No	N\A	N\A
			Thoracotomy	N\A	N\A	No	N\A	N\A	N\A
			N\A	N\A	N\A	No	N\A	N\A	N\A
			N\A	N\A	N\A	No	N\A	N\A	N\A
Özdemir et al. (47)	1994	6	Thoracotomy	N\A	N\A	No	N\A	N\A	N\A
			Thoracotomy	N\A	N\A	No	N\A	N\A	N\A
			N\A	N\A	N\A	No	N\A	N\A	N\A
			N\A	N\A	N\A	No	N\A	N\A	N\A
Avci et al. (48)	2005	1	N\A	N\A	N\A	No	No	N\A	N\A

N/A: non-available

Table 4. Summary and baseline characteristics of the included studies.

Variables	Frequency/percentage
Mean Age (years)	39.7 ± 17.1
Sex	
Male	29 (56.9%)
Female	22 (43.1%)
Country of study	
Turkey	17 (41.5%)
Morocco	3 (7.3%)
Greece	3 (7.3%)
India	3 (7.3%)
Iran	3 (7.3%)
Iraq	2 (5.0%)
United Kingdom	2 (5.0%)
Afghanistan	1 (2.4%)
Ethiopia	1 (2.4%)
Israel	1 (2.4%)
Japan	1 (2.4%)
Jordan	1 (2.4%)
Romania	1 (2.4%)
Saudi Arabia	1 (2.4%)
United States	1 (2.4%)
Past medical history for hydatid cyst	
Positive	10 (19.6%)
Negative	41 (80.4%)
Contact with animal	
Yes	10 (19.6%)
No	1 (2.0%)
N\A	40 (78.4%)
Residency	
Rural	16 (31.4%)
Urban	2 (3.9%)
N\A	33 (64.7%)
Origin	
Primary	16 (31.4%)
Secondary	9 (17.6%)
N\A	26 (51.0%)
Size of the mass on CT scan	7.5 ± 2.4 cm
Presentation	
Swelling	24 (47.1%)
Chest/Abdominal pain	23 (45.1%)
Dyspnea	4 (7.8%)
Cough	4 (7.8%)
Shoulder/back pain	9 (17.6%)
Numbness	5 (9.8%)
Others	6 (11.8%)
N\A	4 (7.8%)
Hydatid serology test	
Positive	9 (17.6%)
Negative	9 (17.6%)
N\A	33 (64.7%)
Provisional diagnosis	
Hydatid disease	14 (27.5%)
Chest wall tumor	3 (5.9%)
Aneurysmal bone cyst	1 (1.9%)
Ewing sarcoma	1 (1.9%)
Hematoma	1 (1.9%)
N\A	31 (60.8%)
Pre-operative medication	
Albendazole	8 (15.7%)
No	43 (84.3%)
Surgical approach	
Thoracotomy	19 (37.3%)
Video-assisted thoracoscopy	1 (1.9%)
N\A	31 (60.8%)
Injection of scolicidal agent with surgery	
Hypertonic saline	8 (15.7%)
Formalin	1 (1.9%)
No	42 (82.4%)
Site of involvement	
Rib	16 (31.4%)
Muscle	6 (11.8%)
Sternum	3 (5.9%)
Vertebra	3 (5.9%)
N\A	28 (54.9%)
Post-operative medication	
Albendazole	25 (49.0%)
Albendazole and chemotherapy	1 (1.9%)
No	24 (47.1%)
N/A	1 (1.9%)
Mean postoperative hospital stay (days)*	8.6 ± 4.4
Outcome of surgery	
Recovered with no complication	29 (56.9%)
Recovered with complication	4 (7.8%)
N\A	18 (35.3%)
Average duration of follow-up (months)	14.1± 10.3
Recurrence	
Yes	0 (0.0%)
No	21 (41.0%)
N\A	30 (59.0%)

N/A: non-available, CT: computed tomography.
**For 12 patients out of 51 patients who underwent surgery.*
#For 23 patients out of 51 patients who underwent surgery.

findings, such as thoracotomy being performed in 37.3% of cases and VATS being performed in 1.9%. This may depend on cyst size and location. Furthermore, the low utilization of minimally invasive approaches like thoracoscopy may suggest either a preference for traditional open techniques or a lack of resources or expertise in minimally invasive surgery in some settings. The postoperative outcomes were generally favorable, with only 7.8% of patients facing complications, and no recurrence was reported, emphasizing the effectiveness of surgical management.

Machboua et al. on intra-thoracic extra-pulmonary hydatidosis noted that the average duration of hospitalization was only seven days, which is similar to what was found in this study (8.58 ± 4.44 days) [46].

The administration of post-operative albendazole alone (49%) or in combination with other medications (1.9%) may appear to be a standard practice to prevent recurrence, even though no

recurrences were reported in this study. This could reflect a preventive strategy against the possible dissemination of HCs during surgery [1,14,15,17,18]. Overall, the study may provide valuable insights into the epidemiology, clinical presentation, diagnostic strategies, and management outcomes of chest wall HCs; however, the lack of essential data in a number of reviewed studies might generate biased or non-conclusive findings.

5. Conclusion

Despite its rarity, chest wall HC may have a good prognosis with few complications. Given its often-nonspecific presentation, reviewing the patient's medical history may help establish an accurate provisional diagnosis.

Declarations

Conflicts of interest: The authors have no conflicts of interest to disclose.

Ethical approval: Not applicable, as systematic reviews do not require ethical approval.

Patient consent (participation and publication)**:** Not applicable.

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Use of AI: ChatGPT-3.5 was used to assist in language editing and improving the clarity of the manuscript. All content was reviewed and verified by the authors. Authors are fully responsible for the entire content of their manuscript.

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