

CLINICAL AND PARASITOLOGICAL STUDIES ON PULMONARY AND HEPATIC HYDATID CYSTS IN HOSPITALIZED CHILDREN AND ADULTS

By

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Abstract

A cross sectional study compared the clinical features of the pulmonary and hepatic hydatid cysts in children and adults and evaluated IHAT and ELISA techniques in diagnosis. The results showed that the patients ages were 5-14 years (10.6±3.7) in children and 16-75 years (32.2±14) in adults, patients 34 (75.5%) had liver cysts, 25 (55.5%) had pulmonary cysts and 7 (15.5%) had both liver and lung cysts. In hepatic hydatidosis, 7/34 (20.5%) cases were asymptomatic while others showed variable clinical manifestations. The commonest symptom was localized right hypochondrial pain in 13 (38.2%) and the least one was jaundice in 4 (11.7%). The commonest sign was abdominal masses on the right hypochondrium in 88.2% and the least one was ascites in 5.8%. The commonest symptom of pulmonary hydatidosis was chest pain in 8 (34.7%) followed by cough and hemoptysis on 4 (17.3%) and the least one was cough and fever (8.6%).

Pulmonary hydatid cysts in children were significantly higher in males (17.3%) than females (4.3%), but without significance in adults (26% in male vs. 21.7% in females). Sex difference in hydatid cyst frequencies between adults and children was significant (P <0.05). Mixed hepatic and pulmonary cysts were less in children than in adults (14.3% vs 85.7%), with huge pulmonary cysts of 20 cm were more common in children (37.7%) than in adults (17.7%). The high sensitivity (95.5%) of ELISA-IgG recommended this test showed a dependable sero-diagnosing one.

Key words: Egypt, Hydatidosis, Clinical picture, ELISA, IHAT, Children, Adults.

Introduction

Hydatidosis is one of major problems in countries where this disease is endemic. It is caused by *E. granulosus* and dogs play an important role in transmitting the tapeworm and so disease to a human being. The cystic echinococcosis (CE) affects various organs of the human body by developing hydatid cysts in them and the progression of disease is different between children and adults (Ahmadi *et al.*, 2011). The most common location for hydatid cysts in children is the lung while adults mostly have hepatic cysts. Furthermore, combined lung and liver cysts are more frequent in children than adults. Some other studies, assume that high elasticity and compressible tissue of lungs in children leads to faster growing of hydatid cysts in lungs than liver. (Santivanez *et al.*, 2010). However, Sorogy *et al.* (2015) reported a rare pancreatic body hydatid cyst a 34-year-old Egyptian male patient. Generally speaking, the hydatid disease is endemic mainly in

the Mediterranean countries (particularly Greece), the Middle East, the Baltic areas, South America, India, northern China, and other sheep-raising areas; however, owing to increased travel and tourism all over the world, it can be found anywhere, even in developed countries (Huizinga *et al.*, 2000). In Arab countries, human hydatidosis was known long ago as in Tunisia (Ben-Osman, 1965), Saudi Arabia (El Marsfy and Morsy, 1975; Mallaika *et al.*, 1980), North Africa (Matossion *et al.*, 1977), Algeria (Larbaoui *et al.*, 1980), The Sudan (Saad *et al.*, 1983), Jordan (Al-Yaman *et al.*, 1985; Kamhawi *et al.*, 1995, El-Shehabi *et al.*, 2000), Syria (Hadidi, 1986), Morocco (Pandey *et al.*, 1986; Anderson, 1997), Kuwait (Abdul Salam and Farah, 1988), Iraq (Saeed *et al.*, 2000), Libya (Kassem, 2006; Kassem and Gdoura, 2006; Mohamed *et al.*, 2014) and Yemen (Alam-Eldin *et al.*, 2015). WHO (2013) planned for an effective disease control strategy by 2018. Diagnosis of hydatid disease is based

upon clinical suspicion, particularly in the endemic areas. As a rule, the routine laboratory tests show non-specific results.

The enzyme linked immunosorbent assay (ELISA) & indirect hemagglutination (IHA) test are the most used serodiagnostic tests for hydatidosis (El-Shazly *et al*, 2010). But, there is a great deal of variability in specificity and sensitivity of these tests among different laboratories, which was influenced by the type and procedures of the antigen preparation (Ortona *et al*, 2000).

This work aimed to compare the clinical features of hydatid cysts in children and adults and to study the role of two serodiagnostic tests for hydatidosis.

Subjects, Materials and Methods

Study Design: This cross sectional study was carried out from October 2013 to April 2015 upon 45 (18 children & 27 adults) proven hydatidosis patients and 20 cross matched healthy controls who attended 6 October University Hospital, Benha Teaching and University Hospitals. The control group was age and sex matched with the patients group.

Ethical considerations: Informed written consent was provided by each patient before inclusion, and the study was conducted according to the institutional ethical and professional guidelines for the management and follow-up of patients.

All cases were subjected to clinical examination for 1- Liver signs affection as: hepatomegaly, jaundice, biliary colic, pancreatitis, abscess, splenomegaly portal hypertension, ascites, and thrombosis, biliary fistula to skin, bronchial system or gastrointestinal tract. 2- Lung signs affection as: bronchial spasm, pneumonia and lung abscess. 3- Bone and muscles signs affection as: bone outgrowth, bone fragility, disturbances of motility, muscle cyst. 4- Brain and spine signs affection as: neurological symptoms, headache, blurring of vision and back pain.

Imaging: Patients and controls undergone the plain x-ray for the chest and skull, abdominal ultrasonography by using 3.5 Mega

Hertz probe. Also, the CT scan was done for patients to confirm hydatidosis.

Laboratory examination: a- Urine by Nucleopore test (Abo-Madyan *et al*, 2004), b- Stool by formal ether sedimentation (Garcia and Bruckner, 1988) and Kato thick smear (Katz *et al*, 1972), c- CBC for eosinophilia, liver and kidney function tests, d- Sputum examination for hydatid sand in pulmonary cystic hydatidosis (Oztek *et al*, 1997) and e- Venous blood to separate sera for detection of antibodies against *E. granulosus* using two commercial available serological tests: IHAT by using echinococcosis kit (Fumouze Diagnostics, France) according to the instruction of manufacturer and ELISA-IgG with anti-human IgG-alkaline phosphatase conjugate (Abcam, USA). Sensitized wells are provided as breakable strips for the economical assay of small series of samples.

Statistical analysis: Data were run on an IBM compatible personal computer using the Statistical Package for Social Scientists (SPSS) for windows 10 (SPSS Inc. Chicago IL. USA). P value was considered significant if less than 0.05.

Results

In the present study, the variable clinical manifestations of hydatidosis were detected. Gastrointestinal and hepatobiliary symptoms were detected (Tab. 1) in 34 cases (75.5%), they were right hypochondrial pain (38.2%), left hypochondrial pain (17.6%), generalized abdominal pain (41.2%), jaundice (11.7%), anorexia (29.4%), abdominal mass (88.2%) and ascites (5.8%) and 20.5% asymptomatic. As regards pulmonary symptoms, 21.7% of cases were asymptomatic. While, chest pain x-ray was detected among (34.7%), cough among (17.3%), cough and fever among (8.6%) and hemoptysis among (17.3%)

Age and sex distribution of patients, according to cyst location (table 2), showed that, there was no cyst detected in females up to 10 years but 2 males patients in age up to 10 years had cysts in the liver. Patients' group in which age ranged from 10-20 years, cysts in liver were detected in 2 fe-

males and 2 male patients respectively. The same results were detected in patients aging 20-30 years. In age group that ranged from 30 - 40 years, 2 cases were reported in liver and one case in spleen in females, 2 cases were in the liver, and two cases were in lung in males (Tab. 3). As regards cases with age

> 40 years, 6 cases had cysts in liver, two cases had cysts in lung in females while in males 10 cases had liver cysts and two cases had lung cysts.

In the present work, ELISA detected 43/45 (95.5%) while IHAT detected 40/45 (88.8%) of patients and non in the controls (Tab. 5).

Table 1: Clinical presentation of hepatic hydatidosis patients.

Clinical presentation	No. of cases	Percentage
Asymptomatic	7	20.5
Right hypochondrial pain	13	38.2
Left hypochondrial pain	6	17.6
Generalized abdominal pain	14	41.2
Jaundice	4	11.7
Anorexia	10	29.4
Abdominal masses	30	88.2
Ascites	2	5.8

Table 2: Clinical presentation of pulmonary hydatidosis patients.

Clinical presentation	No. of cases	Percentage
Asymptomatic	5	21.7
Chest pain	8	34.7
Cough	4	17.3
Cough + fever	2	8.6
Hemoptysis	4	17.3

Table 3: Distribution of hydatid cysts according to age and sex of patients.

Studied group	Male						Female					
	Liver		Pulmonary		Both		Liver		Pulmonary		Both	
	no	%	no	%	no	%	no	%	no	%	no	%
Children (5-14 years)	5	14.7	4	17.3	0	0	3	8.8	1	4.3	1	14.2
Adults (16-75 years)	11	70.5	6	26	4	57	8	23.5	5	21.7	2	28.5
Total	16	47	9	39	4	57	11	32.3	7	30.4	3	42.8

P < 0.05

Table 4: distribution of patients' age and cysts size.

Age	patients		Cyst size	
	No.	Percentage	Hepatic	Pulmonary
5-15 years	17	37.7	5-14 cm	6-20 cm
16-26 years	7	15.5	6-11 cm	6-16 cm
27-37 years	5	11.1	4-12 cm	7-11 cm
38-48 years	8	17.7	5-12 cm	6-13 cm
49-59 years	5	11.1	5-10 cm	8-12 cm
60-75 years	3	6.6	4-9 cm	6-10 cm

P < 0.05

Table 5: Comparative diagnostic of ELISA versus IHAT for hydatidosis patients

Patients	ELISA		IHAT	
	Positive	Negative	Positive	Negative
	No%	No%	No%	No%
Positive sera	43 (95.5)	2 (4.5)	40 (88.8)	5 (11.1)
Control	0	20 (100)	0	20 (100)

Discussion

In the present study, the presenting symptoms of the cystic echinococcosis *granulosus* were highly variable; the right hypochondrial pain (38.2%), left hypochondrial pain (17.6%), generalized abdominal pain (41.2%), the jaundice (11.7%), anorexia (29.4%), abdominal masses (88.2%) and ascites (5.8%), while, 20.5% were asymptomatic. This was explained by dependence of the presenting features not only on the organ involved, but also on: the size of the cysts and their position within the affected organ, the mass effect within the organ and upon surrounding structures and lastly on the complications that related to cyst rupture and secondary infection. The signs and symptoms of liver hydatidosis include hepatomegaly, right/epigastric pain, nausea and vomiting (Nunnari *et al*, 2012)

The present study results agreed with Pawlowski *et al*. (2001) who reported that the initial phase of CE is asymptomatic with small well encapsulated cysts. After an undefined period of several months to years, the infection may become symptomatic as a space-occupying lesion. However, 60% of infections will remain asymptomatic even in advanced age. The symptoms may develop due to local effects of the cyst as mass effects or due to complications of the cyst itself such as rupture or super infection (Garcia *et al*, 2010). Most symptomatic cysts are larger than 5cm in diameter. Additionally, as the cysts in liver enlarge, local pressure causes a mass effect on the surrounding tissue producing commensurate symptoms and signs. These may be generalized with upper abdominal pain and discomfort or more specific such as obstructive jaundice. Biliary rupture may occur through a small fissure or bile duct fistula. A wide perforation allows the access of hydatid membranes to the main biliary ducts, which in turn can cause symptoms simulating choledocholithiasis. Alternatively it may produce a picture very similar to ascending cholangitis with fever, pain and jaundice (Khanfar, 2004). Zubiaurre *et*

al. (2006) reported that portal hypertension and cavernomatosis was reported in patients with liver hydatidosis mainly due to compression, invasion or portal/suprahepatic thrombosis.

Chest troubles that had been detected in the present study were chest pain, cough, cough and fever and hemoptysis (34.7%, 17.3%, 8.6%, 17.3%) respectively. This data agreed with Aletros and Symbos (2000) who reported that, patients with pulmonary hydatid disease may present with fever, cough, chest pain or haemoptysis. The cyst may rupture into the bronchial tree, pericardium or pleural cavity. Hydatid cyst rupture into the lung parenchyma can produce consolidation, pneumothorax or respiratory failure (Boots, 1998).

The present study showed that both children and adults were affected and that both were susceptible to infection. Also, the hepatic hydatidosis prevalence increased in the age group >40 years. These results agreed with Rokni (2009) who reported that hydatidosis is a disease of long incubation period (might be 20-30 year) and accordingly a wide range of different ages is obvious in infected patients. The overall ranged between 20-40 years old as the highest rate infection of age group. Kayal and Hussain (2014) reported that the mean age was 40 years.

The frequency of pulmonary hydatid cysts in children was significantly higher in males (17.3%) than in females (4.3%). However, there was no sex tendency in adults (26% in male vs. 21.7% in females). The sex difference in hydatid cyst frequencies between adults and children was significant ($P < 0.05$). The frequency of mixed hepatic and pulmonary cysts was less in children than in adults (14.3% vs 85.7%). The huge pulmonary cysts (≥ 20 cm) were more common in children (37.7%) than in adults (17.7%).

The present results agreed with Aletros and Symbos (2000) who reported that the most commonly affected organ in adults was the liver (55-70%), followed by the lung (18-35%), but in about 5-13% of cases both

organs can be affected simultaneously. Also, Kandeel *et al.* (2004) in Egypt found that hydatid cysts occurred most commonly in the liver and the lungs, either singly (54 & 52 respectively) or in conjunction with other organs (24 & 11 respectively). A total of 24 cases involved infection in more than 1 organ.

At the sometime, Ahmadi and Hamidi (2008) found that liver involvement by hydatidosis was high (90.5% of cases). Khanfar (2004) reported that liver was the obvious first site (55-70%) after entry in the portal circulation through the gut and most cysts tended to be located in the right lobe. Dyer *et al.* (2001) added that the lung (18-35%) was the second most common site of haematogenous spread. It had predilection for the right posterior segment with 60% of cases manifesting in the lower lobes. They varied considerably in size and because of the compressibility of both cyst and lung; it was the only site where the cyst can become extremely large. These were frequently seen in children. On the contrary, Marjanovic *et al.* (2015) reported that hepatic and pulmonary hydatidosis (hepatopulmonary hydatidosis) is very rare condition in children that occurs incidence to 11%

To monitor remaining or relapsing hydatid cysts, ELISA or other serological techniques are considered useful not only for diagnosis but also for the post-surgical follow-up period (Dessaint *et al.*, 1975). The present study showed that, the high sensitivity (95.5%) of IgG ELISA test indicated that ELISA is the preferable diagnostic procedure for hydatid disease This agreed with Rokni *et al.* (2006) who found that ELISA diagnosed hydatidosis with sensitivity, specificity, positive and negative predictive values of 96.7%, 95.2%, 93.7%, 97.5% respectively. Also, Mohamed (2013) reported that ELISA sensitivity and specificity for diagnosis of hydatidosis as 96%, 100% respectively.

Generally speaking, in Egypt hydatidosis was well documented in many governorates

among man (Abdalla *et al.*, 1975; Babers *et al.*, 1987; Romia *et al.*, 1992; Madwar *et al.*, 1995; Mazyad *et al.*, 1998; 1999; Ramzy *et al.*, 1999; Ramadan and Eldamaty 2000; El Shazly *et al.*, 2001; Sadaka *et al.*, 2002; Kandeel *et al.*, 2004; Dyab *et al.*, 2005; Abbas *et al.*, 2006; El-Sebaie *et al.*, 2006; Mazyad *et al.*, 2007; El Wakil *et al.*, 2007; Ibrahim *et al.*, 2007; El Shazly *et al.*, 2007a; El-Fakahani *et al.*, 2011; Abdelaal and Dabbousdl, 2014), edible animals (El Kordy, 1946; Hamdy *et al.*, 1980; El-Ridi *et al.*, 1983; Ahmed, 1991; Abdel Rahman *et al.*, 1992; Lotfi *et al.*, 1994; Mohamed *et al.*, 1997; Haridy *et al.*, 1998, 2000; Abdel-Alim *et al.*, 1999; Dyab *et al.*, 2005; Amer *et al.*, 2015; Alam-Eldin and Badawy, 2015; Abdelraouf *et al.*, 2015) and in street dogs (Selim, 1967; Abou-Eisha and Abdel-Aal, 1995; Mazyad *et al.*, 2007; El Shazly *et al.*, 2007b,c), and even donkeys (Haridy *et al.*, 2008).

Conclusion

Hydatidosis, or cystic echinococcosis, is one of the major global zoonotic parasitosis. Larval stages of *E. granulosus* develop in the internal organs of humans and various intermediate hosts as fluid-filled cystic lesions. The pulmonary hydatid cysts in children was significantly higher in males there was no sex tendency in adults Sex difference in hydatid cyst frequencies between adults and children was significant Huge pulmonary cysts were very common in the children. The ELISA proved dependable diagnostic test.

Undoubtedly, human hydatidosis is one of the major global zoonotic health-problem. Thus, periodical examination of pet dogs is a must as well as hand-washing. On the other hand, proper checking of the slaughtered-animals and getting rid of stray dogs may help in controlling this disease. Also, proper cooking of foods and abstinence from eating raw vegetables which are contaminated obviously prevents the hydatid disease. A comprehensive health education should be given to farmers, butchers and to the general

population on the health risks associated farm animals stray dogs and hydatidosis by practical demonstration, and radio talks

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