

## Demographic Aspects of Human Hydatidosis in Egypt

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### ABSTRACT

**Background:** Cystic echinococcosis or hydatidosis is caused by the larval stage of the tapeworm *Echinococcus granulosus*. It is one of the most important parasitic zoonoses.

**Objective:** The aim of the work was to determine the prevalence of the disease in humans and its clinical presentation, also targeted to identify risk factors predisposing infections.

**Subjects and Methods:** Thirty-one cystic echinococcosis cases were collected to determine the presence of hydatid cysts in human. Confirmation of hydatid cyst infection was done by radiological assessment and direct parasitological detection of hydatid cyst through PAIR technique or pathological confirmation of surgical removal cyst. A questionnaire survey to identify risk factors of transmission was also carried out.

**Results:** The highest percent of infection with hydatid cyst was in age group 21-30 years (29.04%), followed by age group 31-40 years and 41-50 years that attained (25.81%) for each. Females attained the higher percent of infection (58.06%) in comparison to males (41.94 %). The highest percent of cystic echinococcosis was recorded for farmers (32.26 %) followed by housewives (29.03%). 67.75 % of cystic echinococcosis was for rural resident and (32.25%) was for urban resident.

**Conclusion:** It could be concluded that hydatid disease is still an endemic problem and is a course of challenge to all the medical practitioners. The study has established that hydatidosis is prevalent in humans in Egypt and that the risk factors for its transmission exist.

**Keywords:** Cystic echinococcosis, hydatid cyst, prevalence, Egypt.

### INTRODUCTION

Hydatid disease or cystic echinococcosis (CE) is a major zoonotic disease of significant public health and worldwide distribution caused by the larval stage of the dog tapeworm belonging to the family Taeniidae; genus *Echinococcus* <sup>(1,2)</sup>.

The most common species to cause the human CE is *Echinococcus granulosus*. *Echinococcus multilocularis* causes alveolar echinococcosis although it is rare. *Echinococcus vogeli* and *Echinococcus oligarthrus* cause polycystic echinococcosis <sup>(3)</sup>.

Two mammalian hosts are involved in the life cycle of *Echinococcus granulosus*. The adult worm lives in the small intestine of carnivores (definitive hosts) <sup>(1)</sup> and the larval stage (Hydatid cyst) develops in the internal organs of a wide range of mammalian species such as goats, sheep and cattle, including humans, which acquire the infection through accidental ingestion of the tapeworm eggs <sup>(4)</sup>.

Cystic echinococcosis affects various organs of the human body <sup>(5)</sup>. Hydatid cyst primarily affects the liver in (52–77%) of cases. However, the most common location for hydatid cysts in children is the lung <sup>(6)</sup>. Other rare locations of hydatid cyst include spleen, thyroid, gall bladder, central nervous system, kidney, psoas sheath, retroperitoneal region and orbit <sup>(7)</sup>. The clinical features of hydatid cysts disease depend on the size and site of the cyst and the presence of complications <sup>(1)</sup>. The initial phase of CE is asymptomatic with small well encapsulated cysts.

Accidental discovery of asymptomatic CE in liver is frequent in uncomplicated cases <sup>(8)</sup>. Many patients present first by complications which occur in about (40%) of cases as infection, rupture to the biliary tree, rupture to the peritoneal cavity and rupture to the pleural cavity <sup>(9)</sup>.

Transmission and maintenance of echinococcosis is dependent on complex interactions of several factors, including environmental, host and pathogen factors. A number of such factors are of local epidemiological significance and the identification of such factors is important in the effective implementation of control strategies <sup>(10)</sup>.

The aim of this study was to determine the prevalence of the disease in humans and its clinical presentation. The study also is targeted to identify risk factors predisposing infections.

### MATERIAL AND METHOD

#### Samples collection:

**Hydatid fluid collection:** Samples were collected into capped plastic tubes during the period of April 2016 till the end of September 2016, from Interventional Radiology, Internal Medicine Surgery Departments in Kasr El Eieni Cairo University, Ain Shams University Hospital, Zagazig University Hospital, Benha University Hospital and from Theodore Bilharz Research Institute (TBRI) Hospital, Giza, Egypt.



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**Confirmation of hydatid cyst infection:** verification of infection in 31 CE cases was done through:

- a) Radiological assessment: by ultrasonography and/ or CT scan.
- b) Direct detection of hydatid cyst by one or both of the following:
  1. Hydatid fluid was aspirated by PAIR technique before injection of any scolical agent into the cyst under aseptic conditions. Centrifugation of hydatid fluid at 400Xg for 10 minute, the sediment was collected, film was made and examined under the low power magnification (10X) & high power magnification (40X) of the light microscope (Zeiss, Germany).
  2. Some cases were subjected directly to surgical removal of the cyst and were confirmed pathologically to be hydatid cyst.

**Data collection sheet:**

- **Cases were inquired about the following data:**
  - a. Name, sex, age, residence and occupation.
  - b. Clinical Presentation: whether the case was discovered accidentally or was presented by symptoms.
  - c. Personal hygiene data: washing hands before eating and well washing of vegetables & fruits.
  - d. Environmental data: contact with animals as dogs and cats.
- **Their clinical sheets were revised for the following:**
  - a. Other system affection.

- b. Cyst: site, size and type (unilocular or multilocular).

**Ethical issues:**

An approval of the study was obtained from Cairo University, Ain Shams University, Zagazig University and Benha University academic and ethical committee. An informed consent was taken from each individual participant or from parents of children. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

**Statistical Analysis**

The collected data were tabulated and statistically analyzed using Excel (Microsoft office 2010) on personal computer. The data are presented as mean ± standard deviation of mean ( $X \pm SD$ ). The comparison between different groups was done using Student's T test. The level of significance was adopted at  $P < 0.05$ .

**RESULTS**

Thirty-one cases of human confirmed hydatidosis. Age of the patients varied between less than 10 years to above 60 years. The highest percent of infection with hydatid cyst was in age group 21-30 years (29.04%). The least percent of infection is (3.22%) recorded for each of the age groups ≤ 10 and above 60 years. Regarding sex, females attained the higher percent of infection (58.06%) in comparison to males (41.94 %) (Table 1).

**Table (1): Distribution of patients with hydatidosis disease based on age and sex.**

Age group in years	Male		Female		Total number	Total Percent
	No	%	No	%		
≤10	1	3.22	0	0	1	3.22
11-20	1	3.22	1	3.22	2	6.45
21-30	3	9.68	6	19.36	9	29.04
31-40	4	12.90	4	12.90	8	25.81
41-50	3	9.68	5	16.13	8	25.81
51-60	1	3.22	1	3.22	2	6.45
> 60	0	0	1	3.22	1	3.22
<b>Total</b>	13	41.94	18	58.06	31	100

**Table (2): Distribution of patients according to their occupation.**

Occupation	Number	Percent (%)
Farmer	10	32.26
Housewife	9	29.03
Student	5	16.13
Employee	5	16.13
Unemployed	2	6.45
<b>Total</b>	31	100

The highest percent of CE was recorded for farmers (32.26 %) followed by housewives (29.03%) then student and employee (16.13 %) for each. The least percent (6.45%) was recorded for unemployed (Table 2).

History of direct contact with dogs and cats was positive in about half of cases.

**Table (3): The distribution of hydatid cyst in infected patients.**

Residence				Clinical symptoms				Total	
Rural		Urban		Present		Absent			
No	%	No	%	No	%	No	%	No	%
21	67.75	10	32.25	22	70.97	9	29.03	31	100

The higher percent of CE (67.75%) was for rural resident and (32.25%) was for urban resident (Table 3).

**Table (4): Distribution CE according to the affected organ and type of the cyst.**

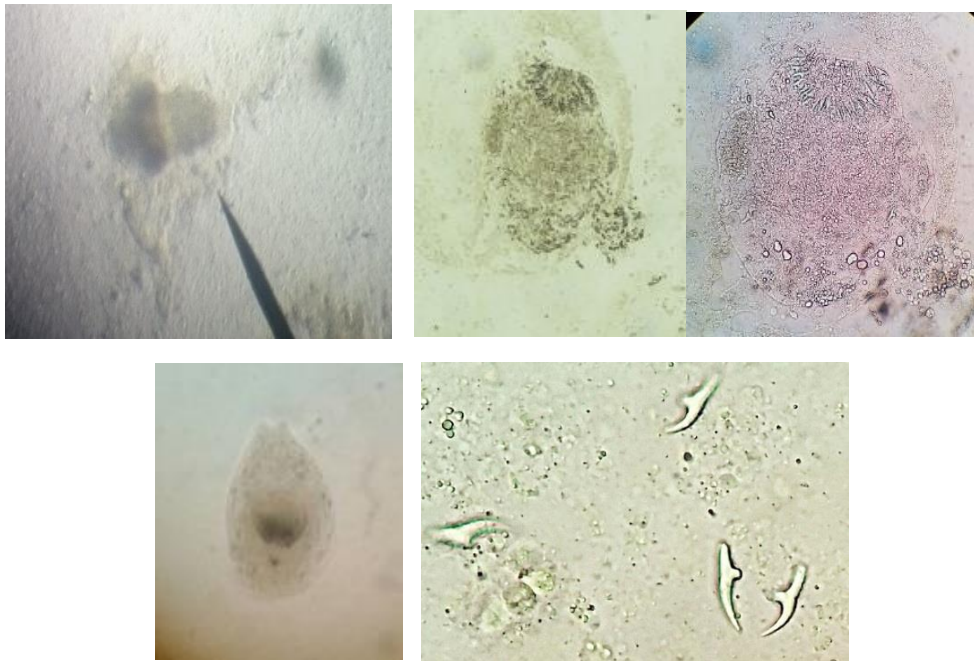
Site	Liver		Spleen		Lung		Total	
	No	%	No	%	No	%	No	%
	26	83.87	4	12.90	1	3.23	31	100
Type	Unilocular		Unilocular		Unilocular			
No	26		4		1			
%	83.87		12.90		3.23			

Liver is the organ with highest distribution (83.87 %) followed by spleen (12.90%) then lung (3.23%). All cases (100%) were presented by unilocular single hydatid cyst with single organ involvement. The size of hydatid cysts ranged between 5-17 cm in diameter (Table 4).

**Table (5): Frequent distribution of different symptoms among CE cases according to infected organ.**

Infected organ	Symptom	No
Liver	Right hypochondrial pain	12
	Abdominal colic	4
	Right shoulder & right arm pain	1
	Asymptomatic	9
Spleen	Left hypochondrial pain	2
	Epigastric pain.	1
	Abdominal colic	2
Lung	Cough, expectoration, wheeze, fever then haemoptysis after blunt trauma	1

- The most frequent symptom in liver infected cases was right hypochondrial pain in (46.15%) followed by abdominal colic in (15.38%) then pain in right shoulder and right arm in (3.85%), also (34.62%) cases were discovered accidentally during routine radiology.
- The spleen infected cases gave one or more of the following symptoms: left hypochondrial pain, abdominal colic and epigastric pain.
- The only case of CE in lung gave a history of no complaint until the patient was exposed to a blunt trauma. After that he began to complain from cough, expectoration, wheeze chest, fever then haemoptysis.
- One female case of hepatic hydatidosis, was complicated with intra operative anaphylaxis. She was admitted to intensive care unit and recovered later.
- Among 14 cases subjected to PAIR technique as a curative treatment, 3 cases returned with recurrence of hydatid cyst during the period of the study.



**Fig. (1):** Hydatid sand detected microscopically after PAIR technique; A and B: evaginated scolices, C: invaginated scolex, D: hydatid hooks (Rose thorn).

## DISCUSSION

Cystic echinococcosis is an important zoonotic disease frequently caused by the larval stage of the tapeworm *Echinococcus granulosus*<sup>(11)</sup>. It is a globally distributed disease which is an important socioeconomic and public health problem<sup>(12)</sup>.

The study analyzed demographic, environmental and clinical data of patients with hydatidosis and found that the highest infection rate was recorded for age group 21-30 years (29.04%) followed by age groups 31-40 years and 41 -50 years where both attended (25.81%). These results agreed with that of **Khader et al.**<sup>(13)</sup> who stated that the maximum number of cases of CE was seen in the 3rd decade. The results of the present study were nearly agreed with **Salama et al.**<sup>(8)</sup> who studied 45 cases of CE in the middle region of the Nile Delta, Egypt. The authors found that the maximum number of CE cases as seen in the fourth (46.7%) and fifth (26.7%) decades of life. **El-Ghareeb et al.**<sup>(14)</sup> showed that among 45 cases of CE the hepatic hydatidosis prevalence increased in the age group above 40 years. In Iran, **Asghari et al.**<sup>(15)</sup> reported the highest rate of infection to be in age group of 40–49 years old. There were some contrast results in other studies, which stated that; it may be anywhere between 2nd to 6th decades<sup>(16,17)</sup>. Determining age of the hydatid infection is the subject of controversy for many researchers. The problem is that the prepatent period is very long in this disease and most cases are diagnosed years after infection<sup>(18)</sup>. In another word this might be attributed to the chronicity and nonspecific (asymptomatic) presentation of the disease in majority of cases<sup>(13)</sup>. So it is impossible to detect the true age group in the context of infection with CE<sup>(15)</sup>.

In the present study the age range of patients with CE was between 10-62 years which is similar to **Gupta et al.**<sup>(19)</sup> and **Salama et al.**<sup>(8)</sup>.

Regarding sex; females attained the higher percent of infection (58.06 %) in comparison to males (41.94 %). A similar observation is recorded by<sup>(15, 18, 19)</sup>. Hydatidosis is established through ingestion of the parasite's egg via various vehicles such as soil, vegetables and contact with dogs. Women may have the higher chance of contact with these sources. In the middle of the Nile Delta, a considerable proportion of women are actively involved in livelihood activities of farming, routine labour, animal breeding and agriculture, compared to men, thus they are more exposed to infection. In contrast to the present study is<sup>(8, 13, 20)</sup> who found that CE was commoner in male gender. Various animal experiments were performed to relate the distribution of sex in hydatidosis. An interesting finding showed that male mice were more susceptible to contact the hydatid disease than the female. The basis propounded regarding this result was that, the female gonadotrophins (estrogens) have an inhibitory action on level of parasitization, while male hormone (testosterone) had a little of any such effect or else and might even increase the susceptibility of the host infection<sup>(21)</sup>. The percent distribution of CE based on occupation showed the highest percent for farmers (32.26 %) followed by housewives (29.03%), then student and employee (16.13%) for each. The least percent was recorded for unemployed (6.45%). Supporting the present finding is **Salama et al.**<sup>(8)</sup> who found farmers and house wives the most commonly affected occupational groups. In a similar researches done by **Al- Barwari et al.**<sup>(21)</sup> and **Akther et al.**<sup>(22)</sup> the

maximum infected cases were housewives. **Asghari et al.** <sup>(15)</sup> also noticed that farmers possessed the highest rates. More susceptibility of farmers and housewives to the disease could be explained by their more involvement in household activities related to animal breeding and agriculture in rural areas.

Concerning residence the present study showed the higher percent of CE to be for rural resident (67.75%) in comparison to urban resident (32.25%), in agree with **Salama et al.** <sup>(8)</sup>, **Ghaffar** <sup>(23)</sup> and **Mousavi et al.** <sup>(24)</sup>.

Since certain human activities, such as feeding dogs with the viscera of slaughtered livestock, increase the risk of infection <sup>(25)</sup>.

The study postulated that residence in rural areas could be regarded as a risk factor for CE where there are predisposing factors such as low to moderate socioeconomic standards, contact with the definitive host (the dogs) and less adequate hygiene <sup>(15)</sup>.

The anatomical location of hydatid cyst in the present study showed liver as the organ with highest percent distribution (83.87 %) followed by spleen (12.9%) then lung (3.23%). On reviewing the literatures nearly all authors agreed that the liver is the first station for CE. **Ahmadi and Hamidi** <sup>(26)</sup> found that liver involvement by hydatidosis was high (90.5%) of cases. This result is in agree with **Salama et al.** <sup>(8)</sup>, **Khader et al.** <sup>(13)</sup>, **El-Ghareeb et al.** <sup>(14)</sup>, **Aletras and Symbos** <sup>(27)</sup> and **Kandeel et al.** <sup>(28)</sup>.

Regarding size of the hydatid cyst in investigated cases, it ranged between 5-17 cm in diameter. According to **Salama et al.** <sup>(8)</sup> the sizes of the cysts are quite variable; (60%) of cases showed cysts more than or equals 5 cm and (40%) showed cysts less than 5 cm size. **Alghoury et al.** <sup>(29)</sup> reported that (94%) of cases showed cysts more than 5cms and only (6%) showed cysts less than 5cms. In contrast to study done by **Khader et al.** <sup>(13)</sup> the sizes of the cysts were quite variable where (83.89%) of the patients showed cysts < 5cm and (16.10%) showed cysts > 5cms size. This controversy might be attributed to the chronicity, long evolutionary history and the predominance of the incidental and asymptomatic presentation of CE.

In this study, no multiple organ involvement was encountered which was a similar finding in most of the research works done on hydatid cysts as **Akther et al.** <sup>(22)</sup>, **Alghoury et al.** <sup>(29)</sup> and **McManus et al.** <sup>(30)</sup>.

Clinical presentations of cases were varied and depended upon the site or visceral organ involved. The present study showed that (70.97%) of CE were symptomatic and (29.03%) were asymptomatic. All the asymptomatic cases were liver infected.

The most frequent symptom in liver infected cases was right hypochondrial pain (46.15%) followed by abdominal colic (15.38%) then pain in right shoulder and right arm (3.45%). The spleen infected cases gave one or more of the following symptoms; left hypochondrial pain, abdominal colic and epigastric pain. The only case of CE in lung gave a history of no

complaint until the patient was exposed to a blunt trauma. After that he began to complain from cough, expectoration, wheezy chest, fever then haemoptysis, that agree with **Salama et al.** <sup>(8)</sup>, **Khader et al.** <sup>(13)</sup>, **El-Ghareeb et al.** <sup>(14)</sup> and **Rukmangadha et al.** <sup>(31)</sup>.

In the present study, the asymptomatic presentation (29.03%) was discovered accidentally during routine radiology of cases. The present results agreed with **Pawlowski et al.** <sup>(32)</sup> 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. A nearby percent of asymptomatic presentation of CE (33.3%) is recorded by **Salama et al.** <sup>(8)</sup> and **Khader et al.** <sup>(13)</sup>.

From a clinical point of view, clinical manifestations of hydatidosis in humans are variable, most patients seem to tolerate the infection for extended periods without any symptoms, or they may suddenly show dramatic and acute symptoms <sup>(33)</sup>.

As regard complications in the present study, it was recorded in one hepatic case (3.2%). She was a female with hepatic CE who had anaphylaxis during surgery. She was admitted to intensive care unit. Later she recovered.

**Abdelraouf et al.** <sup>(34)</sup> recorded allergic manifestations as surgical complication in (16.7%). Also recurrence in the present study was recorded in (9.68%) of cases after PAIR technique during the practical period of the study. The result is in agree with **Gupta et al.** <sup>(19)</sup> who explained this recurrence by the failure of the technique because the cyst cavity did not resolve and the patients remained symptomatic.

This is study on human hydatidosis in Egypt could have a huge impact to define the strategies and monitoring activities for spread reduction of human CE and risk factors are found to be in association with the age, gender and occupation.

## CONCLUSION

Hydatid disease is still an endemic problem and is a course of challenge to all the medical practitioners. It is waging a war, with its roots spread deeply in society. Cystic echinococcosis is more prevalent on the third, the fourth and the fifth decades of life and is reduced in the first decade and above sixty years. The highest percent of CE is recorded for farmers followed by housewives.

Rural resident have the higher rate of CE in comparison to urban resident. Liver is the organ with highest percent distribution of CE followed by spleen then lung. Asymptomatic presentation of CE is always more than expected. Cystic echinococcosis is like the summit of the iceberg that only appears while the rest of the mountain is hidden under water.

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