

## Application of Ultrasound Classification of Hepatic Hydatid Cyst in Iraqi Population

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### ABSTRACT

**Background:** Cystic Echinococcosis (CE) is an endemic disease in Iraq. Its classification is crucial for proper management.

**Objectives:** To apply ultrasound study in classifying hepatic hydatid cyst disease in the Iraqi population, which is essential in treatment planning.

**Materials and methods:** This prospective study conducted during a period from March 2017 to March 2018, in the Gastroenterology and Hepatology Teaching Hospital/ Medical City/ Baghdad. A total of 100 patients with a diagnosis of hydatid cyst by ultrasound were followed-up after surgery and histopathology were proved hydatid cyst. Their age range was 10-79 years (mean age  $32 \pm 12.5$ ), female to male ratio 1.6:1. The standardized WHO classification of CE was used in this study.

**Results:** CE class I was noticing in (35%), class II (35%), class III (17%), class IV (7%), and class V (6%).

**Conclusion:** WHO ultrasound classification of hepatic hydatid cyst becomes more popular and preferable than other classifications. CE class I and II were the most common classes in the Iraqi population. We strongly advise to use this classification in clinical practice and scientific researches.

**Keywords:** WHO, Ultrasound, Classification, Hydatid cyst, Liver.

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### INTRODUCTION

**H**ydatic disease (HD) is a parasitic infestation caused by a tapeworm. It is characterized by the formation of cysts in the liver, lungs, and other parts of the body. The most commonly affected organ is the liver. HD is one of the diseases causing a great impact on public health. Acquisition of infection is usually during childhood, but the incubation period of the disease may continue for years [1].

HD is an endemic zoonotic disease in certain geographical locations in Russia, South America, Eastern Europe, the Middle East (including Iraq), and China. The incidence of human being affection in these regions was more than 50/100,000 individuals per year. While, in other geographical parts like Slaughterhouses in South America, prevalence varies from 20% to as high as 95% [2].

Hepatic HD is usually asymptomatic and discovered only as an incidental finding on routine investigations of the abdomen including ultrasound for various abdominal complaints. Pain in the epigastric or right upper quadrant regions is the most common symptoms. While hepatomegaly and intra-abdominal mass are the most common abnormalities on physical examination of the abdomen [3].

There are various radiological modalities for diagnosing HD, including ultrasound, plain X-Ray, CT scan, and MRI. Ultrasound becomes more popular and the standard technique for HD detection owing to a high accuracy rate reaching 90%, which depends on the operator experience and method used [4]. Also, it is the technique of choice in screening because of its availability even in discrete primary health centers, cost-effectiveness, and the portability of the instrument. Moreover, ultrasound is not only used for the diagnosis but, it is also helpful in postoperative follow-up.

There are different classifications of HD imaged by ultrasound were introduced,

1. Gharbi classifications proposed by Gharbi et al, 1981 [5].

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2. Lewall and McCorkellin 1985 [6].
3. TNRC (topography, nature, recurrent, complication) classification [7].
4. The WHO-IWGE (Informal Working Group on Echinococcosis) in 2003, adopted a universal classification of various classes of hepatic hydatid cysts [8].

Prior studies from various parts of the world, in the period from 2004–2017, used the standardized classification of CE adopted by WHO in 2003, as a reference. The highest studies used WHO classification of CE was from South America 9 of 9 (100%), while the least one from Africa 3 of 17 (18%). Other studies from Asia 32 of 50 (64%), Europe 89 of 113 (79%), North America 8 of 9 (89%) used the classification in a range between them. This means that the WHO classification was preferred than other classifications. However, the rate of its adoption depends on the site of the scientific study [9]. To our best knowledge, this was the first study in Iraq used this classification for diagnosing CE by using ultrasound.

We aimed to apply of WHO CE classification in ultrasound examination reports in patients with hepatic hydatid cysts in the Iraqi population.

## MATERIALS AND METHODS

This is a prospective study conducted through the period from March 2017 to March 2018. A total of 100 patients were included in this study, 62 females and 38 males. They were referred to the ultrasound unit at the Gastroenterology and Hepatology Teaching Hospital, Medical City, Baghdad. They were complained from abdominal pain or nonspecific clinical features like jaundice, anorexia, purities and palpable mass or for ultrasound checking of other complaints. All of them had been operated upon and the histopathology findings consistent with hydatid disease. Detailed demographic characteristics from every subject, including age, gender, occupation, and residence were registered.

The abdominal ultrasonic examination was performed by a qualified specialist radiologist, using real-time B-mode sonography (Philips-HD11XE) with curved transducer (3.5MHZ). Ultrasonic criteria of the hepatic hydatid cyst were carefully noted, including size, site, wall (thickness, double-line, calcification) and contents (clear, solid, septation, daughter cyst, water-lily, calcification). In addition to post-operative follow-up. The examination was done in supine and left-lateral position.

Patients with more than one surgery and those with recurrent liver hydatid disease were excluded from the study. WHO-IWGE or (CE) classification was used in this study Table 1 [8]. Informed consent was taken from every subject. And the study was approved by College of Medicine, Baghdad University.

Figures 1-3 showed ultrasound images in some of our patients. The data were analyzed using Microsoft Excel 2010 and presented in tables as numbers and frequencies of the variables.

## RESULTS

The total number of our patients was 100. The ages of the patients were ranging from 10 to 79 years (mean age  $32 \pm 12.5$ ). It was found that more than half of the patients (55%) were within (20-39) age range. Regarding gender, 62 females (62%) and 38 males (38%), female to male ratio was 1.6:1. The largest group of patients was housewives (49%). Sixty-five of our patients from rural area Table 2.

**Table 1.** WHO-IWGE (CE) ultrasound classification.

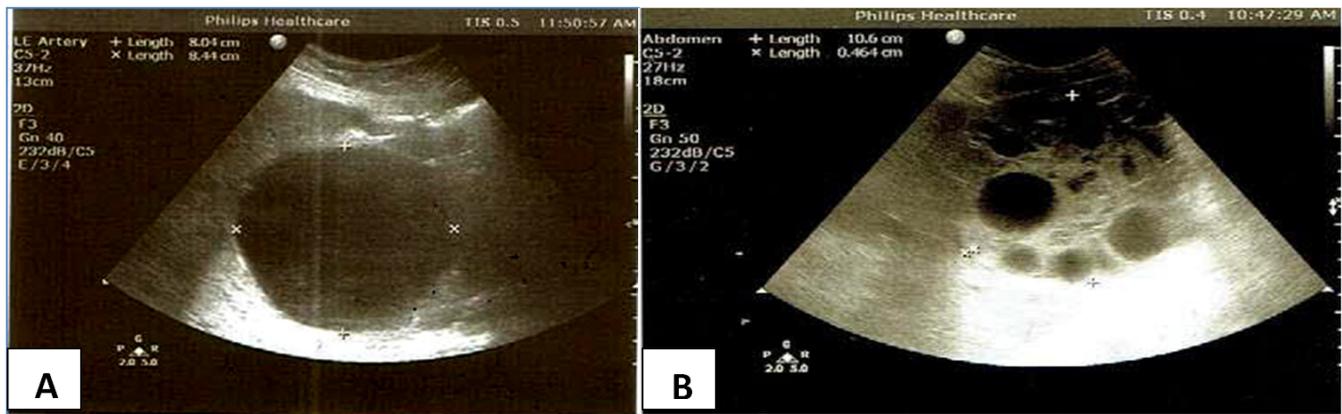
WHO-IWGE (CE classification)	Ultrasound appearance	Activity
CE1	Uni-vesicular fluid collection	Active
CE2	Multi-vesicular cyst with multiple daughter cysts or septa (honeycomb)	Active
CE3A	Water lily sign	Transitional
CE3B	Solid matrix and daughter cysts	Transitional
CE4	Cysts containing solid matrix, without daughter cysts	Degenerative
CE5	Solid cystic wall obscuring its content	Degenerative

**Table 2.** Demographic characteristics of the 100 studied patients.

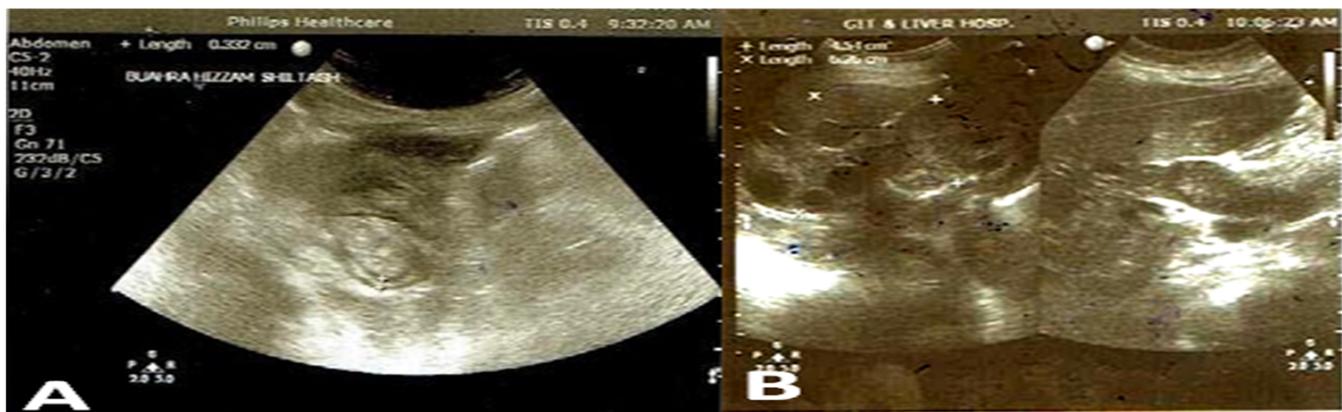
Variable	Number	Percentage%
Age group		
10–19	14	14
20–29	32	32
30–39	23	23
40–49	13	13
50–59	11	11
60–69	6	6
70–79	1	1
Gender		
Male	38	38
Female	62	62
Occupation		
Housewife	49	49
Students	17	17
Self-employed	17	17
Non-skilled workers	15	15
Farmer	1	1
Retired	1	1
Residence		
Rural	65	65
Urban	35	35

Abdominal pain (67%) was the commonest symptom, asymptomatic (21%) was the second, the rest (12%) were non-specific symptoms Table 3.

The ultrasound findings of the identified cysts were demonstrated in Table 4, (75%) of cysts involved right hepatic lobe, (17%) involved left hepatic lobe, while bi-lobar distribution was found in (8%). The cyst diameter range was (3.5-14 cm), unilocular were (53%) and the rest (47%) were multilocular. Fourteen percent of them were septated. Sixty-five with clear fluid, the rest (35%) with non-clear content, (25%) with daughter cysts, (13%) of the patients showing water-lily sign. Regarding cyst wall; (98%) of them showed a thin wall (i.e.  $\leq 3$ mm) and two showed wall thickness ( $> 3$ mm). Forty of them showed a double-line sign. Seventeen of hydatid cysts showing peripheral thin (or incomplete) calcification (does not affect visualization of cyst content), (6%) of patients showing heavy calcification (affects the visualization of cyst content).



**Figure 1.** Liver ultrasound transverse scan showing A: unilocular type 1 HD CE1 with an echoic clear fluid content and smooth regular wall (active). B: multiple daughter cysts, plus multivesicular fluid CE2 (active).



**Figure 2.** Liver ultrasound transverse scan showing A: Water lily sign CE3A (transitional). B: heterogeneous matrix and daughter cysts CE3B (transitional).



**Figure 3.** Liver ultrasound transverse scan showing A: cysts containing solid matrix without daughter cysts CE4 (degenerative). B: solid calcified cystic wall, CE5 (degenerative).

Regarding hepatic cyst classification was demonstrated in Table 5, we found that (35%) of patients having CE1, (35%) CE2, (i.e. patients with active disease were 70%), (17%) CE3 (i.e. transitional disease), (7%) CE4, and (6%) CE5, therefore, inactive disease represented 13% of patients.

**DISCUSSION**

Hepatic HD is an endemic zoonotic disease in Iraq. It causes a major public health problem. Therefore, early diagnosis and in time appropriate treatment is of utmost importance in preventing unwanted sinister complications, in-

**Table 3.** Clinical presentation of HD.

Clinical presentation	Number	Percentage%
Abdominal pain	67	67
Asymptomatic	21	21
Jaundice	4	4
Abdominal discomfort	3	3
Anorexia	2	2
Pruritis	2	2
Palpable mass	1	1

**Table 4.** Ultrasound findings of HD.

Ultrasound findings	Number	Percentage%
Unilocular	53	53
Multilocular	47	47
Thin wall ( $\leq 3\text{mm}$ )	98	98
Thick wall ( $>3\text{mm}$ )	2	2
Right lobe	75	75
Left lobe	17	17
Bi-lobar	8	8
Clear fluid	65	65
Non-clear fluid	35	35
Double-line sign	40	40
Daughter cysts	25	25
Septations	14	14
Water lily	13	13
Peripheral calcification	17	17
Heavy calcification	6	6
Size $\geq 5\text{cm}$	94	94
Size $<5\text{cm}$	6	6

**Table 5.** Classification of the 100 cases with HD according to WHO-IWGE (CE) ultrasound classification.

WHO class	Number	Percentage%
CE1	35	35
CE2	35	35
CE3A	13	13
CE3B	4	4
CE4	7	7
CE5	6	6
Total	100	100

cluding pressure on adjacent local structures, infection, and anaphylaxis due to rupture of the hydatid cyst. Ultrasound has many advantages over the other radiological modalities (CT scan, plain radiograph, and MRI) used for the diagnosis of HD of the liver. The ultrasound is cheap, available, free of radiation, quick, non-invasive, and high accuracy diagnostic rate. Previous researchers adopted many ultrasound classifications for this disease [5–7]. However, WHO-IWGE (CE) ultrasound classification is the most popular with an increment in its usage among the researchers from various geographical parts of the world since the time of its adoption in 2003 [8, 9]. We used this classification in our study to determine its various classes in the Iraqi population.

In the current study, 62% of our patients were females. This is similar to other studies in Iraq and Iran, this may be related to females handling with vegetable more than males [10–13].

While in Egypt male were more than female because a considerable proportion of men in Egypt were actively involved in livelihood activities of farming compared to women, and thus more prone and exposed to infectious diseases [14, 15].

Regarding age distribution, we found that more than half of our patients were in the third and fourth decades. This finding is different from other studies; like Egyptian and Iranian studies, were the first study mentioned (73.4%) of patients were in the fourth and fifth decade [16]. While the second study mentioned (60%) of patients were in the fourth and fifth decades [17]. This difference most likely related to the symptomatology of the disease and chronicity, while older patients have been usually asymptomatic.

Concerning patient's occupation; we found that the maximum number of female cases was housewives (49%). These finding agreed with Khader Faheem *et al.* who stated that housewives were the most affected occupational groups. Housewives were more prone to disease since they were more involved in household activities [18].

HD may be asymptomatic or cause symptoms due to compression of the local structures, and infection or rupture of the cyst. In the present study, the commonest clinical presentation of hepatic HD was abdominal pain. This result was similar to the prior study by Khadar Faheem *et al* [18]. Our study found that the right hepatic lobe was affected more than the left. This result consistent with the prior study by Manterola [19].

In the current study, unilocular cyst (smooth uniform wall type I) was identified in more than half of our patients. This coincides with Kalinova [20] study who stated that unilocular cyst was detected in (51%) of patients.

In our study, we found that the most common CE classes were CE1 (35%), CE2 (35%) (i.e. active disease), which is not consistent with other studies, like Mirzanejad-Asl H *et al.* (Iran), the percentages were CE1 (52.2%), CE2 (8.1%) [17], Salama AA *et al.* (Egypt) the percentages were CE1(42.2%), CE2 (20%) [21], and Giorgio A *et al* study were the percentages were CE1 (45.7%), CE2 (10%) [22]. These differences most likely explained by the geographic distribution of the disease (Iraq, Iran, Egypt, and Italia respectively), clinical presentation and the availability of ultrasound examination. The study also found that CE2 class is significantly more than mentioned in other above studies, this could be explained by the fact that other countries had started earlier interventional procedures (percutaneous aspiration) during CE1 stage, so patients with CE2 will be less than Iraqi percentage.

In the current study we found that class CE3 (i.e. transitional disease) was (17%), approximating the finding of Salama AA *et al* (Egypt) CE3 class (22.2%) [21], while different from Mirzanejad-Asl H *et al* (Iran) was (7.2%) [17] and Giorgio A *et al* (Italy) was CE3 (5.4%) [22], this difference may be due to the presentation of the HD and type of surgical treatment.

Regarding CE4 and CE5 (i.e. inactive disease), almost the same patterns of CE3 were noted; our study (13%), Salama AA *et al* (Egypt) was (17%) [21], while Mirzanjad-Asl H *et al* (Iran) (23.4%) [17] and Giorgio A *et al* (Italy) (38.68%) [22] which could be explained by same above mentioned causes.

The limitations of the present study were small sample size, and the study does not judge the usefulness of the WHO-IWGE (CE) ultrasound classification concerning the various modalities of treatment of the HD. Nevertheless, the results of the study form basic data on the usage of this classification for future studies in Iraq.

## CONCLUSION

CE class I and CE class II (active disease) were the most common classes in the Iraqi population. Ultrasound plays a pivotal role in diagnosis and classifying hydatid cyst as it is fast, available, noninvasive, cost-effective and has a high diagnostic accuracy useful for identifying the site, number and internal structure of cysts. The WHO-IWGE or (CE) classification of hepatic hydatid disease considers all morphological features that predict the activity of the disease, thus the suitable therapy can be arranged. We highly recommended using the WHO-IWGE or CE classification in ultrasound reports of hepatic HD.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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