

Gray scale Trans-Abdomino-Thoracic Ultrasonography in Evaluation of Dengue Hemorrhagic Fever

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Abstract

Objective: To evaluate ultrasound findings in Dengue Haemorrhagic Fever (DHF) and further to predict severity of DHF. **Study design:** Cross sectional study. **Settings:** Allied Hospital Faisalabad. **Duration of study:** 1st July 2011 to 30th November 2011. **Sample size:** 50 Patient. **Material and Methods:** Ultrasound was performed on 50 patients of ages between 6-59 years with clinical suspicion of DHF. Serological tests IgM and IgG on ELIZA were performed to confirm the diagnosis, ultrasound was done on 2nd to 08th day all confirmed serologically 50 positive of DHF. These 50 patient divided into two groups as DHF (Group-I) mild type 45 patients and severe type of DHF (Group-II) 05 Patient. **Result:** Group-I patients ultrasound revealed gall bladder wall thickening 86.6%, Pericholecystic fluid 44.4%, hepatomegaly 26.6%,

17.7%, right pleural effusion 8.8%, left pleural effusion nil and pancreatic enlargement 6.6%. In Group-II ultrasonography revealed gall bladder wall thickening 100%, Pericholecystic fluid 60.0%, hepatomegaly 60.0%, splenomegaly 40.0%, ascites 60.0%, right pleural effusion 60.0%, left pleural effusion 20.0%, pericardial effusion 20.0%, pancreatic enlargement 40.0% and 60.0% patient with fulminant hepatic failure. **Conclusion:** Trans-abdomino-thoracic sonography can be used as adjunct modality in patients with suspected DHF to detect early signs suggestive of the disease prior to obtaining serologic confirmation test results, especially in a dengue fever epidemic area and also useful tool to predict severity of the disease. **Key Words:** Dengue fever (DF), Dengue hemorrhagic fever (DHF), Serology, Epidemic, Ultrasonography.

INTRODUCTION

Dengue fever is a mosquito-borne infection. Approximately 2.5 to 3 billion people worldwide live in areas at risk for transmission of the mosquito-borne dengue flavivirus having four different serotypes, and an estimated 100 million people worldwide are infected each year.¹ In 1998, it was the most important tropical mosquito-transmitted infectious disease, surpassed only by malaria.² Dengue fever (DF) has been known for more than a century in the tropical areas of South East Asia and the Western Pacific regions. Clinically DHF manifests with acute onset of fever, severe headache, retro-ocular pain and pain involving the muscles, bones and joints. Haemorrhagic diathesis and thrombocytopenia with concurrent haemoconcentration is a constant finding. The clinical diagnosis of DHF is based on four major characteristic manifestations: (i) sustained high fever lasting 2–7 days; (ii) hemorrhagic tendency such as a positive tourniquet test, petechiae or epistaxis; (iii)

thrombocytopenia (platelet count $\leq 100 \times 10^9/L$); and (iv) evidence of plasma leakage manifested by hemoconcentration (an increase in hematocrit $\geq 20\%$ above average for age, sex and population), pleural effusion and ascites.⁴ In July 2011, there was an outbreak of dengue in province of Punjab, Pakistan resulted in many casualties. As literature shows there is no single test that can be used to diagnose the condition with a reasonable degree of accuracy and reliability, the diagnosis is based on clinical appearance in combination with serology. Serology takes approximately 7 to 10 days to give a positive result. Ultrasound is reported as a useful diagnostic modality in evaluating DHF patient¹¹. Ultrasound can detect small amount of fluid from body cavities and visceral changes in patients suspected to have DHF. Ultrasonography (USG) is a cheap, rapid and widely available non-invasive imaging method.^{5,6} Sonographic findings of dengue fever have been

described in several previous literatures. Some authors concluded that during an epidemic the ultrasound findings of gall bladder wall thickening with or without polyserositis in a febrile patient should suggest the possibility of DF^{7,8} The reported changes vary according to the severity of each case. Certain dengue virus strains produce severe disease by immune enhancement. Also the proportion of patients who have severe disease depends on the immune status of the individual, the age of the patient and the genetic background of the human host. Thus DHF epidemics vary in severity with some epidemics having a high mortality rate.^{9,10}

The purpose of our study was to evaluate the ultrasound features in patients with DHF, to find out whether ultrasound is an adjunct to clinical and lab profile in the diagnosis of DHF and to further determine whether ultrasound is useful in predicting the severity of the disease.¹¹

MATERIALS AND METHODS

This cross sectional study was carried out in the department of Radiology and Medical Imaging of Allied Hospital Faisalabad, Pakistan, during the period of 1st July 2011 to 30th November 2011, after consenting patients suspected to have dengue fever who were referred from the indoor and outpatient departments. Relevant clinical information was collected systematically. All patients had sonography by radiologist using (Siemen sonoline adara-12H 6J3M), multi frequency 3.0-5.0 MHz probes. All patients underwent serological, hematological and proper clinical examination for dengue virus by a pathologist and physician for final diagnosis.

INCLUSION CRITERIA

- Serological +ve (IgM and IgG) DHF patients of all ages and gender.
- Patients of DHF of all Grades.

EXCLUSION CRITERIA

- DHF Patients without serological test.
- Sero-negative patients of DHF.

After explaining all the necessary information regarding the research study data was collected in predesigned structured data collection sheets and tabulated accordingly.

There are four grades of illness of DHF by WHO⁷ this classification based on severity of the disease:

Grade-I: Fever with nonspecific constitutional symptoms, positive tourniquet test or scattered petechiae.

Grade-II: Same as Grade I, but with spontaneous hemorrhagic manifestation.

Grade-III: Circulatory failure manifested by rapid, week pulse, narrowing of pulse < 20 mm Hg), or hypotension.

Grade-IV: Profound shock with undetectable pulse and blood pressure. We called mild DHF (Grade I & II) and severe DHF (Grade III & IV)¹² All patients were divided in to two groups.

GROUP-I (MILD DHF)

It include symptoms of grade-I and grade-II From 50 confirmed DHF patients who underwent ultrasound on 2nd to 8th day after onset of fever.

Out of 45 patients 43 patients were from Grade-I and 02 patients from Grade-II underwent ultrasound.

GROUP-II (SEVERE DHF)

In include symptoms of grade-III and grade-IV Out of 05 patients with Grade-III 2 patients and Grade-IV 3 patients underwent ultrasound.

RESULTS

Ultrasound findings in Group-I (Mild DHF)

Group-I: 45 patients ultrasound revealed gall bladder wall thickening 86.6%, Pericholecystic fluid 44.4%, hepatomegaly 26.6%, splenomegaly 22.2%, ascites 17.7%, right pleural effusion 8.8%, pancreatic enlargement 6.6% and left pleural effusion nil.

ULTRASOUND FINDINGS IN GROUP-II (SEVERE DHF)

In Group-II 05 patients ultrasonography revealed gall bladder wall thickening 100%, Pericholecystic fluid 60.0%, hepatomegaly 60.0%, splenomegaly 40.0%, ascites 60.0%, right pleural effusion 60.0%, left pleural effusion 20.0%, pericardial effusion 20.0%, pancreatic enlargement 40.0% and 60.0% patient with fulminant hepatic failure. Two patients from Group-II died due to hepatorenal shutdown.

Table 1 and 2 show group classification and ultrasonographic findings respectively.

Table-1
Profile of 50 serologically positive cases

Type of Group	Number of Cases/ Percentage (n=50)
Group-I mild DHF <ul style="list-style-type: none"> • Grade-I. • Grade-II 	43 (86%)
Group-II severe DHF <ul style="list-style-type: none"> • Grade-III. • Grade-IV 	02 (4%)
	03 (6%)

Table-2
Summary of ultrasound findings

List of Complication	Graoup-I n = 45	Graoup-II n = 05
Gall bladder wall thickness	39(86.6%)	05(100%)
Pericholecystic fluid	20(44.4%)	03(60%)
Hepatomegaly	12(26.6%)	03(60%)
Splenomegaly	10(22.2%)	02(40%)
Right pleural effusion	4(8.8%)	03(60%)
Left pleural effusion	Nil	01(20%)
Ascities	08(17.7%)	03(60%)
Pericardial effusion	02(4.4%)	01(20%)
Fulminant hepatic failure	Nil	3(60%)
Pancreatic enlargement	3(6.6%)	2(40%)

Most of patients included in the study were male, out of total 50 confirmed DHF patients 33 were male (66%) and while 17 were female (34%). age ranges from 6-59 years. Mean age among male 23 years while mean age among female is 18 years. The graphical presentation of age distribution Fig-1 clinical picture of DF Fig-2, laboratory investigation table 3 and ultrasound picture of gall bladder wall thickening Fig-III are given below.

Figure-1
Showing age distribution ranges from 6-59 years

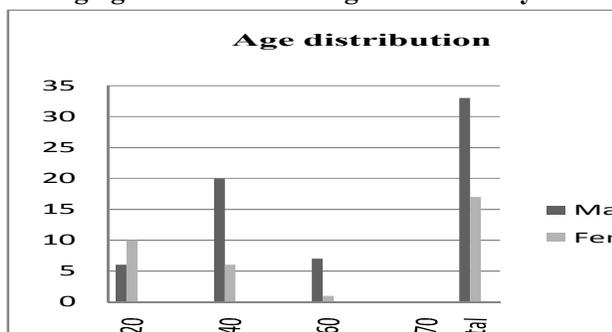


Figure-2
Showing clinical pictures of dengue fever

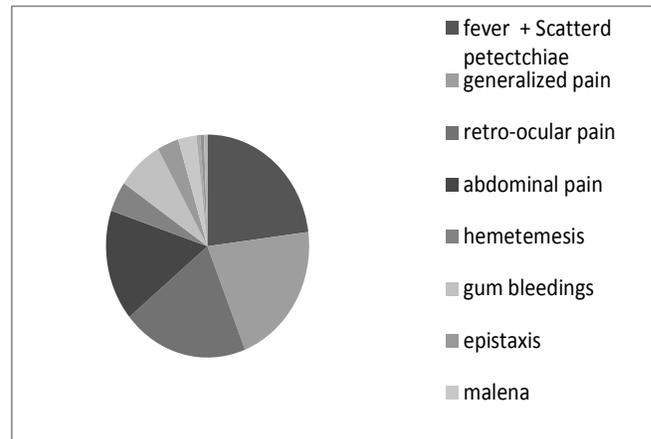
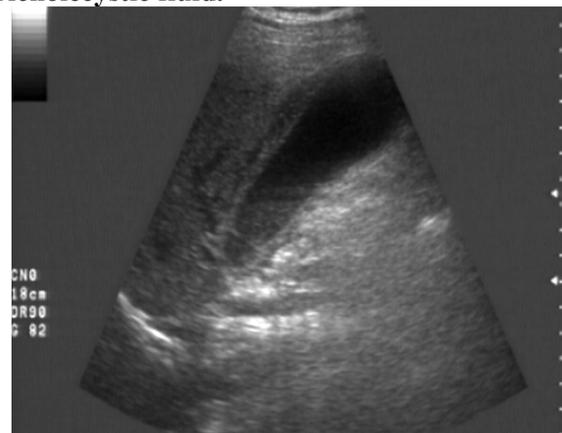


Table-3
Laboratory investigation (n= 50)

Investigation findings	No	Percentage
Disturbed LFT,s	4	8.0%
Thrombocytopenia	50	100%
Haemo-concentration	5	10%
IgM	50	100%
IgG	07	14%
Decreased TLC	17	34%

showed that all patients were positive for IgM, while 100% had decreased platelets count where as 34% showed decreased TLC.

Figure-3
Ultrasound liver through right hypochondrium shows thick wall gall bladder with minimal pericholecystic fluid.



DISCUSSION

Dengue viruses are transmitted to humans through the bites of infective female *Aedes* mosquito. The incubation period of the disease is 3–14 days. It is an acute febrile viral disease caused by flavi-virus having four different serotypes. It occurs in two forms: DF, a milder form of the disease and DHF, the most severe form.¹³ The increase of DF is due to uncontrolled population growth and urbanization in the absence of appropriate water management, global spread of dengue strains via travel and trade and due to inadequate of vector control programmes. In Pakistan since 2007, more than 3 outbreaks have been reported and recent one of last year more severe than previous one. The pathophysiology of DHF related with an increased vascular permeability, leading to loss of plasma and albumin from the intra vascular compartments. Serology is the mainstay in the diagnosis of DF, positive serology (anti dengue antibody) is the mainstay in the diagnosis of DF. Haemagglutination inhibition antibodies usually appear at detectable level by day 5 to 6 of febrile illness. The diagnosis of DF is often delayed owing to time taken for availability of results.^{12, 13, 14} Ultrasound is reported as a useful diagnostic modality in evaluating DF & DHF patient⁶. This study included 50 confirmed DHF patients, age ranged from 6-59 years, 33 were male (66%) and 17 (34%) female, as male are more exposed to external environment in our culture, our study is consistent with Sui PMV.³ There is a positive correlation between the amount of pleural effusion, ascities and gall bladder wall thickening and severity of the disease.¹¹ There are 8.8% patient of pleural effusion of mild type and 60% of severe cases. The pleural effusion right sided or bilateral only patients with left sided pleural effusion were not observed. Clinically ascities can be detect if its volume is above 1000 ml but ultrasound can detect as little as 100 ml ascitic fluid. Ultrasound can also detect pleural fluid in small volume as 100 ml before it clinically evaluated. In our study ascities was present in 17.7% in mild cases and 60 % in severe case. Our findings are consistent with. Bhamarapravati et al^{16, 15} A thickened gall bladder wall more than 3.0 mm is not diagnostic for primary gall bladder disease on a DHF patient as it is seen also in non billiary disorders, since they are noted in DHF, they can be used as supportive evidence to the presence of DHF in epidemic area.¹⁴ We have found gall bladder wall thickening 86.6 % in

mild & 100 % in severe case of DHF. We recommend the gall bladder wall thickness more than 5 mm with Morphy sign –ve should be used as supportive diagnosis of DHF in endemic area. Hepatomegally was 26.6% in mild type and 60% in severe type where as mild splenomegally is 22.2% in mild and 40% in severe cases of DHF.¹⁷ Bhamarapravati et al¹⁶ found enlarged liver and spleen on autopsy 58% and 16% respectively is consistent with our study.¹⁶ A significant difference is found between 6.6% mild and 40 % severe cases of pancreatic enlargement which is explainable due to generalized edema and ascities causing soft tissue thickening. Fluid collection around the kidneys only seen in severe cases and no case documented in mild DHF with these changes.^{16, 18} This study has few limitations regarding the detection and quantification of dengue virus in plasma. It was not done as these tests were expensive and was not performed in our Hospital, secondly the study was done on small number of patients.

CONCLUSION

The study concludes that abdominal and thoracic sonography can be used as a first-line imaging modality in patients with suspected DHF to detect early signs suggestive of the disease prior to obtaining serologic confirmation test results especially in a dengue fever epidemic area and is useful for early prediction of the severity of the disease.

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