ORIGINAL ARTICLE

ROLE OF ULTRASONOGRAPHY OF ABDOMEN AND CHEST IN EARLY DIAGNOSIS OF SEVERE DENGUE FEVER

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ABSTRACT

Objective: To assess the use of ultrasonography in quick diagnosis of severe dengue fever and to look at co-relation between ultrasound findings in abdomen/chest and the severity of dengue fever.

Design: Prospective study.

Place and Duration of Study: Fauji Foundation Hospital Rawalpindi for a duration of 4 months.

Materials and Methods: All referred patients with suspicion of dengue fever on basis of clinical presentation and laboratory investigations from age of 20 to 50 years were investigated by ultrasound abdomen & thorax within 1st one week of start of fever. Dengue fever presentation was classified on basis of WHO classification presented in 2011.

Results: In our study 80 cases were investigated and we found that Dengue Fever was more common in male population with male to female ratio of 3:1. On basis of revised classification of WHO in 2011 about Dengue Fever, we found 33 cases (41%) had non-severe dengue without any warning sign, 17 cases (21%) were having non-severe dengue fever with obvious warning signs & 30 cases (38%) had severe form of dengue fever. In our study all of the 80 cases had ultrasound abdomen and chest with in first week of start of symptoms. Most common findings on ultrasound were thickening of gall bladder wall which was found in 66 cases (82%), hepatomegaly in 49 cases (61%), ascites was there in 35 cases (44%), pleural fluid in 37 cases (46%), peri-cholecystic edema in 15 cases (19%) & splenomegaly in 11 cases (14%). Finding of pleural effusion & ascites in patients with dengue co-related directly with severity of illness and an early sign of disease progression.

Conclusion: Majority of the flood survivors reported poor health conditions with unavailability of timely treatment. Moreover, access to food, shelter, water and sanitation services was limited which highlights the ineffective flood relief services.

Key words: *Dengue Fever, Ultrasound abdomen and chest, Gall bladder wall thickening, Ascites, Pleural Effusion*

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INTRODUCTION

Viral infections especially dengue fever is now one of very common viral infection all over the world caused by Flaviviridae family[1]. This acute viral disease is carried by mosquito and the cause is one out of four serotypes of virus genus Flavivirus[2]. Dengue Fever is found to be endemic for more than 100 years in tropics of South-East Asia and the western Pacific regions[3]. For last 30 years the cases of this infectious disease has shown a significant increase in endemic areas and is a major international public health problem with affecting a large number of populations[4]. Dengue Virus is basically RNA virus belonging to Flaviviridae family of and its transmission is by mosquito called Aedes Aegypti. So far four serotypes of this virus have been identified which are named as DENV-1, 2, 3 and 4[5]. Any of these four types can cause all types of symptoms and signs of this illness. Patients caught by one of the strain usually produces immunity for almost whole life to that specific strain but there is very short lived immunity for other 3 serotypes. There are three phases of this febrile disease: a phase of high grade fever, hypotension or shock and recovery phase[6] . During the first phase when there is swinging fever characterized as bi-phasic or 'Saddle back' that lasts for 3–6 days accompanied by Eye congestion and pain, facial flushing, skin rash, severe bodyaches, myalgia, arthralgia, severe headache and GI symptoms in the form of anorexia, nausea and vomiting etc. This is followed by a critical phase characterized by increased capillary permeability and presents as severe abdominal pain, tenderness, intractable vomiting, extreme lethargy and restlessness[7]. Liver is usually palpable less than 2 cm below costal margin. Investigations

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usually reveal an increased hematocrit along with rapid fall in platelet count. This is followed by recovery phase lasting for 2-3 days in which there is a gradual reabsorption of fluid from extravascular compartment. Diagnosis of dengue fever is mainly done with anti-dengue antibody which usually becomes positive around day 7 of start of symptoms and for this reason diagnosis is often delayed[8] . Ultrasound abdomen is widely available, non-invasive and relatively cheaper imaging modality available all over the world for early diagnosis of dengue fever in comparison with other modes of diagnosis[9] . Ultrasound should be utilized as first line diagnostic technique in any patient with suspicion of Dengue Fever even before results of serological tests are available especially in dengue hemorrhagic fever. Several studies are available in international literature that during any epidemic of dengue, ultrasonographic finding of increased thickness gall bladder wall which may or may not accompanied by poly-serositis in patients with high grade fever suggests the possibility of dengue hemorrhagic fever[10] . We conducted this study which also showed that ultrasound abdomen is very useful for early prediction of the severe form of dengue hemorrhagic fever.

CAPSULE SUMMARY

- Ultrasonographic evidence of Pleural effusion, Gall bladder wall thickening, mild to moderate ascites and Spleenomegaly are useful indicators of assessing of severe dengue fever.

MATERIALS AND METHODS

We conducted this prospective study in Fauji Foundation Hospital for a period of 4 months from August to November 2022. All patients between the age of 20 to 50 years admitted in medical ward with history of fever and suspected case of dengue fever on basis of presenting complaints and laboratory were considered for inclusion in study on basis of convenient sampling. Patients below and above this age range were excluded from study due to multiple other reasons of fever and co-morbid diseases. Initially data of 85 cases was taken for the study out of which 5 patients lost follow due to some reasons. Suspected patients were being investigated with blood complete picture, LFTs, chest X-Ray and renal function tests. All patients investigated for study were confirmed for Dengue with Dengue NS1 antigen and IgG, IgM antibodies. Moreover another confirmatory test named Hess capillary resistance test or Tourniquet test was performed around the upper arm by placing the sphygmomanometer cuff and inflating the pressure halfway from diastolic to systolic blood pressure for about 5 minutes. If there is appearance of more than 20 petechiae over an area of 1 square inch over the flexor area of forearm, the test was considered positive. This technique is considered is a very cheap and rapid screening test in patients with suspicion of Dengue fever.

All patients included in study had ultrasonography of abdomen & thorax done by consultant radiologist within 5 days of start of signs and symptoms leading to diagnosis of dengue fever. Ultrasonography of abdomen and chest with empty stomach was performed for better visualization of the gall bladder wall thickening, peri-cholecystic fluid collection and for presence of any calculi. Liver and spleen size was assessed along with presence or absence and quantification of ascites. Ultrasound thorax was also performed in sitting or supine position for evaluation of assessment of pleural spaces on both sides for pleural effusion.

RESULTS

On basis of clinical, laboratory features and ultrasonographic findings within 5 days of onset of fever, data of 80 cases was analyzed in our study. On basis of revised WHO Dengue case Classification done in 2011, 33 patients (41%) had non-severe dengue without any warning sign, 17 patients (21%) had non-severe dengue with some warning sign & 30 patients (38%) had worse form of symptoms of dengue fever. Seventy six cases (95%) completely recovered & 4 cases (5%) died. Out of 80 patients seen, 28 cases (35%) were from the ages of 20-30 years, 42 cases (53%) were between 30-40 years and 10 cases (12%) were between 40-50 years of age. In our study population 66% patients were male & 34% were of female gender. Male gender was more likely to be affected in comparison to female (ratio of 3:1), probably due to the fact that they are most of times working outside in our culture and are exposed more to mosquitoes especially in evening. In our study 98% of patients were having fever as most common symptom of the disease, severe bodyaches and myalgias were found in 60% of patients, vomiting in 80% of and skin rash was found in 21% of patients. Eye symptoms in the form of retro-orbital pain were found in 32% of cases, congestion of eyes in 75% cases, of patients. Among other variables a positive tourniquet test found 60%, petechiae were present in 40%, low blood pressure in 42% cases, shortness of breath in 24% of patients, oedema in 10%, jaundice in 5% & enlarged lymph nodes were found in 2% of patients.

In our study Dengue NS1 antigen was positive in 52 cases (65%), IgM seen positive in 42 cases (53.5%) & IgG seen positive in 12 cases (15%). Chest X ray PA view done on all cases shoed pleural effusion in 7 patients while it was normal in rest of patients. Ultrasound abdomen and chest was performed on all patients included in study within first 7 days of start of febrile illness and among the most common finding was thickening of gall bladder wall found in 66 cases (82.5%), enlarged liver in 49 cases (61%), ascites in 35 cases (44%), pleural fluid in 37 cases (46%), peri-cholecystic edema in 15 cases (19%) & enlarged spleen in 11 cases (14%). Patients with most common age group in our study were of 30-40 years of age. Ultrasound findings regarding severity of clinical findings also co-related with platelet count as shown in Table 1

DISCUSSION

Dengue fever has become globally one of most deadly

Table 1: Correlation of Ultrasonographic finding with platelet count

USG features	Platelet Count (per µl) - number (%)			Total Patients	P value
	<30000	30000 – 60000	60000 - 120000		
Fraction of patients with positive findings	40	23	17	80	
GB wall edema	36	23	7	66	<0.005
Hepatomegaly	30	13	6	49	<0.005
Ascites	25	8	2	35	<0.005
Pleural Effusion	25	9	3	37	<0.005
Pericholicystic Edema	9	4	2	15	<0.005
Spleenomegaly	5	3	3	11	<0.005

infection related health problem. So far many outbreaks have been reported all over the world[11]. As there is no specific medication of this disease, during an epidemic an early diagnosis of this deadly disease is one of the most important steps in management. Our study was carried out in an outbreak of dengue from August to November 2022 for a period of 4 months. Typical cases show an incubation period of 3 to fourteen days, with maximum peak of illness from 5 to 8 days. Some of other associated features are fever with chills, headache, severe back pain and myalgias and eye congestion as with other viral infections. Symptoms of dengue hemorrhagic fever are almost as of the classical form, but in addition to that there are bleeding manifestations depending on the severity of disease[12]. The spectrum of disease is divided into 4 phases[13] . Phase 1 is characterized by fever, constitutional symptoms with a positive tourniquet test. In phase 2 there are spontaneous hemorrhages over skin and gums presenting as petechiae, bruising over skin and gum bleeding or epistaxis. In phase 3 there are symptoms of phase 2 plus circulatory shortage and agitated behavior. Phase 4 is identified as complete circulatory shock with hypotension and low urine output. Moreover among all these phases there is thrombocytopenia with hemo-concentration. Phase 3 and 4 of disease is also termed as Dengue Hemorrhagic Fever.

Ultrasound abdomen is a very useful non-invasive technique for evaluation of patients suffering from severe dengue fever. In a study done in adults with dengue hemorrhagic fever, pleural effusion was seen 53% of patients, edema of gall bladder wall in 43%, and ascites was seen in 15% of cases[14]. In another study done in children with phase 1 and 2 of disease, pleural effusion was seen in 30% of patients, ascites in 34%, edema of gall bladder wall in 32% and swelling and enlargement of pancreas was seen in 14% of patients[15] . Recently an index was devised on basis of finding in ultrasonography that showed a shock predictive value (DHF-SSD). Score in this index range is from 0 to 12, on basis of parameters seen on ultrasound like pleural effusion, Morrison's pouch fluid, thickened gall bladder wall with a cut-off value of 5. Those patients above the value are having more chance for developing dengue hemorrhagic fever[16]. In an article written by Venkata Sai et al[17], ultrasonographic finding of gall bladder wall thickening with or without having poly-serositis in a patient with high grade fever gives high index suspicion of dengue fever. Another study by Joshi et al. done in Indonesia showed fluid collections in the peri-renal, para-renal, hepatic and splenic sub-capsular areas, pleural and pericardial effusions, enlargement of pancreas and hepato-splenomegaly in severe form of dengue fever[18] .

On basis of above studies and results of our study, it is obvious that ultrasound is a very helpful diagnostic modality for assessment of severity of Dengue fever. Although these observations are also seen in many other infections of viral or bacterial origin but on basis of factors like an epidemic, symptoms, signs and laboratory confirmation, cases of dengue fever can easily be identified. Therefore abdominal and chest ultrasound should be used as first line diagnostic technique in cases having high suspicion of Dengue fever even prior to availability of serologic test results for confirmation[19] . One of the limitations of our study was limited number of cases and sample collected from a single hospital although covering a wide geographical area of Rawalpindi and Islamabad. Further research is required to compare and analyze the ultrasound findings in different subsets.

CONCLUSION

Gall bladder wall thickening, mild to moderate ascites and splenomegaly found on ultrasonography are useful indicators of assessing the severity and early detection of complications of severe dengue fever even before the confirmatory serological laboratory results are available.

AUTHORS' CONTRIBUTION

Sumera Mushtaq	Conception and design
Ghulam Murtaza	Analysis and interpretation of data, Drafting the Article
Kiran Fatima	Critical revision
Kumail Kazmi	Acquisition of data
Qurat-Ul-Ain	Drafting the Article
Tassawar Hussain	Critical revision

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