

Original Research Article

Sonography as an ancillary tool in Dengue fever**Dr. Chandrajeet Yadav¹, Dr. Sandeep Dhruw², Dr. Aman Gupta³, Dr. Shivane Garg⁴**¹ Associate Professor, Department of Radiodiagnosis, S.A.M.C. & P.G. Institute, Indore² Assistant Professor, Department of Radiodiagnosis, S.A.M.C. & P.G. Institute, Indore³ Professor, Department of Radiodiagnosis, S.A.M.C. & P.G. Institute, Indore⁴ Resident, Department of Radiodiagnosis, S.A.M.C. & P.G. Institute, Indore***Corresponding author**

Dr. Aman Gupta

Email: aman_sono@yahoo.co.in

Abstract: DF is an acute febrile illness characterized by the sudden onset of high fever, chills, headache, muscle and joint pain. Usually, the diagnosis of DF is suspected on the basis of clinical manifestations and laboratory results. The presumptive diagnosis of DF can be confirmed by serologic detection of the virus, detection of anti-dengue virus IgM antibodies or by NS1 antigen in patient's serum. Anti-dengue virus IgG antibodies are used for detection of past dengue infection. Not only these serological tests expensive they are also not available at primary health centers and are not 100% sensitive. Therefore, additional diagnostic modalities for first-line evaluation of suspected DF patients are sought. Ultrasonography being non-invasive and easily available modality is being increasingly used in these patients. This study was carried out in a tertiary care hospital. The study population consisted of patients referred during a period of outbreak of dengue fever in the region in the year 2016. A total of 100 serologically positive patients referred for abdominal sonography were included in the study. Patients were sorted into four groups on basis of platelet counts. All patients were subjected to abdominal sonographic examination. Hepatomegaly was the most common finding in our study and was seen in 66 % of the patients. Gall bladder wall thickening was second most common finding and was seen in 51% of the patients. Peritoneal collection was seen in 39 % of the patients. Pleural collection was seen in 38% of the patients. Statistical significant correlation (p value < 0.00001) was observed between sonographic features of hepatomegaly, diffuse gall bladder wall thickening, polyserositis and platelet counts, with majority of patients with positive sonographic features in group 1 (platelet count <50000). In conclusion, in patients with suspected dengue fever, ultrasonography, although nonspecific, is a relevant ancillary tool not only for the early diagnosis of plasma leakage signs but also for predicting disease severity and helps to direct further confirmatory investigations.

Keywords: Dengue fever, ultrasonography, hepatomegaly, polyserositis

INTRODUCTION:

Dengue fever (DF) is caused by one of four closely related virus serotype of the genus Flavivirus. Dengue virus (DV) is transmitted mainly by vector *Aedes aegypti* mosquito and also by *Aedes Albopictus*. Dengue fever and Dengue hemorrhagic fever (DHF) has been a major health problem with an incidence of 11.56/100,000 people and a mortality of about 2.7%. Approximately 2.5 billion people live in dengue-risk regions with about 100 million new cases each year worldwide [1]. The first major widespread outbreak of Dengue Hemorrhagic Fever / Dengue Shock Syndrome in India occurred in 1996 [2] and gradually the whole country was involved with extensive epidemics followed by endemic/hyper endemic prevalence country-wide. A recent outbreak of disease was

reported from Delhi and NCR in 2016. The pathogenesis of DHF is not completely understood, despite extensive studies for over four decades. It has been established that it is caused by "Cytokine Tsunami" [1].

DF is an acute febrile illness characterized by the sudden onset of high fever, chills, frontal headache, muscle and joint pain. Laboratory findings commonly associated with DF include neutropenia, hemoconcentration, deranged liver enzymes and thrombocytopenia. Usually, the diagnosis of DF is suspected on the basis of clinical manifestations and laboratory results. The presumptive diagnosis of DF can be confirmed by serologic detection of the virus, detection of anti-dengue virus IgM antibodies or by

NS1 (nonstructural protein 1) antigen in patient’s serum by using ELISA kits. Anti-dengue virus IgG antibodies are used for detection of past dengue infection.

Not only this serological test expensive they are also not available at primary health centers and are not 100% sensitive. Therefore additional diagnostic modalities for first-line evaluation of suspected DF patients are sought. Ultrasonography being non-invasive and easily available modality is being increasingly used in these patients. Previous articles in literature have shown gall bladder wall thickening is a most prevalent finding in cases of Dengue fever. By this study our aim is to find whether ultrasound of the abdomen is an important adjunct to clinical and laboratory profile in diagnosing DF and further if ultrasound is useful in the diagnosis of the disease during an epidemic, in absence of serological tests.

MATERIAL AND METHODS:-

Study Population:-

The study was carried out in a tertiary care hospital. The study population consisted of patients referred during a period of outbreak of dengue fever in the region in the year 2016. A total of 100 serologically positive patients for NS1, IgM or IgG referred for abdominal sonography were included in the study. It is a retrospective, observational study and need have informed consent was thus obviated. No ethical issues were there in the study.

Study Design:-

Patients were sorted into four groups on basis of platelet counts. All patients were subjected to abdominal sonographic examination on Philips iU22 ultrasound system using multi-frequency 1-4MHz convex and 3-9 MHz linear transducers. The scans were performed by radiologists having more than 10 years’ experience of performing abdominal sonographies. Liver and splenic sizes were measured. Note of peritoneal and pleural collection was made and gall bladder wall thickness assessed. Gall bladder wall measuring more than 3 mm was considered thick.

Statistical Evaluation:-

Continuous variables are represented as Mean +/- S.D. Categorical variables is represented as numbers with percentage. Association of various sonographic features with platelet count is assessed through Chi-square test. P value <0.01 is considered statistically significant.

RESULTS:-

Out of 100 serologically positive patients of Dengue fever in our study 66% were males and 34% were females (Table-1). Maximum number of patients was in age group 21 to 30 years (45%). The mean age in our study group was 30.9 +/- 13.4 (Table-2).

Table 1: Distribution of patients on basis of gender (n= 100)

S.No.	Gender	No. of Patients
1.	Male	66
2.	Female	34

Table 2: Age-wise distribution of patients (n= 100).

S.No.	Age Group	No. of Patient
1.	11-20 Years	17
2.	21-30 Years	45
3.	31-40 Years	14
4.	41-50 Years	10
5.	51-60 Years	7
6.	61-70 Years	7

On ultrasound examination, hepatomegaly was the most common finding. It was seen in 66 % of the patients. Gall bladder wall thickening was second most common finding in our study and was seen in 51% of the patients (Fig.1). Minimal to mild peritoneal collection was seen in 39 % of the patients. Pleural collection was seen in 38% of the patients. Right sided

pleural collection was more frequent, seen in 81 % of the patients. Bilateral pleural collection was seen in 19% of the patients. None of the patients in our study group showed left sided pleural collection. Features of polyserositis (Fig.2) were observed in 34% of study population (Table-3).



Fig 1:- Longitudinal sonographic image of gall bladder revealing diffuse thickening of wall.

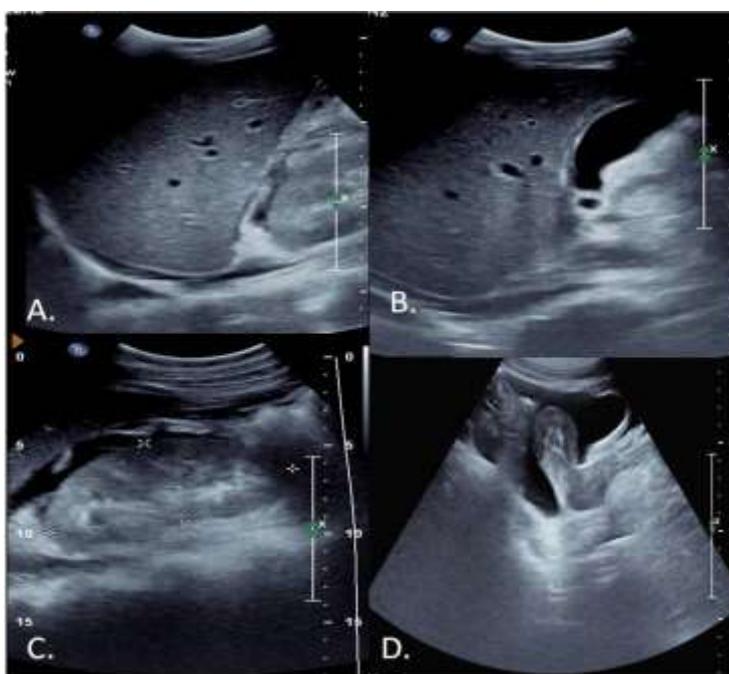


Fig 2 [A-D]:- Sonographic images were showing polyserositis in form of pleural, peri-hepatic and pelvic collection.

Table 3:-Summary of Sonographic Findings in different groups.

Sonographic findings	Group-1	Group-2	Group-3	Group-4	p value
	Platelet count <50000	Platelet count 50000 - 1 lacs	Platelet count 1 lac - 1.5 lacs	Platelet count >1.5 lacs	
No of patients	58	21	9	12	<0.00001
Hepatomegaly	48 (83%)	14 (67%)	4 (44%)	0	<0.00001
Gall bladder wall thickened	41 (71%)	9 (43%)	1 (11%)	0	<0.00001
Splenomegaly	17 (29%)	10 (47%)	2 (22%)	0	0.034
Pleural collection	36 (62%)	2 (9.5 %)	0	0	<0.00001
Peritoneal collection	35 (60%)	4 (19%)	0	0	<0.00001
Polyserositis	33 (57%)	1 (5%)	0	0	<0.00001

Statistical significant correlation (p value < 0.00001) was observed between sonographic features of

hepatomegaly, diffuse gall bladder wall thickening, polyserositis and platelet counts, with majority of

patients with positive sonographic features in group 1 (platelet count <50000).

DISCUSSION:

Dengue is becoming an important emerging problem in India. Now days the epidemics of dengue fever are being heard almost every year in India. The increase in dengue is probably secondary to rapid urbanization and poor water management. The patients were registered in the months of August to November in our study, which is probably due to pooling of water at places secondary to rainy season.

A male preponderance was seen in our study, with 66% of patients being male. Male preponderance has been reported in various other studies [3-5]. The majority of the patients in our study (mean age being 30.9 +/- 13.4 years) were young individuals, which is in accordance with previous other studies [4-6] with the maximum patients in age group of 21-30 years (45%). In contrast to previous studies, hepatomegaly was the commonest finding in our study and was seen in 66% of cases. Chandak *S et al.*; had also reported similar findings in their study [7]. Javed *et al.*; [8] found hepatomegaly in 35.5% patients whereas Venkata Sai *et al.*; reported hepatomegaly in 34% of patients in their study.

Gall Bladder wall thickening was the second most common finding and was however seen in only half of seropositive cases. It is in contrast with previous other studies, who have reported it to be the commonest finding. Venkata Sai *et al.*; have reported it to be present in 100% of cases in their study. Sachar *et al.*; [10] reported honeycomb pattern of GB wall thickening in 95% of patients in their study. A diffuse gall bladder wall thickening (GBWT) is not specific for dengue fever. GBWT of more than 3 mm is observed with various biliary, non-biliary conditions, other viral infections, enteric fever and leptospirosis, but the historical profile, symptom complex evolution and physical findings do not mimic those of DF. GB wall thickening in DF may be due to decrease in intravascular osmotic pressure [7].

Polyserositis in the form of ascites and pleural effusion from capillary leak has been frequently reported in recent outbreaks. In our study, radiological evidence of serositis was seen in 33 (57%) cases out of 58 cases in group 1 (platelet count less than 50,000) only one case in group 2 (platelet count 50000-100000) showed features of polyserositis. Statistically significant correlation was observed between features of serositis and platelet count in our study.

Serositis was self-limiting and disappeared on follow-up scan after 2 to 3 weeks. No intervention was required in our study population. Chatterjee *et al.*; [11]

found serositis in 42% subjects, which was self-limiting and subsided within 2 - 3 weeks of recovery. Splenomegaly was observed in 29% of seropositive patients and this association was not statistically significant (p value- 0.034). Management is conservative in most of cases of Dengue Fever. Platelet concentrates are indicated in cases of severe thrombocytopenia. No mortality was reported in our study population.

CONCLUSION:

Dengue fever continues to involve newer areas and a high proportion of adult predominantly male population. It is increasing in magnitude, epidemic after epidemic. In patients with suspected dengue fever, ultrasonography, although nonspecific, is a relevant ancillary tool not only for the early diagnosis of plasma leakage signs but also for predicting disease severity and helps to direct further confirmatory investigations.

REFERENCES:

1. Gupta N, Srivastava S, Jain A, Chaturvedi UC. Dengue in India. The Indian journal of medical research. 2012 Sep 1; 136(3):373-90.
2. Dar L, Broor S, Sengupta S, Xess I, Seth P. The first major outbreak of dengue hemorrhagic fever in Delhi, India. Emerging infectious diseases. 1999 Jul; 5(4):589-90.
3. Awasthi S, Singh VK, Kumar S, Kumar A, Dutta S. The Changing Clinical Spectrum of Dengue Fever in the 2009 Epidemic in North India: A Tertiary Teaching Hospital Based Study. Journal of Clinical & Diagnostic Research. 2012 Aug 1; 6(6):99-1002.
4. Patil AA. Clinico-laboratory profile of su patients in a tertiary care hospital. International Medical Journal. 2015 Jan; 2(1):54-57.
5. Karoli R, Fatima J, Siddiqi Z, Kazmi KI, Sultania AR. Clinical profile of dengue infection at a teaching hospital in North India. The Journal of Infection in Developing Countries. 2011 Nov 30; 6(07):551-4.
6. Chaturvedi UC, Shrivastava R. Dengue haemorrhagic fever: A global challenge. Indian journal of medical microbiology. 2004 Jan 1; 22(1):5-6.
7. Chandak S, Kumar A. Can radiology play a role in early diagnosis of dengue fever? North American journal of medical sciences. 2016 Feb; 8(2):100.
8. Asghar JA, Farooq KH. Radiological appearance and their significance in the management of dengue hemorrhagic fever. Pakistan Journal of Medical and Health Sciences. 2011; 5(4):685-92.
9. Sai PV, Dev B, Krishnan R. Role of ultrasound in dengue fever. The British journal of radiology. 2005;78:416-418
10. Sachar S, Goyal S, Sachar S. Role of Ultrasonography ("Honeycomb Sign") in Early Detection of Dengue Hemorrhagic Fever. Archives

of Clinical and Experimental Surgery (ACES).
2013; 2(1):38-42.

11. Chatterjee N, Mukhopadhyay M, Ghosh S, Mondol M, Das C, Patar K. An observational study of dengue fever in a tertiary care hospital of Eastern India. JAPI. 2014 Mar; 62:224-7.