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Sonography in the Evaluation of Dengue Fever

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Abstract:
Background*: Dengue is one of the most important cause of significant morbidity in last 2 decades .There are 4 serotypes of dengue , For promt and adequate treatment early diagnosis is important .Diagnosis is based on clinical features and serology ,but serology is time consuming .The main aim of study is role of ultrasound of abdomen and thorax by using it as an adjuvant in evaluating dengue fever in clinically serologically positive patient and to known the severity of dengue .*
Materials and Methods*: This prospective comparative study was carried out on patients of (at Department of radiology) MAHARAJA 'S INSTITUTE OF MEDICAL SCIENCES ,Nellimarla, Vizianagaram from November 2020 to November 2022. Study was done 50 patients who have clinically symptomatic and serologically positive for dengue (NS1 AG) ,referred to department of radiology for ultrasound abdomen and thorax .*
Results*: Out of 50 patients edematous gall bladder wall thickening is the most common finding seen in 37 cases contributing to 76% ,24 patient has ascites contributing to 48% ,15 patients has pleural effusion contributing to 30%,14 patients have hepatomegaly contributing to 28%,16 patients have splenomegaly contributing to 32% and periportal echogenicity is seen in 10 cases contributing to 20% .*
Conclusion: *The sonographic features include gall bladder wall thickening ,ascites ,periportal echogenicity,pleural effusion,hepatomegaly,spleenomegaly surve as adjuvant findings in diagnosis of dengue fever in addition to clinical features and serological findings .secerioty of patient also determined by sonographic features .more severe sonographic features are associated with low thrombocyte which indirectly show there is direct correlation .*
Key Word*: GALL BLADDER WALL THICKENING ,ASCITES ,PLEURAL EFFUSION*

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I. Introduction

One of the most common cause of fever in last 2 decades in india ,it is most common in tropical and sub tropical regions . Dengue fever also known as break bone fever is a viral disease caused by virus belonging to the flaviviridae ,it is transmitted by aedes aegypti mosquito which is peak in rainy seasons .[1,2] Clasically dengue present with symptoms of sudden onset of high grade fever with chills, severe headache, muscle and joint pain, retro-orbital pain and backache. Fever usually lasts for about 5 days, rarely for more than 7 days .It will present in 2 forms classical dengue fever and other one is fatal type which include dengue hemorrhagic fever ,which is fatal type[4-5] . .For diagnosis of dengue fever it is based on the combination of clinical features and positive serology .Positive serology includes anti dengue antibodies (IgG ANTIBODIES) and NS 1 antigen in blood .Development of antibodies may take 3 days and for detection of antibodies in blood will take 1 to 2days .This serology test is expensive and it is not available everywhere . Ultrasound is an alternative fast ,widely available and low cost investigation helpful in diagnosis of dengue .Previous investigations have shown that milder ultrasonography abnormalities may include pleural effusion, ascites, thickness of the gall bladder wall, hepatomegaly, splenomegaly, pancreatic enlargement, pericholecystic fluid, and pericardial effusion. The main aim in this study was to find the imaging features of abdomen and thorax in dengue patient and to know if ultrasound features can help as an additional investigation along with clinical features and serology in diagnosing and staging the severity of disease .If the patient fulfill the inclusion criteria ,informed consent is taken and ultrasonography findings were noted .

II. Material And Methods

This prospective comparative study was carried out on patients of Department of radiology at MAHARAJA 'S INSTITUTE OF MEDICAL SCIENCES ,Nellimarla,Vizianagaram from November 2020 to November 2022. Study was done 50 patients who are clinically and serologically positive for dengue (NS1 AG)

,referred to department of radiology for ultrasound abdomen and thorax . If the patient fulfill the inclusion criteria ,informed consent is taken and ultrasonography findings were noted .

Study Design: Prospective hospital based observational study

Study Location: This was a tertiary care teaching hospital based study done in Department of radiodiagnosis at MAHARAJA 'S INSTITUTE OF MEDICAL SCIENCES ,Nellimarla,Vizianagaram,Andhra Pradesh . (10)

Study Duration: November 2021 to November 2022.
Sample size: 50 patients.
Sample size calculation: The sample size was estimated on the basis of a single proportion design. The target population from which we randomly selected our sample was considered 10000. We assumed that the confidence interval of 10% and confidencelevel of 90%. The sample size actually obtained for this study was 50 patients .
Subjects & selection method: The study population was drawn from consecutive fever patients who presented to MAHARAJA 'S INSTITUTE OF MEDICAL SCIENCES ,Nellimarla,Vizianagaram,Andhra Pradesh department of general medicine on serological investigation if they show positive NS ag test ,then they were referred to department of radiology for ultrasound abdomen and thorax imaging.
Inclusion criteria:
Patient who are referred to department of radiology for ultrasound examination of abdomen and thorax with serologically and clinically positive dengue patient at department of radiodiagnosis, MAHARAJA 'S INSTITUTE OF MEDICAL SCIENCES ,Nellimarla,Vizianagaram,Andhra Pradesh .

Exclusion criteria:
1. Patients with clinical features of dengue but serologically negative .
2. Patients of dengue who undergone blood transfusion .

Procedure methodology

After informed consent is obtained from the patient , a form is given to fill the socio economic status ,age ,height ,gender and clinical features of patient . Patient ultrasound examinations of abdomen and thorax were performed with an ultrasound machine (PHILIPS AFFINITY 70 G) by using 5 -8 MHz probes. For enhanced gall bladder visualisation and distention of gall bladder , abdominal ultrasonography was conducted with a 5 MHz curvilinear probe after the patient had fasted for 4-6 hours. Gall bladder wall thickening is measured by placing the calipers between the two anterior layers of gall bladder wall [3—4}.In all cases where gallbladder wall thickness more than 3mm were considered significant and any pericholecystic fluid collections were noted . By using curvilinear probe 5MHZ liver and spleen measurements are taken in coronal plane if liver size more than 15 cm is considered as hepatomegaly and spleen size more than 12 cm is noted as spleenomegaly[4] . Prescence of any free fluid in the peritoneal cavity is noted as ascites .By sitting or in supine position thoracic ultrasonography through intercostals approach is done by using 4-12 MHZ curvilinear probe . Fluid collection were collected by measuring the distance between the dome of the diaphragm and the base of the lung.

Statistical analysis

Qualitative variables such as the existance of various ultrasound features were expressed as percentages. Through the Chi-square test of statistical significance, the relationship between distinct sonographic features and various age groups or platelet counts was evaluated. The gateway for statistical significance was $P < 0.05$. Stastical tables are made using Microsoft excel and graphs and correlation tables are done using goggle sheets .Stastic package of social science (SPSS) was used for descriptive study .

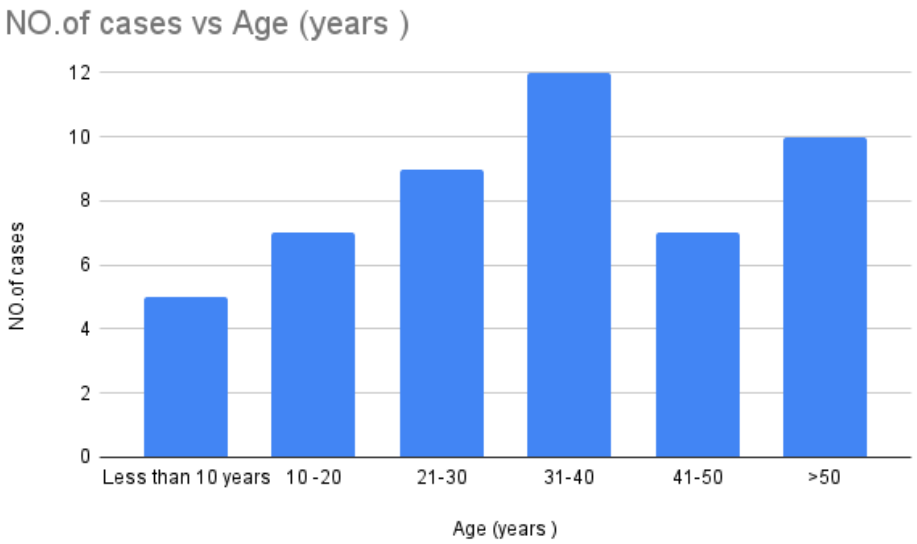
III. Result

1) Study age distribution :

Table no 1 : Shows study age distribution .

Age (years)	NO.of cases	Percentage (%)
Less than 10 years	5	10%
10 -20	7	14%
21-30	9	18%
31-40	12	24%

41-50	7	14%
>50	10	20%



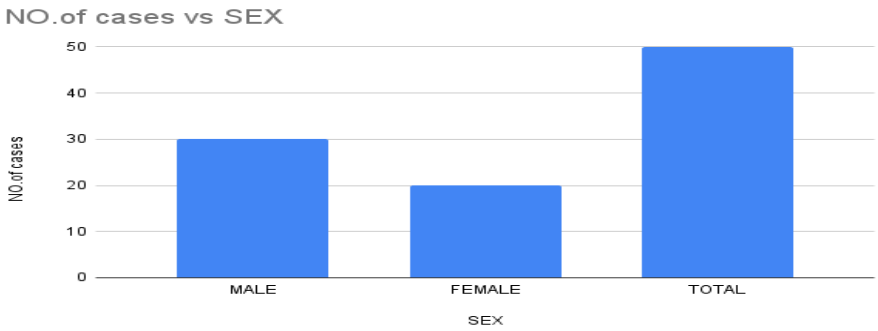
GRAPH 1 : STUDY AGE DISTRIBUTION

The study showed maximum cases were in the age group of 31-40 years accounting for 24% .the age group of our study range between 6 to 64 years .

2) Study sex distribution :

Table 2 : Study sex distribution

SEX	NO.of cases	Percentage (%)
MALE	30	60%
FEMALE	20	40%
TOTAL	50	100%



GRAPH 2: STUDY SEX DISTRIBUTION

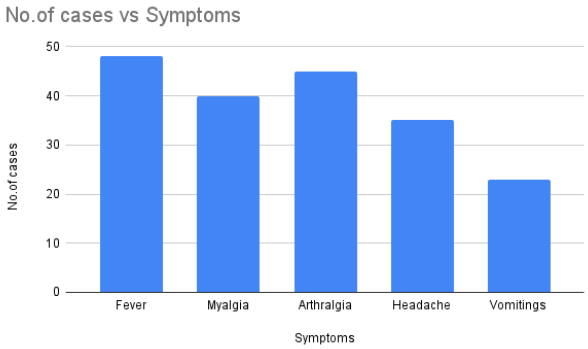
out 50 patients males were more affected than females

Symptoms distribution in study population:

Table 3 : Symptoms distribution in study population:

Symptoms	No.of cases	Percentage (%)
Fever	48	96%
Myalgia	40	80%
Arthralgia	45	90%
Headache	35	70%
Vomitings	23	46%

Out of 50 cases in our study ,Fever is the most common and consistent symptom which is seen in 48 cases contributing to 96% and followed by Arthalgia seen in 45 cases contributing to 90% .

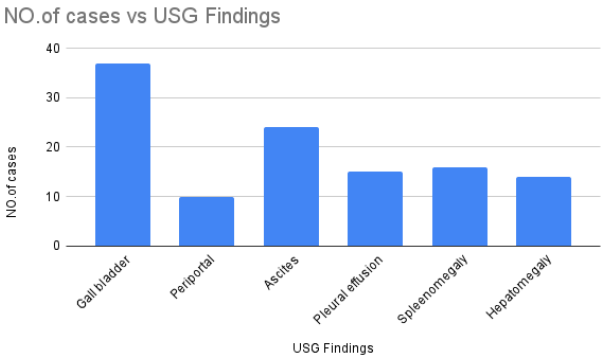


GRAPH 3: SYMPTOMS DISTRIBUTION IN STUDY POPULATION

Ultrasound findings in study sample :

Table 4 : Ultrasound findings in study population:

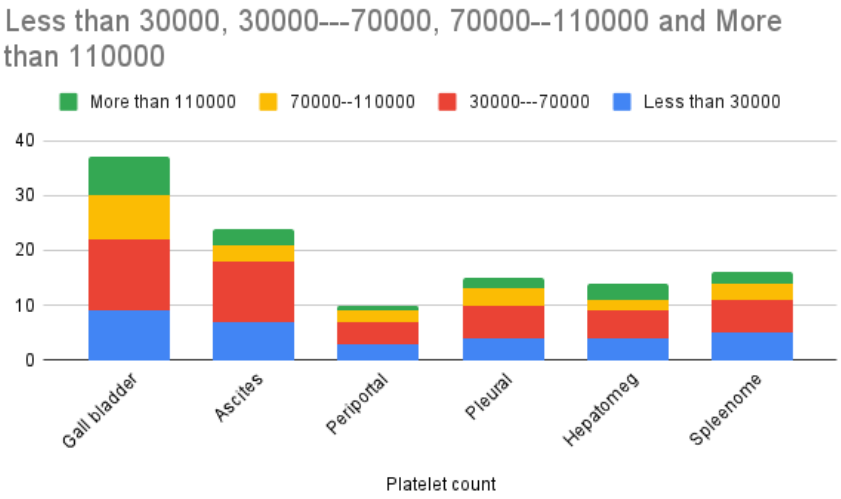
USG Findings	NO.of cases	Percentage
Gall bladder thickening	37	74%
Periportal echogenicity	10	20%
Ascites	24	48%
Pleural effusion	15	30%
Spleenomegaly	16	32%
Hepatomegaly	14	28%



GRAPH 4: Ultrasound findings in study population

CORRELATION OF PLATELET COUNT WITH SONOGRAPHIC FINDINGS:

Platelet count	Gall bladder wall thickening	Ascites	Periportal echogenecity	Pleural effusion	Hepatomegaly	Spleenomegaly
Less than 30000	9	7	3	4	4	5
30000---70000	13	11	4	6	5	6
70000--110000	8	3	2	3	2	3
More than 110000	7	3	1	2	3	2



GRAPH 5: Correlation of platelet count with sonographic findings

Ultrasound features based on day of fever :

Table 5 : sonographic findings based on day of fever

USG features	Less than 4 days	More than 4 days
Gall bladder edema	25	12
Periportal echogenecity	7	3
Ascites	16	8
Pleural effusion	9	6
Splenomegaly	10	6
Hepatomegaly	9	5

FIG 1: USG IMAGE SHOWING GALL BLADDER WALL THICKENING IN DENGUE PATIENT

FIG 2: USG IMAGE SHOWING ASCITES IN DENGUE PATIENT

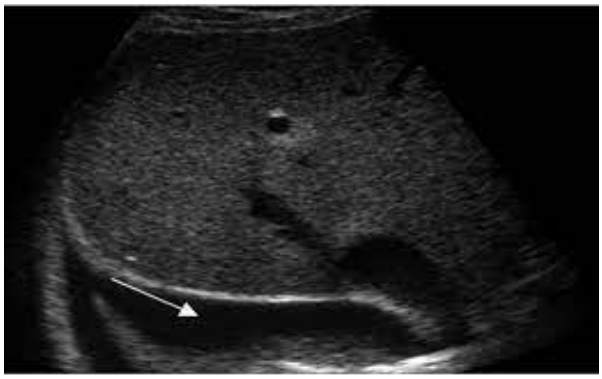


FIG 3: A 23 YEAR MALE MALE WITH DENGUE FEVER AND THROMBOCYTOPENIA USG IMAGE OF LIVER SHOWING MILD RIGHT PLEURAL EFFUSIOIN

IV. Discussion

Dengue fever is one among the most common cause of fever in the last 2 decades contributing to significant morbidity and mortality .It is an mosquito borne viral disease. Dengue fever typically begins during the rainy season, when vector mosquito breeding is typically plentiful. In the post-monsoon season from September to November, dengue cases are more prevalent. [7] Clinical symptoms of classic dengue fever include an abrupt start of high fever and chills, as well as severe headache, backache, and pain in the muscles and joints. The average length of a fever is 5 days, seldom lasting longer than 7. Since the first infection likely sensitises the patient and the second infection with a different serotype seems to result in an immunological catastrophe, multiple serotype infections are what cause the severe form of dengue fever. [8] The management of these patients and the reduction of morbidity and death, especially in DHF, might greatly benefit from early detection of DHF/dengue shock syndrome (DSS) [9].

Non structural protein 1 (NS1) antigen test is the important test which will help in diagnosis of dengue fever in addition to the clinical features . The antibodies are detected in the plasma of infected patient from day 5- 7 of fever . USG findings which will favour for suspecting dengue fever include gall bladder wall edema ,ascites ,pleural effusion ,hepatomegaly and splenomegaly . In severe cases there may collection of haemorrhages .

The diagnosis of dengue fever can be made with some degree of accuracy using ultrasound imaging featutres of the disease such thickness of the GB wall, ascites, pleural effusion, hepatomegaly, and splenomegaly. When ultrasound is performed, this aids in initiating proper patient management, particularly in settings where advanced laboratory facilities may not be accessible for serological confirmation.

Joshi et al., conducted a study in the year 1997 the most common age group involved was 20-40 years and right-sided pleural effusion was the most repititive finding, which was similar to our study .[10]

Thulkar et al, in their study showed in the year 2001 , the most common features was pleural effusion (seen in 55% of patients), while thickening of gall bladder wall was seen in 43%. 57 The common findings in different studies have altered outcomes, probably due to the nonstandardised sonological examination from the day of onset of fever.

Keng-Liang Wu et at all in their study in the year 2004 concluded that gall bladder wall edema is the most common ultrasound feature which was similar to our study .

VR santhosh et alin the year 2014 conducted study on 96 patients out of which 64 have gallbladder wall thickening (66.7%) ,62 have ascites (64.5%) ,48 pleural effusion (50%),17 patients hepatomegaly (17.7%) ,16 patients spleenomegaly(16.7%),17 cases were normal sonographically (17%) .[11]

V. Conclusion

The sonographic features include gall bladder wall thickening ,ascites ,periportal echogenicity,pleural effusion,hepatomegaly,spleenomegaly surve as adjuvant findings in diagnosis of dengue fever in addition to clinical features and serological findings .severity of patient also determined by sonographic features .more severe sonographic features are associated with low thrombocytes which indirectly show there is direct correlation .

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