DOI: https://doi.org/10.53350/pjmhs22164756

ORIGINAL ARTICLE

Ultrasound Findings in Dengue Fever: A Single Center Study

ZAHID BASHIR[1], ASAD ULLAH KAMRAN[2], HARRIS SAEED[3], ROMALE NAZIR[4], SEHRISH PATRAS[5], KHURRAM MEHMOOD[6], MUHAMMAD ZULQARNAIN[7]
[1,2,3]Consultant Radiologist Sadiq Abbasi hospital bahawalpur
[4]Medical Officer Sadiq Abbasi Hospital Bahawalpur
[5]Woman Medical Officer Sadiq Abbasi Hospital Bahawalpur
[6]Consultant Radiologist Bahawal victoria hospital Bahawalpur
[7]MBBS, MPH District Program Coordinator District Health Authority, Faisalabad
Correspondence to: Zahid Bashir, Email: zahidbashirrad@gmail.com

ABSTRACT

Dengue fever is the most quickly spreading and transmitted mosquito bite disease, with an annual incidence of around 50 million people. Plasma leakage during dengue fever results in the development of serious consequences.

Objective: To determine the ultrasonography findings used for diagnosing plasma leakage in patients managed with diagnosis of dengue fever

Study Design: Cross sectional descriptive study

Setting: Department of Radiologist, Bahawal victoria hospital Bahawalpur.

Duration of Study: 4 months (August to November, 2021)

Methodlogy: All the patients of dengue fever admitted in the dengue isolation ward of the hospital, diagnosed using anti-dengue serology were enrolled to be included in the study after a written informed consent from the parents or attendants. All these patients were sent to a consultant radiologist for ultrasound abdomen to look for ascites, pleural effusion, gall bladder thickness, liver size, hepatomegaly, spleen size and splenomegaly.

Results: Dengue fever is one of the most frequent diseases in our region of the globe. It manifests itself in a variety of ways, but early detection and treatment can help to reduce case fatality rates. This demonstrates the ultrasonography results that might be observed in Dengue Fever patients showing capillary leakage are seen in around thirty percent of the patients. Further studies should be done to correlate ultrasonography findings with the severity of dengue.

Conclusion: Dengue fever is one of the most frequent diseases in our region of the globe. It manifests itself in a variety of ways, but early detection and treatment can help to reduce case fatality rates. This demonstrates the ultrasonography results that might be observed in Dengue Fever patients showing capillary leakage are seen in around thirty percent of the patients. Further studies should be done to correlate ultrasonography findings with the severity of dengue.

Keywords: Dengue, splenomegaly, Ultrasonography, Ascites, Pleural effusion, Gall bladder thickness

INTRODUCTION

Dengue Viral infection is the most rapidly distributed and transmitted mosquito bite disease, with an annual recurrence rate of around 50 million people.[1] The vectors of this RNA Virus (DEN) include Aedes Aegypti and Aedes Albopictus from the flavi virus family; however, Aedes Aegypti producing Dengue fever is more common in our urban areas.[2]

Dengue fever has increased dramatically in the previous decade, and more than 40% of the population is now at danger. Dengue infection can cause moderate febrile sickness to severe hemorrhagic disease and Dengue Shock Syndrome.[3] Fever, arthralgia, myalgia, retro-orbital discomfort, and rash are common symptoms of classic dengue. Dengue patients might potentially have hemorrhagic manifestations (e.g. sub-conjunctival hemorrhage, petechiae, epistaxis, etc.) with or without shock.[4]

Clue regarding plasma leakage in the dengue fever can be picked using radiography for effusions in the pleural and pericardial spaces, fluid in the abdomen, thickness of the gallbladder wall, and hypoproteinaemia / hemoconcentration. Ultrasonography is an excellent non-invasive method for detecting plasma leakage, and region specific hematocrit values may be used to demonstrate plasma leakage.[5]

Dengue fever has become a serious health concern in Pakistan in recent years. To lessen the disease's impact, quick diagnosis and treatment are required. Thus, the clinical characteristics, laboratory profiles, and seropositivity test findings of dengue patients from Pakistan should be studied.[5,6]

Early detection of plasma leakage and, thus, DHF is important for the outcome of this disease; in the early period, ascites and effusion cannot be diagnosed by simple radiology and clinical examination, whereas Ultrasonography is a good means for detection of these in minimal amounts at any stage of this disease, assisting in DHF diagnosis at an earlier stage. The goal of this study was to establish the ultrasonography findings utilised to diagnose plasma leakage in patients with dengue fever.

With early diagnosis of various findings of plasma leakage in the abdomen using ultrasound, triage of the patients can be done and early management strategy can be made. The findings of the study should assist physician better grasp the circumstantial diagnosis of dengue patients and improve early management.

MATERIAL AND METHODS

Data collection for this descriptive cross sectional study was done at the Department of radiology, 4 months (August to November, 2021). All the patients of dengue fever admitted in the dengue isolation ward of the hospital, diagnosed using anti-dengue serology were enrolled to be included in the study after a written informed consent from the parents or attendants. But all patients of dengue having myelo-proliferative, lympo-proliferative, thalassemia or aplastic anemia were not included to as to remove all types of bias.

A definite case of dengue was defined as any suspected case of dengue reported in the emergency by a consultant physician with either serological evidence of positive nonstructural protein 1 (NS-1) antigen or raised dengue immunoglobulin IgM, if both are negative and patient had four times or more rise in the paired dengue specific IgG immunoglobulin.

All these patients were sent to a consultant radiologist for ultrasound abdomen to look for ascites, pleural effusion, gall bladder thickness, liver size, hepatomegaly, spleen size and splenomegaly. For hepatomegaly, cutoff value of liver size was taken as 15 cm and for splenomegaly; cutoff value of 12 cm was taken. Among the various ultrasound findings,

All the data collected from the samples was entered and analyzed using the software names SPSS version 23.0. Mean along with standard deviation was calculated for all the numerical variables including age, while frequency and percentage was calculated for all the qualitative variables. Primary outcome was the frequency of various ultrasound findings among the dengue patients. Data of the primary outcome variable was stratified for age and gender, and post stratification chi-Square was applied to

determine the significance, P-value ≤ 0.05 was considered statistically significant.

RESULTS

In this cross sectional study, 71 diagnosed cases of dengue were included in the study and ultrasound abdomen was done to identify any positive findings. Data was collected using a pre-designed questionnaire after the departmental approval to carry out this study.

Mean age among these patients was 26.67 SD 7.7 years. The distribution with respect to age group showed that 10/71 (14.08%) patients having dengue effects were under 20 years of age 42/71 (59.2%) were between 21-30 years old, 18/71 (25.35%) were between 31-50 years of age and 1/71 (1.41%). Among all these patient of dengue fever, 67/71 (94%) were male, 4/71 were females (6%) (as shown in Table no. 1).

Data analysis of ultrasonography findings among these patients of dengue fever showed that signs of capillary leakage were seen in terms of peri-cholecystic edema was present in around 39.4% patients, pleural effusion in 32.4%, ascites in 38%. Data of these findings was stratified for age and gender, majority of these were common among the patients of age 21 to 40 years (p value 0.09) and among male patients, p value 0.9. (as shown in the table no. 2)

Table 1: Distribution of dengue patients with respect to Age and gender (n=71)

Age group	Frequency	Percentage
<20	10	14.1%
21-30	42	59.2%
>30	19	26.7%
Gender		
Male	67	94%
Female	4	6%
Total	71	100%

Splenomegaly and hepatomegaly was also seen on ultrasonography of the patients of dengue. Splenomegaly was present in 22 of 71 patients (31%) while only 6 patients of 71 (8.4%) showed enlarged liver. Almost all the patients with enlarged spleen were of 21 to 40 years age and male gender.

Table 2: showing the details of the ultrasonography findings among the patients of dengue fever

Findings	Total (n: 71)		Age (in years)			P-value	Gender		P-value
	No.	%	< 21	21 - 40	41 – 60		Male	Female	
Peri-cholecystic Edema	28	39.4	4	22	2	0.09	25	3	0.90
Pleural Effusion	23	32.4	10	12	1		11	2	
Ascites	27	38	4	22	1		24	3	
Splenomegaly	22	31	0	21	1		21	1	
Liver Enlarged	06	8.4	0	06	0		06	0	

Table 3: showing Comparison of liver size and spleen size according to age group (n: 71)

Age (in years)	Liver size		P value
	Mean	SD	
<20	13.50	1.02	0.05
21-30	14.03	0.59	
>30	14.18	0.56	

Age(in years)	Spleen size		P value
	Mean	SD	
<20	10.05	1.04	0.014
21-30	11.31	1.02	
>30	11.07	1.32	

Table 4: Comparing liver and spleen size according to gender

Gender	Liver size		P value
	Mean	SD	
Male	14.03	0.68	0.15
Female	13.53	0.54	

Gender	Spleen size		P value
	Mean	SD	
Male	11.09	1.19	0.84
Female	10.97	0.95	

DISCUSSION

Dengue fever has grown rapidly in recent years and has become a substantial worldwide burden. Dengue fever incidence have increased in recent years as a result of uncontrolled urbanisation involving unregulated infrastructure development and insufficient sanitary amenities, which has resulted in an abundance of mosquito breeding places. Capillary leakage is the major complication leaking to many clinical findings in these patients.[7] Early detection of effusions and edema in many regions of the body showing capillary plasma leakage, a characteristic of severe dengue pathogenesis, is crucial in the management of ICU patients.[8,9]

In our study, data analysis of ultrasonography findings showed that signs of capillary leakage were seen in terms of peri-cholecystic edema was present in around 39.4% patients, pleural effusion in 32.4%, ascites in 38%. Data of these findings was stratified for age and gender, majority of these were common among the patients of age 21 to 40 years (p value 0.09) and among male patients, p value 0.9. Splenomegaly and hepatomegaly was also seen on ultrasonography of the patients of dengue. Splenomegaly was present in 22 of 71 patients (31%) while only 6 patients of 71 (8.4%) showed enlarged liver. Almost all the patients with enlarged spleen were of 21 to 40 years age and male gender.

In a regional study, done in Bangladesh, Mahmood R, et al reported that most of the patients of dengue belonged to 20-40 years age sub-class, with common presentations like fever (93%), abdominal pain (30%), skin rash (25%), and diarrhea (20%). Complications were documented as breathing problems (41%), pleural effusion (39%), gum bleeding (11%), Ascites 29.4%, hepatomegaly 7.6% and splenomegaly 1.3%. Incidence of all these complications was similar to that reported in our study, apart from splenomegaly which was seen in 31% patients in our study. .

Zeb R, et al found in a research that included 56% men and 44% women, with a mean age of 6.53 SD 3.4 years. All patients with a confirmed diagnosis of dengue fever had hepatomegaly and splenomegaly, accounting for 28.4% of the total, with ascites accounting for 23.5 percent, pleural effusion accounting for 7.1%, and gallbladder thickness accounting for 7.1%. When all of these ultrasonography findings were connected to the severity of the sickness in terms of platelet count drop, a p-Value of 0.05 was established.[10] Our study also showed similar results.

Another significant research on dengue patients found that 61% of patients had Dengue Fever, 35% had severe Dengue Hemorrhagic Fever, and only 4% had Dengue Shock Syndrome (DSS). Positive findings on ultrasonography of potentially impacted areas of the body were more common in severe dengue patients. Data analysis revealed that pericholecystic fluid accumulation was only detected in severe dengue illness, but gall bladder wall edoema, or ascites, increased with disease severity. Study showed that risk of having gall bladder wall edema, ascites, were 2.74 and 2.04 times higher.[11]

Bhagyawant KR and colleagues looked at young dengue patients (55 men and 25 women) and discovered that gall bladder wall edoema, pleural effusion, and ascites were more prevalent in

patients with non-severe dengue with warning symptoms than in patients with severe dengue. (P=0.0001).[12]

Baharuddin KA, et al also studied many dengue patients and documented warning signs in 2/3rd of the dengue fever patients. Only 38 of these patients had subclinical plasma leakage at the time of their initial presentation, and 84.2 percent and 7.9 percent of them advanced to dengue fever with warning symptoms and severe dengue, respectively.[13]

In another study, around 67 percent of patients exhibited edematous gallbladder (GB) wall thickening, 64.5 percent had ascites, 50% had pleural effusion, 17.7 percent had hepatomegaly, and 16.7 percent had splenomegaly. In all age groups, the most prevalent combination of observations was edematous GB wall thickening, ascites, and pleural effusion. Patients with 40,000 platelets were more likely to have edematous GB wall thickening, as well as ascites and pleural effusion.[14] These findings were even higher than that reported in our study.

Balasubramanian S, et al. in his study on dengue patients analyzed radiographic and ultrasonographic findings inrelation with hematocrit. Patients with plasma leakage proven on ultrasonography were around 91%. Both the area specific hematocrit and ultrasonography was found sensitive for diagnosing and ruling out plasma leakage.

Ultrasonography is an ideal non-invasive investigation to detect plasma leakage and area specific hematocrit values are useful as evidence of plasma leakage.

CONCLUSION

Dengue fever is one of the most frequent diseases in our region of the globe. It manifests itself in a variety of ways, but early detection and treatment can help to reduce case fatality rates. This demonstrates the ultrasonography results that might be observed in Dengue Fever patients showing capillary leakage are seen in around thirty percent of the patients. Further studies should be done to correlate ultrasonography findings with the severity of dengue.

Limitation of the Study: The total number of patients with dengue included among was small. Furthermore, because to a shortage of facilities and funding, it was not feasible to properly study all participants and serotype the dengue cases. A detailed feature-by-feature comparison of all the patients was not possible.

REFERENCES

1. World Health Organization. Dengue: Guideline for diagnosis, treatment, prevention and control. Geneva: World Health Organization; 2009.
2. Tittarelli E, Lusso SB, Goya S, Rojo GL, Natale MI Dengue Virus outbreak in Buenos Aires, Argentina, 2016. Emerg Infect Diseases. 2017;23(10):1684-5.
3. Azad DAK, Ferdousic DS, Islam QT, et al. National guideline for clinical management of dengue syndrome. 4. Dhaka: Government of the People's Republic of Bangladesh; 2018.
4. Hasan MJ, Tabassum T, Sharif M, et al. Comparison of clinical manifestation of dengue fever in Bangladesh: an observation over a decade. BMC Infect Dis. 2021;21(1):1113. Published 2021 Oct 29. doi:10.1186/s12879-021-06788-z
5. Balasubramanian S, Janakiraman L, Kumar SS, Muralinath S, Shivbalan S. A reappraisal of the criteria to diagnose plasma leakage in dengue hemorrhagic fever. Indian Pediatr. 2006;43(4):334-339.
6. Mahmood R, Benzadid MS, Weston S, et al. Dengue outbreak 2019: clinical and laboratory profiles of dengue virus infection in Dhaka city. Heliyon. 2021;7(6):e07183. Published 2021 May 29. doi:10.1016/j.heliyon.2021.e07183
7. Mutsuddy P., Tahmina Jhora S., Shamsuzzaman A.K.M., Kaisar S.M.G., Khan M.N.A., Dhiman S. "Dengue situation in Bangladesh: an epidemiological shift in terms of morbidity and mortality" Can. J. Infect. Dis. Med. Microbiol. 2019;2019
8. Koyama H, Chierakul W Lung Ultrasound Findings of Patients with Dengue Infection: A Prospective Observational Study Am J. Trop Med Hyg. 2021;105(3):766-70.
9. Shah S, Rolfe R, Henostroza G, Seas C. Ultrasound Findings of Plasma Leakage in Dengue Fever. Am J Trop Med Hyg. 2018;99(6):1362-3.
10. Zeb R, Ahmed MS, Zeb J. Dengue fever; ultrasonography of dengue fever patients in paediatric age group "a descriptive study at a tertiary care hospital Peshawar. Professional Med J 2018; 25(9):1397-1401.
11. Chaudhary S, Manrai K, Dhagat P, Dudeja P, Sen D, Grewal DS, et al. Abdominal and Chest Ultrasonography: A predictor for disease progression in nonsevere dengue. Medical Journal Armed Forces India. 2021.
12. Bhagyawant KR, Chate SV. Abdominal Ultrasound Findings In Pediatric Patients Having Dengue Fever. Journal of Medical and Clinical Research. 2021;1(2):7-12.
13. Baharuddin KA, AW SF, Andey R, Ridzuan MI, Siti-Azrin AH. Ultrasound findings of plasma leakage as imaging adjunct in clinical management of dengue fever without warning signs. Med J Mal. 2020;75(6):635-41.
14. Santhosh VR, Patil PG, Srinath MG, Kumar A, Jain A, Archana M, et al. Sonography in the diagnosis and assessment of dengue Fever. J Clin Imaging Sci. 2014;4:14.