Utilization of Clinical Profile and Ultasonogaphic Findings as Diagnostic Tool in Children with Dengue Fever at Bhuj, Kutch, Gujarat: A Cross-Sectional Study

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Abstract

Background and Aim: Dengue fever is one of the most important emerging vector-borne viral diseases. There are four serotypes of dengue viruses, each of which is capable of causing self-limited dengue fever or even life-threatening dengue hemorrhagic fever and dengue shock syndrome. The aim of this study was to evaluate the clinical and sonographic findings of dengue fever. *Methods:* This cross-sectional observational study was carried out in the Department of Pediatrics, Gujarat Adani institute of medical science, Bhuj. The participants were clinically and serologically evaluated against NS1 antigen, IgM and IgG antibody. These patients also underwent USG abdomen and chest within the first week of the illness. *Results:* Out of the 200 confirmed dengue cases, 53% cases were males and the 47% were females. The most common age group was school going children (42%) and adolescents (36%). All the cases had fever (100%). Other features were vomiting in 71.9%, abdominal pain in 45.9 %, 33.2% had hepatomegaly, bradycardia in 12.9%, and rashes in 10.4%. Investigations revealed thrombocytopenia in 96.9%, hemoconcentration in 94.2%, leucopenia (< 4000/mm3) in 62.9% and raised liver enzymes in 43.1%. The ultrasonographic findings were hepatomegaly in 84 cases, gall bladder thickening in 61 and splenomegaly in 16.5% of cases. Pleural effusion was noticed in 46.5% and 37% had ascites. *Conclusion:* Dengue fever should be suspected among children in endemic areas like India when they present with fever, vomiting, myalgia along with hepatomegaly, low platelet count with elevated liver enzymes.

Keywords: Bhuj; Dengue Fever; Hepatomegaly; Vector-Borne.

Introduction

Dengue fever is a serious mosquito-borne viral disease which in recent years has become a major international public health concern. It is the most serious viral haemorrhagic fever in the world with an annual incidence of 100 million cases [1]. It is now endemic in more than 100 countries and threatens the health of more than 2500 million i.e. 40% of the world's population. Nearly 90% of the dengue infections occur in children with risk of dying during a secondary attack is nearly 15- fold higher than that of adults. Its mortality ranges from 1-5% treated patients to a maximum of 50% for untreated or inadequately treated patients resulting in at least 12,000 deaths annually mainly among children [2,3]. Dengue viruses cause symptomatic infections or asymptomatic seroconversion. Symptomatic dengue infection is a systemic and dynamic disease. It has a wide clinical spectrum that includes both severe and non-severe clinical manifestations [4].

Previously WHO had classified the disease as classic dengue, the milder form of the disease and dengue hemorrhagic fever (DHF), the severe form which was further divided into four grades. Changes in the epidemiology of dengue, especially with an increasing number of cases and the expansion of dengue into other regions of the world, has led to problems with the use of the existing WHO classification. As there have been many reports of

difficulties in the use of the previous classification which were summarized in a systematic literature review the dengue classification has been revised and is classified as Dengue fever with or without warning signs and Severe Dengue fever [5,6]. Positive serology is the mainstay in the diagnosis of DF. But serology takes approximately 7 days to give a positive result [7,8] the diagnosis of DF is often delayed owing to time taken for availability of serology test results. Ultrasonography (USG) is a cheap, rapid and widely available non-invasive imaging method [9,10]. 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 [11,12]. Several studies concluded that ultrasonography of the chest and abdomen can be an important adjunct to clinical profile in diagnosis DF and diagnosis can be made early in the course of disease compared with other modes of diagnosis. It can be used as a first-line imaging modality in patients with suspected dengue fever to detect early signs suggestive of the disease prior to obtaining serologic confirmation test results, especially in a dengue fever epidemic area. These findings may also occur in other viral infections and enteric fever but in other viral infections the historical profile, symptom complex evolution and physical findings do not mimic those of dengue fever. The aim of this study was to evaluate the clinical and sonographic findings of dengue fever which may be useful as an early diagnostic tool.

Material and Methods

This cross-sectional observational study was carried out in the Department of Pediatrics, Gujarat Adani institute of medical science, Bhuj. Ethical clearance was taken from the institutional ethics board. Consent for this study was taken from the school heads as well as from the parents. Two hundred children with serologically confirmed dengue fever, admitted in the year 2015, were included in this study. All these patients were clinically and serologically evaluated. All underwent Dengue serology (NS1 antigen/ IgM/ IgG antibody) examination. These patients also underwent USG abdomen and chest within the first week of the illness. The results were tabulated and analyzed.

Statistical Analysis

Data The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 15 (SPSS Inc. Chicago, IL, USA) Windows software program. Descriptive statistics included computation of percentages. For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results

Out of the 200 confirmed dengue cases, 53% cases were males and 47% were females. The most common age group was school going children (42%) and adolescents (36%). Among these 200 cases all had fever, 71.9% had vomiting, 45.9% had abdominal pain, 33.2% had hepatomegaly, 10.4% had rashes, 1.9% had splenomegaly, 12.9% had bradycardia and 23.4% developed hypotension and shock (Table 1). The most common bleeding manifestation was petechiae followed by haemetemesis and epistaxis. In our study, 2 patients had presented with altered sensorium. Dengue encephalopathy was suspected in view of normal metabolic profile and CSF examination Out of these 200 cases 96.9% had thrombocytopenia, 94.2% had hemoconcentration, 62.9% had leucopenia< 4000/mm3 and 41.1% had raised liver enzymes (Table 2). The ultrasonographic findings were hepatomegaly in 42%, splenomegaly in 33, gall bladder wall thickening in 61, and ascites in 74. Out of the 47 cases that developed shock, all had gall bladder wall thickening, moderate to severe ascites and bilateral moderate pleural effusion and 80% had hepatomegaly.

Table 1: Clinical manifestations among dengue cases

Clinical Manifestation	Percentage
Fever	(100)
Vomiting	(71.9)
Abdominal pain	(45.9)
Rashes	(10.4)
Hepatomegaly	(33.2)
Hypotension	(23.4)
Bradycardia	(12.9)
Splenogmagaly	(1.9)

Table 2: Laboratory findings among dengue cases

Lab Findings	Percentage
Thrombocytopenia	96.9
Hemoconcentration	94.2
Leucopenia	62.9
Raised liver enzymes	41.1

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. Dengue has become a major international public health concern in recent years [13]. Hence, it will be useful in the proper management of dengue fever if symptoms, signs and laboratory parameters and sonographic findings associated with the disease are identified early and the clinical severity is known. The main objective of their study was to identify symptoms, signs and investigation findings of dengue fever and the ultrasonographic findings which could help in diagnosis and proper management of cases.

The sex distribution is consistent with previous study findings that dengue fever occurs more in male sex. In this study fever and vomiting were the most frequent symptoms and hepatomegaly was the most frequent signs similar to that observed in earlier studies [14,15]. Our study revealed rashes in 10.5% cases similar to the observation of Ahmed FU et al [16] who noted rashes in 12% of children. In our study the most common bleeding manifestation was petechiae followed by hematemesis which is different from few studies where haemetemesis was commoner [17,18]. Headache and retroorbital pain were not seen in our study as compared to other studies [19] but was similar to a study conducted in Mumbai [20].

The one important laboratory finding is the rise in serum levels of liver enzymes (LFTs) as reported in various studies [21]. The high incidence of vomiting, hepatomegaly and elevated liver enzymes can serve as markers for suspicion of dengue during an epidemic. Subclinical hepatitis may contribute to the abdominal pain and vomiting in these children. Mortality in the present study was 2%. All patients who expired developed hypotension, shock and ARDS. In the study by Anju et al overall mortality was 6%, compared to 3% by Ahmed et al. Dengue associated ARDS is associated with a high mortality [22]. In this study 79% cases were positive for NS1 antigen with or without antibodies and the remaining were positive only for antibodies. And it was found that out of the 78 cases (39%) which were positive for

NS1 antigen alone, 56 cases (72%) had Ultrasound findings in the form of either hepatomegaly with polyserositis or gall bladder wall thickening. This clearly shows that Ultrasound can be used as an early, non invasive and economical diagnostic tool. The ultrasound findings in our study showed gall bladder wall thickening in 30.5% cases whereas as Quiroz-Moreno et al found gallbladder thickening in 86% of the patients, Sai et al in 56% patients, Gonzalez et al in 35.1% [23]. This may be due to serotype of the causative dengue virus, secondary antibody patterns of the patients due to previous exposure to dengue viruses, race of the patients and other factors yet to be known.

In our study pleural effusion or ascites was apparent on clinical examination in many of them. But sonography diagnosed all of them. Similarly 17 cases of hepatomegaly and 29 cases of splenomegaly could not be diagnosed by clinical examination but were diagnosed correctly by ultrasonography. So this study clearly demonstrates the importance of abdominal and thoracic sonography in the accurate and complete clinical evaluation and management of dengue fever. All the cases which went into hypotension and shock showed gall bladder wall thickening, with moderate to severe pleural effusion and ascites. One study attempted to investigate whether gall bladder wall thickening measured by ultrasonography can be used to predict the onset of severe dengue fever. It is found that a thickness of 5mm is useful as a criterion for identifying DHF patients at high risk of developing hypovolemic shock [24]. This means that ultrasonography can also give the clinicians some idea about the severity of the disease process and thus help in more meticulous management of the patients.

Conclusion

It is concluded that dengue fever should be suspected among children in endemic areas like India when they present with fever, vomiting, myalgia along with hepatomegaly, low platelet count with elevated liver enzymes. Abdominal and thoracic sonography can be used as a first-line imaging modality in patients with suspected dengue fever to detect early

signs suggestive of the disease prior to obtaining serologic confirmation tests which are costly, invasive and not affordable by all patients.

References

1. Price DD, Wilson SR. Dengue Fever. [Online]. 2008 [cited 2009 Jan 21]. Available from: URL: http:// emedicine. medscaDe.com/article/78.

2. Sai PMV, Dev B, Krishnan R. Role of ultrasound in dengue fever. British Journal of Radiology 2005, 78: 416-418.

3. World Health Organisation. Prevention and control of dengue and dengue hemorrhagic fever: comprehensive guidelines. WHO regional publication. SEARO, No. 29. WHO, 1999.

4. Rigau-Perez JG, Clark GG, Gubler DJ, Reiter P, Sanders EJ, Vorndam AV et al. Dengue and dengue haemorrhagic fever. Lancet, 1998;352:971-977.

5. World health organization. Handbook for clinical management of dengue fever. WHO, 2012.

6. Bandyopadhyay S, Lum LC, Kroeger A. Classifying dengue: a review of the difficulties in using the WHO case classification for dengue haemorrhagic fever. Tropical Medicine and International Health, 2006;11(8):1238-1255.

7. Rahman M, Rahman K, Siddique AK, Shoma S, Kamal AH, Ali KS, et al. First outbreak of dengue haemorrhagic fever, Bangladesh. Emerg Infect Dis 2002;8(7):738-740.

8. Bhamarapravti N. Pathology of dengue haemorrhagic fever. In: Thongcharoen P (ed) Denge/dengue haemorrhagic fever. WHO, Geneva 1993; pp.72-3.

9. Venkata S, Dev B, Krishnan R. Role of ultrasound in dengue fever. Br J Radiol. 2005;78:416-418.

10. Thulkar S, Sharma S, Srivastava DN, Sharma SK, Berry M, Pandey RM et al. Sonographic findings in grade III dengue hemorrhagic fever in adults. J Clin Ultrasound 2000;28:34-37.

11. Wu KL, Changchien CS, Kuo CH .Early abdominal sonographic findings in patients with dengue fever. Clin Ultrasound 2004;32:386-388.

12. Statler J, Mammen M, Lyons A, Sun W. Sonographic findings of healthy volunteers infected with dengue virus. J Clin Ultrasound 2008;36:413-417.

13. Dengue Haemoorrhagic fever: Diagnosis, treatment and controle, Geneva, World Health Organization, 1986.

14. Srivastava VK, Suri S, Bhasin A, Srivastava L, Bharadwaj M. An epidemic of dengue hemorrhagic fever and dengue shock syndrome in Delhi: a clinical study. Ann Trop Pediatr 1990;10:329-334.

15. Bethell DB, Gamble J, Loc PP, Dung NM, Chau TTH, Loan HT, et al. Non-invasive measurement of microvascular leakage in patients with dengue hemorrhagic fever. Clin Infect Dis 2001;32:243-253.

16. Ahmed FU, Mahmood BC, Sharma JD, Hoque SM, Zaman R, Hasan MS. Dengue and Dengue Haemorrhagic Fever in Children During the 2000 Outbreak in Chittagong, Bangladesh. Dengue Bulletin 2001;25:33-39.

17. Aggarwal A, Chandra J, Aneja S, Patwari AK, Dutta AK. An epidemic of dengue hemorrhagic fever and dengue shock syndrome in children in Delhi. Indian Pediatr 1998;35:727-732.

18. Pushpa V, Venkatadesikalu M, Mohan S, Cherian T, John TJ, Ponnuraj EM. An epidemic of dengue haemorrhagic fever/dengue shock syndrome in tropical India. Ann Trop Pediatr 1998;18:289-293.

19. Lei HY, Yeh TM, Liu HS, Lin YS, Chen SH, Liu CC et al. Immunopathogenesis of dengue virus infection. J Biomed Sci; 2001;8(5):377-388.

20. Shah I, Deshpande GC, Tardeja PN. Outbreak of Dengue in Mumbai and Predictive Markers of dengue Shock Syndrome. J Trop Pediatr. 2004;50:301-305.

21. Kalayanarooj S, Vaughn DW, Nimmannitya S, Green S, Suntayakorn S, Kunentrasai N, et al. Early clinical and laboratory indicators of acute dengue illness. J Infect Dis 1997;176:313-321.

22. Lum LC, Thong MK, Cheah YK. Dengue-associated adult respiratory distress syndrome. Ann Trop Pediatr.1995;15(4):335-339.

23. Quiroz-Moreno R, Mendez GF, Ovando- Rivera KM. Clinical Utility of ultrasound in the identification of dengue hemorrhagi fever. Rev Med inst Mex Seguro Soc 2006;44(3):243-348.

24. Setiawan MW, Samsi TK, Pool TN ,Sugianto D, Wulur H. Gallbladder wall thickening in dengue hemorrhagic fever: an ultrasonographic Study. J Cin Ultrasound 1995;23(6):357-362.