ORIGINAL ARTICLE

CLINICAL PROFILE OF CHILDREN WITH DENGUE AND FACTORS ASSOCIATED WITH SEVERE DENGUE AND DENGUE WITH WARNING SIGNS

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Abstract

Aim: To study the clinical profile of children with dengue and determine risk factors associated with severe dengue.

Methods: An observational prospective study was conducted in the pediatric ward and Pediatric Intensive Care Unit (PICU) in a Medical College in Mumbai, India over 2 years duration. Patients were classified for their severity based on World Health Organization (WHO) 2009 criteria for dengue. Factors associated with severe dengue and dengue with warning signs were determined.

Results: Out of 100 patients enrolled, mean age of presentation was 5.82 years. Forty-five children had dengue without warning signs, 44 had dengue with warning signs and 11 had severe dengue. Fifty-three children were in the age group of 6 to 12 years. Male: Female ratio was 1.43: 1. Common clinical presentations were fever (100%), vomiting (57%), rash (50%), malaise (49%), hepatomegaly (46%), abdominal pain (44%), positive tourniquet test (45%), headache (45%), petechiae (37%) and bleeding manifestation (26%). Abdominal pain (79.5%) (p=0.0109), petechiae (62.2%) (p=0.0466), bleeding manifestations (65.4%) (p=0.0305), hepatomegaly (76.1%) (p=0.035) and splenomegaly (60%) (p=0.026) were more common with dengue with warning signs. Altered sensorium, convulsion, circulatory failure and hypotension were seen in children with severe dengue.

Conclusion: Most of the patients with dengue present in the age group of 6-12 years and have dengue with warning signs or severe dengue. There is a male preponderance mostly due to more outdoor activities. Abdominal pain, petechiae, bleeding manifestations and hepatosplenomegaly suggest dengue with warning signs and need more aggressive management.

Keywords

Dengue hemorrhagic fever, Dengue virus, Dengue.

Introduction

Dengue Fever is one of the arthropod borne diseases that are on the rise in India. (1) Dengue Fever (DF) and Dengue Hemorrhagic Fever (DHF) have emerged as a global public health problem. Infact dengue is hyper endemic in many urban, periurban and rural areas with frequent epidemics. (2)The south-east Asia region is one of the regions at highest risk of DF/DHF accounting for 52% of global risk. (3) Typically, people infected with dengue virus are asymptomatic or have mild symptoms (80%), others have more severe illness (5%), and in a small proportion it is life threatening. (4) Severe disease is more common in infants and young children and in contrast to many other infections, it is more common in well-nourished children. (5) According to World Health Organization (WHO) criteria 2009, patients are classified as severe dengue if they have manifestations of severe plasma leakage, severe hemorrhage or severe organ impairment. (6) Dengue may be diagnosed by microbiological laboratory testing for viral antigen detection or specific antibodies (serology), nucleic acid detection by PCR. (7) Early detection based on clinical suspicion and corroboratory laboratory evidence can help to limit number of cases that progress to developing complications with timely intervention. With there being an increasing number of cases detected, a study of the basic clinical and hematological aspect of the disease is important. Thus this study was undertaken classify and study the clinical profile of the patients with dengue at a tertiary care centre in Mumbai.

Methods & Materials

An observational prospective study was conducted in the Pediatric ward and Pediatric Intensive Care Unit (PICU) in a medical college in Mumbai over a period of 2 years (Dec 2013 to Dec 2015). All the patients with laboratory confirmed dengue (either a positive Dengue NS1 antigen or a positive Dengue IgM or a positive Dengue PCR) hospitalized over a period of these 2 years in age group 1 month-12 years were included in study after approval of hospital ethics committee and written consent of the parents. Patients having other co-infections like malaria, typhoid or infective hepatitis, immunocompromised patients were excluded from the study. Detailed clinical manifestation, laboratory investigations and treatment details were recorded into a case proforma. Nutritional status was assessed by World Health Organization (WHO) guidelines and patients were classified as severe malnutrition and moderate malnutrition. (8) Tourniquet test was considered as positive if there were more than 20 petechiae per 2.5cm square. (9) Tachycardia was defined as pulse rate more than normal for age and tachypnea was defined when respiratory rate was more than normal for the age as per American Heart Association (AHA) guidelines 2010. (10) Hypotension was defined when blood pressure (BP) was less than age as per AHA guidelines. (10). Circulatory failure was also defined as per AHA guidelines. (10). Patients were classified as dengue without warning signs, dengue with warning signs or severe dengue according to the WHO classification 2009. (6) Treatment was given according to severity based on WHO 2009 protocol. (6) Outcome in terms of mortality & morbidity was noted. Factors associated with severe dengue were determined.

Statistical Analysis

Qualitative data was represented as frequency and percentage. Association between qualitative variables were assessed by Chi-Square test or Fisher's Exact test Analysis of Quantitative data was done using unpaired t-test, Mann-Whitney Test or One-way ANOVA. P value of <0.05 was taken as significant.

Results

Total 100 patients were enrolled in the study. Forty-five children had dengue without warning signs, 44 had dengue with warning signs and 11 had severe dengue. Fifty-three children were in the age group of 6 to 12 years, 36 were between 1-5 years of age and 11 were infants. Mean age of presentation was 5.8 years.

Table 1: Clinical Features of patients with dengue

Clinical Features	No. of patients (n=100)
Fever	100
Vomiting	57
Rash	50
Malaise	49
Hepatomegaly	46
Abdominal pain	44
Tourniquet test Positive	45
Headache	45
Petechiae	37
Bleeding manifestation	26
Tachycardia	17
Splenomegaly	10
Signs of circulatory failure	8
Hypotension	7
Altered sensorium	3
Convulsion	2

Table 2: Factors associated with severe dengue and dengue with warning signs.

Factors		Severe Dengue	Dengue with warning signs	Dengue without warning signs	Total	p-value
Age (years)	< 1 years	0	3 (27.3%)	8 (72.7%)	11 (100%)	0.29
	> 1 to 5 years	4 (11.1%)	15 (41.7%)	17 (47.2%)	36 (100%)	
	6 to 12 years	7 (13.2%)	26 (49.1%)	20 (37.7%)	53 (100%)	
Gender	Female	6 (14.6%)	19 (46.3%)	16 (39.0%)	41 (100%)	0.479
	Male	5 (8.5%)	25 (42.4%)	29 (49.2%)	59 (100%)	
Nutritional status	Severe undernutrition	0	4 (50%)	4 (50%)	8 (100%)	0.590
	Moderate undernutrition	2 (7.1%)	11 (39.3%)	15 (53.6%)	28 (100%)	
	Normal nutrition	9 (14.1%)	29 (45.3%)	26 (40.6%)	64 (100%)	
Malaise		7 (14.3%)	20 (40.8%)	22 (44.9%)	49 (100%)	0.559
Abdominal Pain						
Vomiting		8 (14.0%)	28 (49.1%)	21 (36.8%)	57 (100%)	0.145
Rash		6 (12.0%)	21 (42.0%)	23 (46.0%)	50 (100%)	0.903
Petechiae		10 (27.0%)	23 (62.2%)	4 (10.8%)	37 (100%)	0.0466
Bleeding Manifestation		9 (34.6%)	17 (65.4%)	0	26 (100%)	0.0305
Headache		6 (13.3%)	18 (40.0%)	21 (46.7%)	21 (46.7%)	0.686
Tachycardia		6 (35.3%)	10 (58.8%)	1 (5.9%)	17 (100%)	0.0024
Hepatomegaly		11 (23.9%)	35 (76.1%)	0	46(100%)	0.035
Splenomegaly		3 (30%)	6 (60%)	1 (10.0%)	10(100%)	0.026
Positive Tourniquet test		8 (17.8%)	26 (57.8%)	11 (24.4%)	45 (100%)	0.00067

Male: female ratio was 59:41. Sixty-four children had normal nutrition, 28 had moderate malnutrition and 8 had severe malnutrition. The common clinical features are depicted in Table 1. Factors associated with severe dengue and dengue with warning signs is depicted in Table 2. The mean duration of stay was 9.18 days for severe dengue, 6 days for dengue with warning signs and 3.96 days for dengue without warning signs respectively. The mortality rate in our study was 2%. Both patients died due to severe dengue.

Discussion

In our study, 44% of children had dengue with warning signs and 11% had severe dengue. This is in contrast with the study done by Kalanayarooj et al where 58.4% had dengue with warning signs and only 1.1% were severe dengue. (11) In a study by Prasad et al, 16% patients had dengue with warning signs and 82.1% as severe dengue. (12) In another study by Sahana et al, 27.2% had dengue with warning signs and 24.7% had severe dengue. (13) This variance in the subject distribution as per the classification of dengue may be attributable to the timing of admission, the awareness in the draining community and timely intervention.

Most of the patients in our study were in age group 6 to 12 years. Similarly most studies have reported the common age group of presentation to be between 4.9 -12 years. (2,14-16) More prevalence of dengue in this age group is probably due to more involvement in outdoor activities during the day time exposing them to a higher risk of mosquito bites. Though Shah et al (2) and Vincente et al (17) have shown that younger age is one of the predictive marker for DSS and DHF, in our study we found that severity of dengue was not related to age. Similarly, Maron et al showed no association between age and severity of dengue fever. (18) In a study by Pongpan et al, age more than 6 years is found to be a significant risk factor for severity. (19) However none of the above studies were based on WHO classification 2009.

Though we found a male preponderance in our study as seen in other studies (2), there was no association between gender and severity of dengue as seen in other 2 studies. (18,19) Male preponderance was seen in our study probably due to more involvement of boys in outdoor activities with increased risk of exposure to mosquitoes.

In our study we found that dengue affects most of the children with normal nutritional status but nutritional status is not a predictor of severity for dengue. Similarly, Kalayanarooj et al reported in a review of over 4,000 cases that shock was more common in malnourished children with dengue infection. (11) In another study by Maron et al, nutrition does not appear to be a risk factor for severe forms of dengue infection, nor does malnutrition appear to be predictive of good outcomes. (18)

Though vomiting is considered as one of the feature of severe dengue (20), we did not find the same in our study. Abdominal pain is reported as another prognostic factor for severe dengue. (20-22) We found the same in our study. It could be caused by gastrointestinal bleeding and/or hepatomegaly. Junia et al in their study proposed that during the shock or pre-shock state, blood supply to visceral organs was reduced causing tissue hypoxia followed by abdominal pain. (21) However, this has not been found in other studies. (19,22) Thus cause of abdominal pain remains undefined. In our study, we found that abdominal pain, petechiae, bleeding manifestations and hepatosplenomegaly were more common with dengue with warning signs whereas altered sensorium, convulsion, circulatory failure and hypotension were seen in children with severe dengue. Similarly, bleeding manifestations, hepatomegaly have been found to be predictive of severity. (19,23,24)

We found that patients with severe dengue had a longer stay in the hospital. Also mortality was 2% and both children had severe dengue. Similarly, case fatality rates for the world are approximately 1%, but in India, the focal outbreaks have reported case-fatality rates of 3-5 %. (16)

Conclusion

Most of the patients with dengue present in the age group of 6-12 years and have dengue with warning signs or severe dengue. There is a male preponderance mostly due to more outdoor activities. Most of patients present with fever, vomiting, rash, malaise, hepatomegaly, abdominal pain, positive tourniquet test, headache, petechiae and bleeding manifestation. Abdominal pain, petechiae, bleeding manifestations and hepatosplenomegaly were more common with dengue with warning signs whereas altered sensorium, convulsion, circulatory failure and hypotension were seen in children with severe dengue.

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References :

1. Chaturvedi UC, Nagar R. Dengue and dengue hemorrhagic fever: Indian perspective. J Biosci. 2008 Nov;33(4):429-41.
2. Shah I, Deshpande GC, Tardeja PN. Outbreak of dengue in Mumbai and predictive markers for dengue shock syndrome. J Trop Pediatr. 2004 Oct; 50(5):301-5.
3. World Health Organization (WHO). Prevention and control of dengue and dengue hemorrhagic fever: comprehensive guidelines. WHO SEARO Regional Publication, 1999;29.
4. Oishi K, Saito M, Mapua CA, Natividad FF. Dengue illness: clinical features and pathogenesis. J Infect Chemother. 2007;13(3):125-33.
5. Ranjit S, Kissoon N. Dengue hemorrhagic fever and shock syndromes. Pediatr Crit Care Med. 2010;12(1):96-100.
6. World Health Organization (WHO). Geneva. Dengue: Guidelines for diagnosis, treatment, prevention and control. WHO;2009:1-144.
7. Guzman MG, Halstaed SB, Artsob H. Dengue: a continuing global threat. Nat Rev Microbiol. 2010;8(12):S7-S16.
8. Elizabeth KE. Nutrition and child development: Triple burden of Malnutrition.4th ed. New Delhi: Paras Medical Publisher; 2010.
9. Halstead, Scott B. Dengue. London. Imperial College Press.

2008: 180 & 429.
10. Kleinman ME, Chameides L, Schexnayder SM, Samson RA, Hazinski MF, Atkins DL, et al: Pediatrics advanced life support: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Paediatrics. 2010; 126:e136-e1399
11. Kalayanarooj S. Dengue classification: current WHO vs newly suggested classification for better clinical application? J Med Assoc Thai. 2011 Aug;94 Suppl 3:S74-84.
12. Prasad D, Kumar C, Jain A, Kumar R. Accuracy and applicability of the revised WHO classification (2009) of dengue in children seen at a tertiary healthcare facility in northern India. Infection. 2013 Aug;41(4):775-82.
13. Sahana KS, Sujata R. Clinical Profile of Dengue among Children According to Revised WHO Classification: Analysis of a 2012 Outbreak from Southern India. Indian J Pediatr. 2015 Feb;82(2):109-13
14. Gomber S, Ramachandran VG, Kumar S, Agarwal KN, Gupta P, Dewan DK et al. Hematological observation as diagnostic marker in dengue hemorrhagic fever- a reappraisal. Indian Pediatr. 2001 May;38(5): 477-481.
15. Rasul CH, Ahasan HA, Rasid AK, Khan MR. Epidemiological factors of dengue hemorrhagic fever in Bangladesh. Indian Pediatr. 2002 Apr;39(4):369-372 .
16. Dayal A, Wani A, Prasad VSV. Recent Advances in Management of Dengue in Children: Correlation of Clinico-Patho-Radiological parameters, with the severity of illness and outcome. 2014[cited 2014 Oct 12] available from: http://www.indus.org/healthcare/Secientific%20Sessions/Dr.%20Anjul%20Dayal-Advances%20in%20Management%20of%20Dengue%20in%20Children.pdf
17. Vicente CR, Lauar JC, Santos BS, Cobe VM, Junior CC. Factors related to severe dengue during an epidemic in Vitória, State of Espírito Santo, Brazil, 2011. Rev Soc Bras Med Trop. 2013 Sep-Oct;46(5):629-32.
18. Maron GM, Clara AW, Diddle JW, Pleites EB, Miller L, McDonald G et al. Association between Nutritional Status and Severity of Dengue Infection in Children in El Salvador. Am J Trop Med Hyg. 2010 Feb;82(2):324–329.
19. Pongpan S, Wisitwong A, Tawichasri C, Patumanond J. Prognostic Indicators for Dengue Infection Severity. International J Clin Pediatr. 2013;2(1):12-18.
20. Diaz-quijano FA, Martinez-vega RA, Villarcenteno LA. Early indicators of severity in dengue virus infection. Enferm Infecc Microbiol Clin. 2005 Nov;23(9):529-32.
21. Junia J, Garna H, Setiabudi D. Clinical risk factors for dengue shock syndrome in children. Paediatr Indones. 2007;47(1):7-11.
22. Al-Araimi H, Al-Jabri A, Mehmoud A, Al-Abri S. Dengue Hemorrhagic Fever presenting as Acute Abdomen. Sultan Qaboos Univ Med J. 2011 May;11(2):265-268.
23. Pham TB, Nguyen TH, Vu TQ, Nguyen TL, Malvy D. [Predictive factors of dengue shock syndrome at the children Hospital No. 1, Ho-chi-Minh City, Vietnam]. Bull Soc Pathol Exot. 2007 Feb;100(1):43-47.
24. Falconar AK, Romero-Vivas CM. Simple Prognostic Criteria can Definitively Identify Patients who Develop Severe Versus Non-Severe Dengue Disease, or Have Other Febrile Illnesses. J Clin Med Res. 2012 Feb;4(1):33-44.

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