

Comparison of Clinical Features and Outcome of Dengue Infection Between Children and Adults : A Hospital Based Study

Farid Uddin Ahmed^{1*} Mitra Datta² Nur Jahan Aktar³

ABSTRACT

Background: Epidemiological profile of dengue has been changing progressively over the past several years and is currently characterized by an increase in the number of cases in different age groups in different parts of world. We investigated an outbreak in 2019 in an endemic area of Bangladesh aimed at comparing the clinical features and outcome between adults and children with dengue.

Materials and methods: We performed a prospective analysis of 617 individuals (192 children \leq 12 years and 425 adults $>$ 12 years of age) with serologically-confirmed dengue cases who sought treatment at Chittagong Medical College Hospital from July to December 2019. All enrolled patients were treated according to the standard management protocol of national dengue guideline.

Results: Children comprise of 114 males and 78 females with a mean age of 7.04 (\pm 3.23) years and adults comprise of 327 males and 98 females with a mean age of 28.94 (\pm 12.52) years. Regarding clinical symptoms headache and myalgia/arthralgia were more common among adults, but abdominal pain, skin rashes, positive tourniquet test were more likely in the child cases. Bleeding manifestations were low in both groups without any statistical significance. In addition, children exhibited a higher frequency (11.5%) of the severe forms of the disease relative to adult (5.4%) but ICU admission was significantly higher among children (9.4%) compared to adults (3.4%). There was no fatality in children but 5 (1.2%) adults expired in hospital.

Conclusion: Based on these results, this study demonstrated significant differences in the clinical presentations, disease severity and outcome between hospitalized adults and children affected by dengue.

Key words: Dengue fever; Patient outcome; Children; Adults.

INTRODUCTION

Dengue has rapidly spread in all regions of World Health Organization (WHO) in recent years. Disease spectrum is wide and can range from subclinical disease to severe flu-like symptoms. Although less common, some people develop severe dengue, which can be any number of complications associated with severe bleeding, organ impairment and/or

plasma leakage. In recent years severe dengue affects most Asian and Latin American countries and has become a leading cause of hospitalization and death among children and adults in this regions¹. The largest number of dengue cases ever reported globally was in 2019. Nationwide occurrence of dengue fever in 2019 dengue outbreak in Bangladesh began primarily in April 2019 and reported cases reached a total of 101,354 with 164 dengue deaths. In 2018 the number of dengue fever patients was 10,148 and 26 of them died²⁻⁴.

The changing patterns of affected age groups and clinical severity of dengue infection are not well understood. This could be due to more reports with a greater interest in adult patients, the differences of serological coverage in various endemic areas or variations in the virulence of dengue virus strains⁵. There are few reports on the clinical and laboratory differences in children and adults with dengue⁶⁻¹¹. Age-related differences in dengue severity and outcome are poorly understood and the recent detailed information is not

1. Assistant Professor of Community Medicine
Chittagong Medical College, Chattogram, Bangladesh.
2. Assistant Professor of Pediatric Medicine
Chittagong Medical College, Chattogram, Bangladesh.
3. Post Graduate Student of Internal Medicine (Thesis Part)
Chittagong Medical College, Chattogram, Bangladesh.

*Correspondence to:

Dr. Farid Uddin Ahmed

Mobile : +88 01727 78 97 00

Email: fuahmed_34@yahoo.com

Date of Submission : 15-01-2020

Date of Acceptance : 25-01-2020

available about the differences between the two groups, therefore it has become increasingly important to elucidate the clinical differences between them¹².

This study was carried out to determine the differences in the clinical manifestations and outcome of hospitalized children and adults with dengue virus infection admitted to the tertiary hospital of Chattogram during 2019 outbreak in Bangladesh.

MATERIALS AND METHODS

This prospective observational study was carried out from July to December 2019 in Chittagong Medical College Hospital (CMCH) 2nd largest tertiary care hospital of Bangladesh. A total 192 infant and children, aged 0-12 years and 425 adults (>12 years) who were admitted during this time with a confirmed diagnosis of Dengue Fever (DF) (Positive to Dengue NS1 antigen and/or anti-dengue IgM antibodies) were included in the study. Prior approval was taken from the Ethical Review Committee of CMC and informed consent was obtained from the patients and guardian of the patient as required.

Detailed history was taken and clinical examination was performed on admission; and subsequently during the stay in the hospital. Dengue cases were classified according to WHO revised classification-2009^{13,14}. The laboratory investigations like complete blood count including-hemoglobin level, Platelet count and Packed Cell Volume (PCV) was done in all the cases and repeated. Chest X-ray, ultrasonography of the abdomen and chest, Liver and renal function tests were done when needed. All enrolled patients were treated according to the standard management protocol of national Dengue guideline (Published in collaboration with WHO and Ministry of Health and Family welfare, Bangladesh)¹⁵. Patients were discharged from hospital when fever subsided and/or vital signs became normal.

A statistical analysis was performed to evaluate the differences in the clinical and laboratory manifestations among individuals with dengue from the two age groups: adults and children. For between groups comparison, a chi-square analysis or Fisher's exact test were performed for the categorical variables. Continuous variables were compared by independent sample t-test. p-values lower than 0.05 were considered to be significant. Data analysis was performed with the software program SPSS version 23.0 for Windows.

RESULTS

Of the patients admitted to CMCH with a diagnosis of dengue infection included in this study 192 were children and 425 were adults. Though male was predominate in both groups, proportion was significantly higher in adults ($p < 0.001$). Proportion of patients resides in urban area and hill tracts were significantly higher in child patients compared to adults (Table I).

Fever was present in all patients, about half of both children and adults had symptoms of vomiting. Abdominal pain and skin rashes were more common in children. On the other hand headache and arthralgia/myalgia were more common in adults. Bleeding manifestations were low in both groups without any statistical significance. Positive tourniquet test results were more likely in the child cases (Table II).

The proportion of DF without warning signs (91.3%) among the adults was higher than for the children (66.7%) and the proportion of severe dengue (5.4%) in adults was lower than the children (11.5%) (Figure I). A chi-square test of independence was performed to examine the relation between dengue severity and age groups. The relation between these variables was significant ($p < 0.001$).

Mean duration of hospital stay was significantly lower in cases of children than in adults. On the contrary, significantly higher number of children was referred to ICU compared to adults. All the dengue-infected children included in this study survived. Of the 425 adult patients, 5 patients (1.2%) died (Table III).

Table I: Demographic characteristics of the patients.

Variables	Children (n=192)	Adult (n=425)	p
Age (Years)			
Mean \pm SD	7.04 \pm 3.23	28.94 \pm 12.52	NA
Range	0.50-12.0	13-70	
Gender			
Male	114 (59.4)	327 (76.9)	<0.001
Female	78 (40.6)	98 (23.1)	
Residence			
Urban	127 (66.2)	188 (44.2)	
Rural	45 (23.4)	237 (55.8)	<0.001
Hill tracts	20 (10.4)	-	

Table II : Comparison of clinical features of the dengue patients.

Clinical features	Children (n=192)	%	Adult (n=425)	%	p
Fever	192	100	425	100	NA
Abdominal pain	176	91.7	63	14.8	<0.001
Vomiting	92	47.9	188	44.2	0.365
Headache	45	23.4	333	78.4	<0.001
Arthralgia/Myalgia	28	14.5	238	56.0	<0.001
Skin rash	22	11.4	21	4.9	0.003
Bleeding manifestations	8	4.2	31	7.3	0.139
Reduced urine output	16	8.3	13	3.1	0.007
Positive tourniquet test	8	4.2	5	1.2	0.008

Table III: Outcome pattern of dengue patients.

Parameters	Children (n=192)	Adult (n=425)	p
LOS (Days)	4.4 (±1.47)	5.6 (±2.58)	<0.001
Need for ICU	18 (9.4%)	14 (3.3%)	0.002
Mortality	-	5 (1.2%)	0.331

LOS: Length of hospital stay.

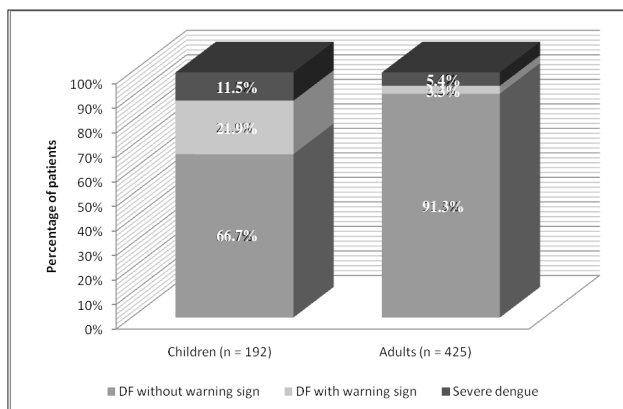


Figure 1: Severity of dengue infection in children and adults.

DISCUSSION

The first epidemic of dengue hemorrhagic fever occurred in Bangladesh, in mid-2000 when 5,551 dengue infections were reported from Dhaka, Chattogram and Khulna cities, occurring mainly among adults¹⁶. From then onwards, dengue outbreaks have occurred in small or large scales every year in Bangladesh¹⁷⁻²⁰. In the last year Bangladesh has experienced an unprecedented dengue outbreak that has resulted in an enormous increase in the number of cases and mortality as compared to previous years²⁻⁴. This study examined the clinical features and outcome of hospitalized dengue cases in a tertiary hospital of Chattogram during the year 2019 in children and adults.

Mean age of the patients of children group was 7 years and in adult group it was around 28 years. Other studies also demonstrated that, the older children and younger adults were predominantly affected by dengue^{8,9,12}.

In this study, we detected a higher prevalence of men who were infected with dengue than of women in children and adults, though the trend was more prominent in adults. These data are similar to those reported by a study in Asiabut different from other studies conducted in Nicaragua and Brazil^{6,8,10,13}.

All patients irrespective of the age group presented with fever during illness; fever is an essential criterion for a diagnosis of DF. Another prominent symptom in both groups was vomiting. We found a higher prevalence of headache and

myalgia/ arthralgia in adults. These findings may be related to the difficulty in identifying these signs and symptoms by the parents and the children. In contrast, abdominal pain was less common among adults. In our study, skin rash was observed in few cases with significantly higher proportion in children, probably because a large percentage of patients were admitted after this manifestation had abated. Bleeding manifestations were low in both groups without any statistical significance. Tourniquet test were more likely to be positive in the child cases. Differences in clinical features were observed between children and adult patients in previous studies and there are disagreement among these studies⁶⁻¹¹. It is probably explained by the facts that studies were conducted in different geographical location at different time.

In accordance with a previous study a low prevalence of severe dengue cases (11.5% in children and 5.4% in adults) was observed in the current study⁸. We ascribe these findings to the efficacy of the government policy, which advises patients to seek medical assistance immediately after the onset of clinical manifestations and recommends that a diagnosis be based on the clinical evolution of the disease, thereby reducing the risk of disease development to the severe forms, such as dengue shock syndrome².

There was no mortality among the children in the present study. Other recent studies conducted in pediatric age group also reported such favorable outcome in the entire cohort^{12,21}. Studies also reported that, early diagnosis and prompt management above all awareness of the disease among the study population are important to minimize or avoid mortality^{12,21}. Although the mortality rates for both groups were not significantly different in the current study 5 (1.2%) adult patients expired in hospital. Notably, age per se has previously been reported to be a high-risk factor for mortality in dengue infection⁶.

LIMITATION

Certain limitations should be kept in mind while deciding on the implications of the findings of the study. The study was conducted in a single hospital and the patient population may have been biased by the referral pattern. Relevant laboratory testing and imaging studies were not compared in the study due to unavailability in most cases. Lack of serotype identification was another limitation.

CONCLUSION

Nevertheless, our study has provided information regarding the comparison of dengue-infected children and adults in Chattogram, Bangladesh and has highlighted differences in clinical manifestations, severity and outcome between these two groups. The presence of classic symptoms (Fever, headache and myalgia) was observed in the adult's dengue

prominently. Adult patients with dengue typically present with symptoms of headache and arthralgia. Children manifests mainly with abdominal pain and vomiting. There were no differences between these two age groups about the presence of fever, vomiting and bleeding manifestations. Children had a higher risk of severe dengue but lower mortality risk than adults.

The age related differences in clinical manifestations and outcome described in this study indicate the importance of comparing a wide range of ages in future clinical studies of dengue identifying the complete serotype and genome sequencing of several dengue viruses.

ACKNOWLEDGMENTS

It was a self funded study. The authors would like to thank all survey participants and their guardians for their involvement, as well as the physicians of the respective wards of CMCH for their collaboration and cooperation.

DISCLOSURE

All the authors declared no competing interest.

REFERENCES

- World Health Organization. Dengue and Severe Dengue (Online). Update: 23 June, 2020.
Available from: <https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue>. Accessed on: 13 August, 2020.
- Health Bulletin on current Dengue situation published by CDC, DGHS (Online).
Available from: <https://dghs.gov.bd/index.php/en/home/5175-health-bulletin-on-current-dengue-situation-published-by-cdc-dghs>.
- Dengue Current Situation. Institute of Epidemiology, Disease Control and Research (Online).
Available from: <https://www.iedcr.gov.bd/website/index.php/dengue/219>.
- 2019 Dengue Outbreak in Bangladesh (Online).
Available from: https://en.wikipedia.org/wiki/2019_dengue_outbreak_in_Bangladesh.
- Bäck AT, Lundkvist A. Dengue viruses - An overview. *Infect EcolEpidemiol.* 2013; 3: 10.3402/iee.v3i0.19839
- Wang CC, Lee IK, Su MC, Lin HI, Huang YC, Liu SF et al. Differences in clinical and laboratory characteristics and disease severity between children and adults with dengue virus infection in Taiwan, 2002. *Trans R Soc Trop Med Hyg.*2009;103(9): 871–877.
- Kittigul L, Pitakarnjanakul P, Sujirarat D, Siripanichgon K. The differences of clinical manifestations and laboratory findings in children and adults with dengue virus infection. *J ClinVirol.*2007; 39(2): 76–81.
- De Souza LJ, Pessanha LB, Mansur LC, de Souza LA, Ribeiro MBT, do Vale da Silveira M et al. Comparison of clinical and laboratory characteristics between children and adults with dengue. *Braz J Infect Dis.*2013;17(1):27–31.
- Wichmann O, Hongsiriwon S, Bowonwatanuwong C, Chotivanich K, Sukthana Y, Pukrittayakamee S. Risk factors and clinical features associated with severe dengue infection in adults and children during the 2001 epidemic in Chonburi, Thailand. *Trop Med Int Health.* 2004;9(9):1022-1029.
- Hammond SN, Balmaseda A, Pérez L, Tellez Y, Saborío SI, Mercado JC et al. Differences in dengue severity in infants, children, and adults in a 3-year hospital-based study in Nicaragua. *Am J Trop Med Hyg.* 2005;73(6):1063-1070.
- Hanafusa S, Chanyasanha C, Sujirarat D, Khuankhunsathid I, Yaguchi A, Suzuki T. Clinical features and differences between child and adult dengue infections in Rayong Province, southeast Thailand. *Southeast Asian J Trop Med Public Health.* 2008;39(2):252-259.
- Shultana K,Rahman AZMM , Baki AA, Khan MSI, Deb B, Chowdhury D, et al. Dengue Infection in Children: Clinical Profile and Outcome in Dhaka City. *American Journal of Pediatrics.* 2019; 5(3):111-115.
- World Health Organization. Dengue: Guidelines for diagnosis, treatment, prevention and control. Geneva. 2009. [Cited 2013 June 10].
Available from: <http://www.who.int/tdr/publications/documents/dengue-diagnosis>.
- World Health Organization. Comprehensive guidelines for prevention and control of dengue and dengue haemorrhagic fever. 2011. Revised and expanded edition. [Internet] http://apps.searo.who.int/pds_docs/B4751.
- National Guideline for Clinical Management of Dengue Syndrome. National Malaria Elimination & Aedes Transmitted Disease Control Program Disease Control Unit Directorate General of Health Services Mohakhali. Dhaka. 2018.
- Yunus EB, Bangali AM, Mahmood MAH, Rahman MM, Chowdhury AR, Talukder KR et al. Dengue Outbreak 2000 in Bangladesh: From Speculation to Reality and Exercises. *Dengue Bulletin.* 2001;25:15-20.
- Pervin M, Tabassum S, Ali MM, Mamun KZ, Islam MN. Clinical and Laboratory Observations associated with the 2000 Dengue Outbreak in Dhaka, Bangladesh. *Dengue Bulletin.* 2004; 28: 96-106.

