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Original research article

A Study of Clinical and Laboratory Parameters of Dengue Fever with Respect to Onset of Complications in Paediatric Patients

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Abstract

Background: Dengue fever is a major public health problem especially in Indian subcontinent. It is a mosquito – borne arboviral infection which results in significant morbidity and mortality. The complications of dengue fever usually happen after the 5th day of illness which include fluidleak, bleeding, hepatitis, encephalopathy, ARDS. The studies on dengue in paediatric age group are scant in this part of the country. Hence this study was taken up with aim of analysing the clinical and haematological and radiological parameters in children during the febrile phase of dengue and correlating them with onset of complications**.**

Objective: To study the clinical profile, laboratory parameters of dengue fever in paediatrics age group compare them with complications.

Material and methods: Cross sectional study was conducted in PMCH, on 250 pediatric cases presenting with fever for 2 to 7 days, presenting at OPD/IPD of pediatric department Study duration of Two years..

Results: This study had shown that, the age group was between 6 – 9 years, males sex, fever was the common sign, hepatomegaly was the common sign, leucopenia, reduced platelet count, NS1 positive, IgM and IgG positive, normal C3 count, positive widal test abnormal USG abdomen, more than 5 days of hospitalization and mortality was present in 11.1% of the cases.

Conclusion: Dengue was common and dreadful mosquitoborne disease which can be prevented easily. Prompt early recognition of signs and symptoms can present further progressions of the disease and prevention of the morbidity and mortality due to this disease.

Keywords: Dengue hemorrhagic fever, Complications, Laboratory investigations, Mortality, Pediatric patients.

Introduction

Dengue fever is an internationally recognized major public health problem especially in tropical and subtropical countries mainly affecting urban and sub urban areas. It is a most common mosquito – borne arbo viral infection (single stranded RNA virus) which results in significant morbidity and mortality. The dengue virus is capable of infecting humans and causing the disease. The estimates have shown that, 2.5 billion people are mainly living in urban areas who are under risk of acquiring the infection.[1] The literature available has shown that, the dengue is more common in more than 100 countries, most cases are reported mainly from South East Asiaand western pacific regions.[2] There are about 50 and 100 million cases of dengue fever (DF) and about 500,000 cases of dengue hemorrhagic (DHF) each year which

requirehospitalization. It has become a leading cause of hospitalization and death especially among the children in the South – East Asia region of WHO over last 10 – 15 years following diarrhoea disease and acute respiratory infections.[3] Dengue is a mosquito - borne disease caused by serologically related but antigenicallydistinct single strand positive RNA viruses. The literature available had shown that four different types of serotypes are known cause Dengue infection (DENV through DENV - 4. They belong to flavivirus family (Family flaviviridae). Aedes Aegypti is the primary mosquito vector but other species of genus Aedes, such as Aedes albopictus can also act as vector for the virus transmission. The clinical spectrum may range from asymptomatic infection, mild dengue fever (DF), dengue hemorrhagic fever (DHF) or dengue shock syndrome, which is often fatal because of abnormal capillary permeability and plasma leakage. The disease can also manifest in unusual manner resulting in myocardiopathy, hepatic failure and neurological disorders. Specific treatment for the dengue is not available till today but only vector control is the main preventive strategy.[4] The dengue virus is often confused with other febrile illness of viral origin which confounds both clinical management and disease surveillance for prevention of viral transmission. Non specific clinical symptoms predominate during the early phase of illness which makes the clinical management difficult. Retro-orbital pain and clinical signs including petechiae are definitive symptom and sign which do not appear until the later stage of illness.[5] The diagnostic tests such as RT- PCR is costly; not sufficiently rapid, such as virus isolation or under field trials including ELISA for NS1 protein of Dengue virus can be used atearly stages of illness. Simple haematological or biochemical tests are the need of the hour which can be useful for case management and preventing mortality and morbidity.[6] The radiological techniques including ultrasonography is useful in diagnosing GB wall thickening, pericholecystic fluid, minimal ascites, pleural effusion, pericardial effusion and hepatosplenomegaly. The ultrasonography was also able to find the abnormality of liver parenchyma which can be due to intraparenchymal and subcapsular haemorrhages. GB wall thickening in DF can be due to decrease in intravscualr osmotic pressure.[7]The complications of dengue fever usually happen after the 5th day of illness. The complications of dengue include fluid leak, bleeding, hepatitis, encephalopathy, ARDS especially in paediatric age group and its most important public health problem in tropical developing countries and also have a major economic and social impact. The studies on dengue in paediatric age group are scant in this part of the country. Hence this study was taken up with aim of analysing the clinical and haematological and radiological parameters inchildren during the febrile phase of dengue and correlating them with onset of complications[8].

Objectives

*****To study the clinical profile, laboratory parameters of dengue fever inpaediatric age group.
*To study the laboratory parameters (C3 level, CBC) and compare them withcomplications.
*To study the Chest X ray, ECHO and USG abdomen findings among thecomplicated cases.

Material and Methods

A cross sectional study was undertaken in the Department of Paediatrics of Patna medical college and Hospital Patna And NMCH, Sasaram, among 250 cases presenting with fever for 2 to 7 days from the outpatient and inpatients departments Study duration of Two Years. Clearance from institutional ethics committee was obtained before the study was started. An informed Bilingual and written consent was obtained from the close patient relatives before the study was started. The calculated sample size was 250 cases and calculated as follows,
According to study done by Sharma RS et al[9], the Attack rate of dengue fever during Epidemics is between 40 – 50%. The endemicity of the disease is around 30%.

$$N=\frac{4\ Z\alpha^2 pq}{\partial^2}$$

p = Attack rate of dengue in endemic areas (30%) q = 100-p
Zα = 1.96
α = 0.05
∂ = the percentage of error (20% of 30% attack rate)
The calculated sample size is 224 cases which was approximately equal to **250 cases.** he cases definition for the selection of the dengue cases was **Dengue fever**- clinical features of dengue with NS1 positivity or IgM positivity orboth. **Complications** – Dengue fever with presence of anyone or more of the followingsigns and symptoms .

Inclusion criteria
*Serologically confirmed (positive for NS1 antigen or IgM or both) dengue fever patients, admitted at Basaveshwara Medical College Hospital and Research Centre, Chitradurga.
*Those patients whose parents give informed consent.
*All cases in paediatric age group of both sex

Exclusion criteria
*Clinical features of dengue with NS 1 negative and IgM negative.
*IgG positive cases with features of dengue.
*Lost for study (referred during the course of treatment or Discharge against medicaladvice.
*Cases of enteric fever, malaria and leptospirosis by appropriate investigation
Detailed history of patients with dengue and NS1 positive or IgM positive serological findings were enrolled into the study after obtaining parental consent. The presenting signs and symptoms that were observed among the cases who meet the inclusion criteria are: fever, headache, retro orbital pain, myalgia, arthralgia, appearance of rashes, any bleeding manifestation (epistaxis, melena, hematemesis), decreased urinary output, breathlessness and yellowish discoloration of eyes. Cases were followed up throughout the hospital stay for the onset of complicationsor until recovery. A detailed laboratory evaluation consisting of Hb% estimation, Differential count, platelet count, ESR, urine dipstick, dengue serology (done by CARD test, confirmedby ELISA), Widal test, Rapid diagnostic test for Malaria Parasite, C3 levels was done for all the cases during the time of admission. Platelet count and Haematocrit were monitored on daily basis. ECHO, ECG, LFT, CXR and USG abdomen were conducted among the patients with complications.

Results

Table 1: Distribution of the study group according to age group

Age group	**Frequency**	**Percent**
Less than 3 years	47	19.0
3 – 6 years	38	15.2
6 – 9 years	56	22.4
9 – 12 years	45	18.0
12 – 15 years	44	17.6
More than 15 years	20	8.0
Total	250	100

This study had shown that, about 22.4% of the study group were aged between 6 – 9years, 19% were aged less than 3 years, 18% were aged between 9 – 12 years, 17.6% were aged between 12 – 15 years

Table 2: Distribution of the study group according to sex

Sex	**Frequency**	**Percent**
Male	143	57.2
Females	107	42.8
Total	250	100

Table 3: Distribution of the study group according to signs

Signs	**Frequency**	**Percent**
Tachycardia	2	0.8
Raised Respiratory rate	1	0.4
Positive tourniquet test	24	9.6
Reduced blood pressure	1	0.4
Hepatomegaly	159	63.6

Hepatomegaly in 63.6% of the cases followed by positive tourniquet test in 9.6% ofthe cases and raised total count in 6% of the cases.

Table 4: Distribution of the study group according to Leucopenia and complications

Leucopenia	**Complications**		**Totaln (%)**
	No n (%)	**Yes n (%)**	
No	51 (22.9)	13 (48.1)	64 (25.6)
Yes	172 (77.1)	14 (51.9)	186 (74.4)
Total	223 (100)	27 (100)	250 (100)

χ^2 Value=8.08 df=1 P value, Sig= 0.004, Sig

Leucopenia was observed in 77.1% of the patients without complications and 51.9%of the patients with complications which was statistically significant.

Table 5: Distribution of the study group according to Platelet count and complications

Plateletcount	**Complications**		**Totaln (%)**
	No n (%)	**Yes n (%)**	
Normal	66 (29.6)	0	66 (26.4)
Decreased	157 (70.4)	27 (100)	184 (73.6)
Total	223 (100)	27 (100)	250 (100)

χ^2 Value=10.857 df=1 P value, Sig= 0.001, Sig

The platelet count was decreased in 70.4% of the patients without complications and all the patients with complications. There was a statistically significant difference in the platelet count between the patients without and with complications.

Table 6: Distribution of the study group according to NS1 test and complications

NS1 test	Complications		Totaln (%)
	No n (%)	Yes n (%)	
Negative	65 (29.1)	1 (3.7)	66 (26.4)
Positive	158 (70.9)	26 (96.3)	184 (73.6)
Total	223 (100)	27 (100)	250 (100)

χ^2 Value=8.8025 df=1 P value, Sig= 0.005, Sig

Table 7: Distribution of the study group according to IgM test and complications

IgM	Complications		Totaln (%)
	No n (%)	Yes n (%)	
Negative	142 (63.7)	16 (59.3)	158 (63.2)
Positive	81 (36.3)	11 (40.7)	92 (36.8)
Total	223 (100)	27 (100)	250 (100)

χ^2 Value=0.202 df=1 P value, Sig= 0.653, NS

The IgM test was positive in 36.3% of the patients without complications and 40.7% of the patients with complications. This difference was not statistically significant betweenthe patients without and with complications.

Table 8: Distribution of the study group according to DHF grading and complications

DHF grading	Complications		Totaln (%)
	No n (%)	Yes n (%)	
Grade I	163 (73.1)	2 (7.4)	165 (66.0)
Grade II	60 (26.9)	24 (88.9)	84 (33.6)
Grade III	0	1 (3.7)	1 (0.4)
Total	223 (100)	27 (100)	250 (100)

χ^2 Value=51.54 df=2 P value, Sig= 0.000, Sig

About 73.1% of the cases without complications were diagnosed as DHF grade I, 26.9% as grade II and none as grade III in this study. The patients with complications had noted that 7.4% were diagnosed as grade I, 88.9% as grade II and 3.7% as grade III in this study at the time of admission .

Discussion

Dengue fever is a major public health problem especially among the pediatric population. The disease is rampant in tropical and subtropical countries mainly affecting urban and sub urban areas. It is a most common mosquito – borne arbo viral infection (single stranded RNA virus) which results in significant morbidity and mortality. The estimates have shown that, 2.5 billion people are mainly living in urban areas who are under risk of acquiring the infection.[1] It has become a leading cause of hospitalization and death especially among the children in the South – East Asia region of WHO over last 10 – 15 years following diarrhoea disease and acute respiratory infections.[3] Dengue is caused by a serologically related but antigenically distinct

single strand of positive RNA viruses. The literature had shown four different types of serotypes are known cause Dengue infection (DENV through DENV - 4. The virus belongs to flaviviurs family and Aedes Aegypti is the primary mosquito vector but other species of genus Aedes, such as Aedes albopictus can also spread the disease. The clinical spectrum ranges from asymptomatic infection, mild dengue fever (DF), dengue hemorrhagic fever (DHF) or dengue shock syndrome, which is often fatal because of abnormal capillary permeability and plasma leakage. The disease may manifest as myocardiopathy, hepatic failure and neurological disorders. Specific treatment for the dengue is not available till today but only vector control is the main preventive strategy.[4] confounds both clinical management and disease surveillance for prevention of viral transmission.[5] The diagnostic tests such as RT- PCR is costly; not sufficiently rapid, such as virus isolation or under field trials including ELISA for NS1 protein of Dengue virus can be used atearly stages of illness. Simple haematological or biochemical tests are the need of the hour which can be useful for case management and preventing mortality and morbidity.[6] The radiological techniques including ultrasonography is useful in diagnosing GB wall thickening, pericholecystic fluid, minimal ascites, pleural effusion, pericardial effusion and hepatosplenomegaly. The ultrasonography was also able to find the abnormality of liver parenchyma which can be due to intraparenchymal and subcapsular haemorrhages. GB wall thickening in DF can be due to decrease in intravscualr osmotic pressure.[7] The complications of dengue fever usually happen after the 5^{th} day of illness. The complications of dengue include fluid leak, bleeding, hepatitis, encephalopathy, ARDS especially in paediatric age group and its most important public health problem in tropical developing countries and also have a major economic and social impact. [8] About 22.4% of the study group were aged between 6 – 9 years and 19% were aged less than 3 years. A study by Dhobale et al had shown that, about 39% of the children belonged to 5 – 10 years. Among them, 35.9% were females and 64.1% were males.[10] Astudy by Gupta et al had shown that the mean age was 11.6 years.[11] A study by Tamil Selvan et al had reported that, about 35.5 ere aged between 6 – 10 years.[12] A study by Shinde et al had shown that, the mean age was 8.7 years. In a study by Banerjee et al, most of the cases were school age children. Male patients outnumbered females in this study. In a study by Dhobale et al, about 72% were females and 28% were males.[10] A study by Gupta et al had reported that males outnumbered females.[11] A study by Shinde et al had shown that males were than females. Astudy by Banerjee et al had shown that about 58% of the cases were males. NS1 test was positive in 70.9% of the patients without complications and 96.3% of the cases with complications. A study by Dhobale et al had shown that, 20% had NS_1 antigen positive.[10] About 39% had NS1 positive in a study by Shinde et al. The IgM test was positive in 36.3% of the patients without complications and 40.7% of the patients with complications. In a study by Dhobale et al, 31% of the cases were IgM positive.[10] A study by Shindet al had shown that 19% were IgM positive. About 2% had both IgM and NS1 was positive. The IgG test was positive in 4.9% of the cases without and 3.7% of the cases with complications. A study by Dhobale et al had shown that, 23% had IgG positive. A study by Shinde et al had shown that 2 persons were IgG positive. About IgM & IgG was positive 3% of the cases. The C3 level was abnormal(decreased) in 11.7% of the cases without complications and 7.4% of the cases with complications. No studies have compared these findings. The widal test was positive in 63.7% of the cases without and 18.5% with complications. These results were not compared any other studies. About 73.1% of the cases without complications were diagnosed as DHF grade I and 88.9% of the patients with complications as grade II in this study. None of the studies reported these findings.

Conclusion

This study had shown that, the age group was between 6 – 9 years, males sex, fever was the common sign, hepatomegaly was the common sign, leucopenia, reduced platelet count, NS1

positive, IgM and IgG positive, normal C3 count, positive widal test abnormal USG abdomen, more than 5 days of hospitalization and mortality was present in 11.1% of the cases. But this study was not without limitations. This was a cross sectional study, sample size was calculated and sampling method was not followed. Community based analytical studies are required to find the association between the clinical manifestations and dengue fever.

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