Original Article

CRP Levels in the Disease Progression of Dengue in the Patients Who Attended Tertiary Care Hospital, Telangana

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ABSTRACT

Objective: CRP levels can be an important marker for assessing the severity and progression of the disease. Elevated CRP levels in dengue patients can indicate the severity of the infection. Hence the present study is intended to use a CRP biomarker in the disease progression and prevalence of Dengue in the patients who attended Tertiary Care Hospital, Telangana.

Materials and Methods: It is a prospective study conducted for period of one year. The study was conducted in the Dr. Patnam Mahender Reddy Institute of Medical Sciences, Chevella, Ranga Reddy District, Telangana, India. NS1 Antigen Day 1 rapid test (J.Mitra & Co Pvt. Ltd.) kit was used for NS1 antigen detection. Serum samples of patients suffering from fever of more than 5 days were subjected to dengue test. The patients who were positive for dengue with rapid test, their serum samples were tested for CRP levels. Latex agglutination test was performed.

Results: Out of total 638 samples, tested for dengue infection for a period of one year, 219 (34.32%) samples were tested positive. Among the positive 219 samples, the NS1 Antigen positive samples with rapid test were 98 (44.74%) and the remaining 121(55.26%) samples were positive for IgM. Among the 219 positive cases, 127 serum samples were negative for CRP and 92 samples were positive for CRP and most of the cases i.e. 51 samples showed the CRP levels of 12mg/L (1:2dilution).

Conclusion: The study concluded the usefulness of CRP levels in the early progression of disease and disease diagnosis in severe dengue in triage patients.

Keywords: Dengue, CRP, DSS, NS1 antigen.

INTRODUCTION

Dengue is a viral infection caused by the dengue virus, which is transmitted to humans through the bites of infected Aedes mosquitoes, primarily *Aedes aegypti* and *Aedes albopictus.* Dengue virus (DENV) has four distinct serotypes, known as DENV-1, DENV-2, DENV-3, and DENV-4. Each serotype can cause dengue fever, and infection with one serotype provides lifelong immunity to that specific serotype but not to the others. All four serotypes are found in tropical and subtropical regions worldwide, often co-circulating in the same areas. The distribution can vary over time and space, leading to shifts in dominant serotypes during different outbreaks. In the past five years, India has seen significant variations in the number of dengue cases and related mortality. Approximately 101,192 cases were reported with 172 deaths in the year 2018. Cases increased to 157,315 with 166 deaths in the year 2019. In 2020, the number of cases dropped to around 44,585 with 56 deaths, likely due to underreporting during the COVID-19 pandemic and there was a significant rise to 193,245 cases and 346 deaths in 2021. In 2022, the number of cases was recorded at 233,251 with 303 deaths and nearly 95,000 cases and 91 deaths were reported in 2023 world-wide. As of 2024, India continues to experience significant dengue activity, with substantial variation across states. According to the National Center for Vector Borne Diseases Control (NCVBDC), as of mid-September 2023, the country reported over 94,000 dengue cases and 91 deaths. States such as Maharashtra, Karnataka, and Delhi have seen particularly high case numbers.[1,2] Maharashtra alone reported around 8,496 cases, while Karnataka reported 9,185 cases. Efforts to manage and control dengue in India are ongoing, with strategic plans and training programs being implemented to enhance clinical management and reduce mortality associated with the disease. The WHO's South-East Asia Regional Office also continues to monitor the situation, providing epidemiological updates and supporting national efforts to combat dengue. Clinical phenotypes can range from a self-limiting febrile illness that is quite mild to severe symptoms that can occasionally be fatal, such as haemorrhage, damage of organs, and vascular leakage resulting in shock[3, 4]. These severe symptoms appear around defervescence, which typically happens 4-6 days after the sickness begins, late enough in the course of the illness to provide a possible window of opportunity for identifying people who may progress.

C-reactive protein (CRP) is an acute-phase protein produced by the liver in response to inflammation. Its levels in the blood increase in response to a wide range of conditions, including infections, inflammation, and tissue injury. In the context of dengue fever, CRP levels can be an important marker for assessing the severity and progression of the disease. Elevated CRP levels in dengue patients can indicate the severity of the infection. Higher CRP levels are often associated with more severe forms of

dengue, such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). In dengue, the virus induces a significant inflammatory response, and CRP levels rise accordingly. This rise can help in distinguishing dengue from other febrile illnesses where CRP levels might not be as elevated. Monitoring CRP levels can help in predicting the clinical outcome of dengue patients. Persistent high levels of CRP may suggest complications and a need for more intensive monitoring and management, however CRP alone cannot diagnose dengue, it can be used in conjunction with other clinical findings and laboratory tests to support the diagnosis and understand the disease's progression. Studies have shown higher levels of C-reactive protein (CRP) in severe dengue versus non-severe dengue, with a CRP cutoff level of 30.1 mg/L (AUC, 0.938; 100% sensitivity, 76.3% specificity)[5]. Hence the present study is intended to use a CRP biomarker in the disease progression and prevalence of Dengue in the patients who attended Tertiary Care Hospital, Telangana.

MATERIALS AND METHODS

Study design: It is a prospective study.

Study place: The study was conducted in the Dr. Patnam Mahender Reddy Institute of Medical Sciences, Chevella, Ranga Reddy District, Telangana, India

Study period: The study was conducted for a period of one year Jan 2023m to Feb 2024.

Study sample: A total of 538 cases were included in the study.

Methodology: Patients of both OP and IP of all age groups of both genders were included in the study. Informed consent was taken from all the patients. Ethical committee clearance was taken from the study institute. The patients who were suffering with any chronic febrile illness or any fever related illness like typhoid fever, malaria, Chikunguniya etc. were excluded from the study. The patient demographic variables, signs and symptoms, duration of illness was recorded. Blood samples were collected from the patients aseptically and serum was separated and diagnostic tests were separated. Antigen detection was done to the serum samples collected from patients suffering from fever of less than 5 days. NS1 Antigen Day 1 rapid test (J. Mitra & Co Pvt. Ltd.) was performed to the tested serum samples. The patients who were positive for dengue with rapid test, their serum samples were tested for CRP levels. CRP latex agglutination test was performed. The procedure was done according to manufacturer's instruction.

RESULTS

Out of total 638 samples, tested for dengue infection for a period of one year, 219 (34.32%) samples were tested positive for NS1 Antigen positive samples. Out of 219 patients, males were 135 (61.64%) and females were 84 (38.36%). Among the 219 samples, most of the positive cases 62 (28.31%) were seen in the pediatric age group below 10 years of age group and very few cases were reported from the age group 61-70 years 10 (4.56%) (Table 1). Among the 219 positive cases, 127 serum samples were negative for CRP and 92 samples were positive for CRP and most of the cases i.e. 51 samples showed the CRP levels of 12mg/L (1:2 dilution) (Figure 1). In majority of the cases, fever is the most common symptom 81.7%, 55% cases showed myalgia and arthralgia and 46% cases showed headache (Table 2). No deaths were reported in the present study.

Table 1: Age-wise distribution of study cases

Age (years)	Frequency	Percentage
< 10	62	28.31%
11-20	40	18.26%
21-30	36	16.4%
31-40	25	11.4%
41-50	19	8.67%
51-60	15	6.84%
61-70	10	4.56%
>70	12	5.47%
Total	219	100%

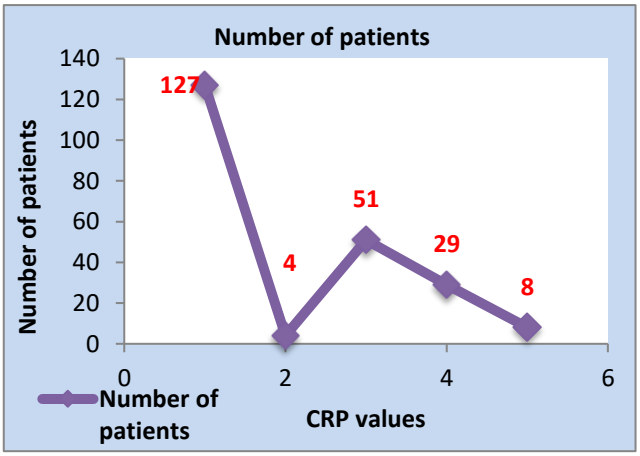

Figure 1: CRP levels in Dengue positive cases

Table 2: Clinical manifestations of dengue

Symptom	Frequency	Percentage
Fever	179	81.7%
Anorexia	63	28.7%
Lethargy	95	43.37%
Myalgia and Arthralgia	121	55.25%
Rash	89	40.6%
Headache	101	46.11%
Nausea with vomiting	75	34.24%
Diarrhea	51	23.28%
Abdominal pain	63	28.76%
Retro-orbital pain	71	32.42%
Epistaxis	4	1.82%
Seizures	2	0.91%
Altered sensorium	1	0.45%

DISCUSSION

Dengue is endemic in more than 100 countries, with an estimated 390 million infections occurring annually, of which approximately 96 million manifests clinically. The disease is most prevalent in tropical and subtropical regions, including Southeast Asia, the Pacific Islands, USA, Africa etc. Dengue outbreaks can occur suddenly and spread rapidly, often overwhelming healthcare systems in affected regions. Dengue remains a complex and evolving public health issue that requires coordinated global efforts to manage and mitigate its impact. Among the 219 samples, most of the positive cases 62 (28.31%) were seen in the pediatric age group below 10 years of age group. Similar findings by Mishra et al. (2016)[5] reported that more dengue prevalence 34% was seen in paediatric age group. Numerous studies found that the maximum numbers of cases were seen in the age group of >11 years (34.02%)[6,7]. Children, particularly those under 15, are highly susceptible to dengue infection.

In many endemic areas, the incidence of dengue in children can be higher than in adults because children will exposed more to outdoor exposure and more chances of mosquito bite, immature immune system, more severe complications noticed in children etc. In the present study, male prevalence is more 61.64% compared to females. Most of the dengue cases 219 (34.32%) samples were positive for NS1 Ag in the present study. Similar findings were reported by Anker et al. (2011), Skufca et al. (2012) and Alekhya et al. (2020))[8-11]. C-reactive protein (CRP) is an acute-phase protein that is commonly used as a marker of inflammation in various infectious and non-infectious conditions, including dengue. Research studies have investigated the role of CRP in dengue to understand its diagnostic, prognostic, and therapeutic implications. CRP levels can be elevated in the early stages of dengue infection. Studies have evaluated the utility of CRP as an early biomarker to differentiate dengue from other febrile illnesses, such as bacterial infections, which typically present with higher CRP levels. A prospective cohort study might demonstrate that elevated CRP levels on admission are associated with an increased risk of developing severe dengue, providing a basis for CRP as a prognostic tool. Among the 219 positive cases, 127 serum samples were negative for CRP and 92 samples were positive for CRP and most of the cases i.e. 51 samples showed the CRP levels of 12mg/L (1:2 dilution).

In an investigation into the usefulness of CRP in varying stages of dengue infection, Chen et al.[12] came to the conclusion that "single measurement of CRP as a potential useful and simple biomarker to identify patients who are at risk for developing a more severe dengue illness and to help triage patients requiring hospital care." In majority of the cases, fever is the most common symptom 81.7%, 55% cases showed myalgia and arthralgia and 46% cases showed headache. No deaths were reported in the present study. Similar findings were reported by Alekhya et al.[11]

CONCLUSION

In conclusion, our study emphasises the potential use and simplicity of a single CRP test as a biomarker to help triage patients requiring hospital care and to identify individuals who may develop a more severe dengue disease. Clinicians in nations with low medical resources and high dengue rates should pay particular attention to these findings.

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