

Research Article

Detection of Arboviral Infections in Acute Febrile Patients with Thrombocytopenia – A Serological Study

Thejaswini HS*, Tejashree A¹

1. Department of Microbiology, JSS Medical College, Mysore, India

***Corresponding Author: Thejaswini HS**, Department of Microbiology, JSS Medical College, Mysore, India.

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Abstract

Background: Arboviruses (arthropod-borne viruses) are a diverse group of viruses that survive in nature by transmission from infected to susceptible hosts by certain species of mosquitoes, ticks, sand flies or biting midges. (1) The members of this group can replicate both in arthropods and vertebrate. The member of the genus Flaviviruses and Alphaviruses of the arboviruses accounts for important diseases in India. The major arboviral infections that affect a significant portion of Indian populations every year are Dengue, Chikungunya and Japanese encephalitis. (2)

Materials and Methods: Febrile patients with thrombocytopenia admitted at J.S.S. Hospital, Mysore during the study period of one year six months were the subjects for this study. The serum was tested for IgM antibodies against Dengue, Chikungunya and Japanese encephalitis virus by ELISA.

Results: Out of 200, 101(50.5%) patients of fever with thrombocytopenia were positive for arboviral infections and 99(49.5%) were negative for arboviral infections. Among arboviral infections, dengue infection was the predominant cause of fever with thrombocytopenia. No coexistence of arboviral infections were noted in the same subjects.

Conclusion: Testing for arboviral infections in fever with thrombocytopenia cases helps in early detection, management and predicts the outcome as well.

Keywords: Arboviruses, Thrombocytopenia and ELISA.



Introduction

Arboviral infections are one of the most important public health problems all over the world including India. The members of this group can replicate both in arthropods and vertebrates.

The member of the genus *Flaviviruses* and *Alphaviruses* of the arboviruses accounts for important diseases in India. The major arboviral infections that affect a significant portion of Indian populations every year are Dengue, Chikungunya and Japanese encephalitis. **(3)**

Dengue virus belongs to the family Flaviviridae, genus *Flavivirus* transmitted mainly by *Aedes aegypti* mosquitoes. **(1,3)** Among the four serotypes, infection with any of them generally leads to a mild self-limiting febrile illness i.e. dengue fever. Its typical symptoms include headache, a characteristic skin rash, joint pain, and body ache. A more severe form of the disease involving vascular and hemostatic abnormalities leads to dengue hemorrhagic fever (DHF) and dengue shock syndrome, which is responsible for a high mortality rate, especially in children. **(4,5)** In India, dengue was first isolated in 1946, and many epidemics have since been reported. In 2006 there was a dengue outbreak in India affecting 11,637 individuals with a case fatality rate of 1.49%. **(5)**

Chikungunya virus is one of the major viral pathogens throughout the world, causing severe morbidity in developed and developing countries. It is a mosquito-borne virus, of the genus *Alphavirus*, transmitted to humans by *Aedes* mosquitoes. Chikungunya virus causes an illness with symptoms almost like dengue fever except for the prolonged arthralgia which persists for months to a year, even after the disappearance of other clinical illnesses including the fever. After the outbreak of chikungunya virus infection in India in 1971,**6** there was a long gap of such illness. In 2006, there was a massive epidemic outbreak and there were about 13.9 million suspected chikungunya cases, confirmed cases were only in 1997, because of deficient laboratory facilities for confirmation of chikungunya. **(6,7)**

Japanese encephalitis virus (JEV) is a member of the genus *Flavivirus* of the family, Flaviviridae, transmitted to humans by mosquitoes (*Culex* sp.) between wild and domestic birds and pigs. **(1,4)** Japanese encephalitis is one of the most important causes of viral encephalitis worldwide, with an estimated 50,000 cases and 15,000 deaths annually. The mortality rate of this disease ranges from 0.3%-60%. The morbidity especially in children and young adults (aged 2-15 years) is very high. **(8)** It has been reported that those who recover have neurological sequelae in about 30% of cases. In 2006, there was an epidemic outbreak of Japanese encephalitis in India affecting 6,000 people with high mortality of 1,600 patients. **(9)**



Important arboviral diseases with thrombocytopenia in India are dengue, chikungunya, JEV, KFD (localized in Karnataka) and rarely Hantavirus. Although virus isolations provide the most conclusive evidence, they can be carried out in a few specialized centers only, and serological surveys are very important for studying the distribution of arboviruses. **(10)** The increasing significance of Arboviruses as human and animal pathogens emphasizes that their study remains important. Clinically, the febrile illness produced by arboviral infections may be indistinguishable. **(11)** Laboratory diagnosis plays an important role in identifying the causative agent.

In this regard, an attempt is being made to detect the number of Dengue, Chikungunya and Japanese encephalitis infections as a cause of fever with thrombocytopenia among the patients admitted to JSS Hospital, Mysore.

Objectives

1. To identify Arboviral infections among febrile patients with thrombocytopenia.
2. Detection of possible co-existence of different arboviral infections in febrile thrombocytopenic patients in this region.
3. Clinical features among arbovirus infected patients

Material and Methods

The study was conducted at J.S.S. Hospital, Mysore from January 2012 to June 2013. A total of 200 serum samples from Febrile patients with thrombocytopenia were included. The personal and clinical data of these subjects were documented in the proforma. With aseptic precautions, two to five ml of blood samples were collected by venipuncture from these patients for the serological test. The serum was separated by centrifugation of the whole blood sample and labeled with the particulars of the patient and stored in the refrigerator at -20oC. The test kits used were the Japanese Encephalitis - Dengue IgM Combo ELISA test using Panbio kit and SD Chikungunya IgM ELISA Kit. The tests were performed as per the manufacturers' instructions.



Results

In the present study, a total number of 200 cases of fever with thrombocytopenia were included. Out of 200, 101(50.5%) patients of fever with thrombocytopenia were positive for arboviral infections and 99(49.5%) were negative for arboviral infections. (**Table 1**)

Among 101, 96(48%) of patients with febrile thrombocytopenia were positive for Dengue IgM ELISA, 4(2%) were positive for Chikungunya IgM ELISA and 1(0.5%) was positive for Japanese encephalitis IgM ELISA. (**Table 2**)

The mean platelet count of 96 dengue positive cases was $60,198 \pm 24584$ /cmm. Chikungunya positive cases had a mean platelet count of $87,800 \pm 12,038$ /cmm. The platelet count of the Japanese encephalitis positive case was 92,000/cmm.

Table-3 shows the clinical presentation of arboviral infected patients.

Table-4 shows the Correlation of different arboviral infections with organomegaly. In the present study, no coexistence of arboviral infections was noted in the same subjects.

Table 1: Serology of Fever with Thrombocytopenia cases

Arboviral Infections	Number of cases	Percentage (%)
Positive cases	101	50.5
Negative cases	99	49.5
Total number of cases (n)	200	100

**Table 2: Distribution of Arboviral infections among cases of Fever with Thrombocytopenia**

Arboviral Infections	Number of cases	Percentage (%)
Dengue	96	48
Chikungunya	04	02
Japanese Encephalitis	01	0.5

Table 3: Clinical presentations of Arboviral infected cases

Symptoms	Dengue positive cases		Chikungunya positive cases		JEV positive case n=1
	n=96	%	n=4	%	
Fever	96	100	4	100	1
Chills and Rigors	57	59	4	100	1
Headache	41	42	1	25	0
Vomiting	53	55	1	25	1
Diarrhea	12	12.5	0	0	1
Cough	12	12.5	0	0	0
Myalgia/ arthralgia	47	49	2	50	1
Rash	17	18	1	25	0

**Table 4: Correlation of different arboviral infections with organomegaly**

Organomegaly	Dengue positive cases		Chikungunya positive cases		JEV positive case n=1
	n=96	%	n=4	%	
Hepatosplenomegaly	21	22	2	50	0
Splenomegaly	28	29	3	75	0
Hepatomegaly	48	50	2	50	0
No organomegaly	41	43	1	25	0

Discussion

At the beginning of the twentieth century, epidemic infections were among the most important global public health problems. Arboviruses are major causes of fever in endemic areas of the world. Many times infections by these viruses are subclinical or mild, occasionally may cause severe hemorrhagic illness. Laboratory diagnosis by isolation of the virus, by detection of the viral genome, or by the demonstration of a rise in antibody is possible in special centers. **(12)**

The risk of arboviral infections is increasing because of the lifestyle changes of the people. Air travel, rapid urbanization, increasing growth of the population, global warming and climatic changes are very important factors for the epidemiology of these diseases. They can be responsible for explosive epidemics. Because of the complex transmission cycle, they also pose a challenge in the prevention, control and surveillance of these diseases. **(5)**

The present study was done to detect the presence of arboviral infections in 200 patients of acute febrile illness with thrombocytopenia.

In the present study, 101(50.5%) patients of fever with thrombocytopenia were serologically positive for arboviral infections and 99 (49.5%) were negative for arboviral infections.

The seroprevalence of arboviral infections (50.5%) of the present study is comparable with the seroprevalence (62%) observed in Debjani Taraphdar et al study. **(2)**



In the present study, 96(48%) cases were serologically positive for Dengue infection and were the most common arboviral infection. 4(2%) cases were positive for Chikungunya and 1 case was positive for Japanese encephalitis infection.

This prevalence is under the findings of Nair et al **(13)** and Deol Siddhart et al **(14)**, with Dengue infection being the commonest of all arboviral infections detected. In a study conducted by George Watt et al., thrombocytopenia has been noted as one of the predominant features in 8 JE virus-infected cases. **15** According to Rashmi Kumar et al., the abnormalities in platelet count in JE patients in recent reports could be due to a change in the virulence of the virus or strain variation over time, with the virus developing properties similar to dengue-like flaviviruses. **(16)**

In the present study, the coexistence of any two arboviral infections in the same subject was not found. In a Community based epidemiological study conducted by Sathya P. Manimunda et al during the chikungunya outbreak in 2008 in Dakshina Kannada District of Karnataka State, the coexistence of CHIKV and dengue antibodies in the same subjects was found in 9(4%) cases tested. **(17)**

In the present study, fever with chills and rigors, vomiting, followed by myalgia, headache were the most common clinical presentations among Dengue positive cases. Other manifestations like rashes, cough and diarrhea were also noted.

Among dengue positive cases, Hepatomegaly was noted in 48 (50%) patients and splenomegaly in 28 (29%) patients and Hepatosplenomegaly in 21 (22%) patients.

Conclusion

The arboviral infections mainly dengue, chikungunya and Japanese B Encephalitis are most common in tropical and subtropical regions. Testing for arboviral infections in fever with thrombocytopenia cases helps in early detection, management and predicts the outcome as well. There are no specific therapies or vaccines available for arboviral infections. The most effective means of prevention are those that protect against any contact with the disease-carrying vector mosquitoes. Community awareness, early diagnosis and management and vector control measures need to be strengthened, to curb the increasing number of dengue cases.



References

1. Smith DW, Hall RA, Johansen CA, Broom AK and Mackenzie JS. Arbovirus Infections In: Manson's Tropical Diseases 22nd edn, Ed Cook CG and Zumla AI, Saunders Elsevier, 2009:715-749.
2. Taraphdar D, Sarkar A, Chatterjee S. "Mass scale screening of common arboviral infections by an affordable, cost effective RT-PCR method". Asian Pac J Trop Biomed. 2012 February; 2(2): 97–101.
3. Gubler DJ, Kuno G, Markoff L. Flaviviruses In: Field's Virology 5th edn, Ed Knipe D and Howley PM Ing, Lippincott Williams & Wilkins, USA, 2007; 1:1155-1210.
4. Schoub BD and Venter M. Flaviviruses In: Principles and Practice of Clinical Virology 6th edn, Ed Zuckerman AJ, Banatvala JE, Schoub BD, Griffiths PD and Mortimer P Ing, Wiley Blackwell, 2009: 669-698.
5. Joshi PL. "Arthropod borne viral infections in India –An overview In: Arthropod Borne Viral Infections: Current status and Research", Ed D Raghunath, C Durga Rao Ing, Tata McGraw-Hill Publishing Company Ltd, India, 2008 ; 8: 3-18.
6. Pialoux G, Gauzere BA, Jaureguibery S, Stobel M. "Chikungunya, an epidemic arbovirolosis". Lancet Infect Dis. 2007; 5: 319–327.
7. Ravi V. "Re-emergence of chikungunya virus in India". Indian J Med microbiol. 2006; 24(2): 83–84.
8. Chatterjee S, Chattopadhyay D, Bhattacharya MK, Mukherjee B. "Serosurveillance for Japanese encephalitis in children in several districts of West Bengal, India". Acta Pediatr. 2004; 93 : 390–393.
9. Parida MM, Dash PK, Tripathi NK, Ambuj, Santhosh SR, Saxena P, et al. "Japanese encephalitis outbreak, India, 2005". Emr Infec Dis. 2006; 9: 1427-1430.
10. Oishi K, Saito M, Cynthia A et al. "Dengue illness: clinical features and pathogenesis". J Infect Chemother 2007; 13:125–133.
11. Manjith Narayanan, M.A. Aravind, N. Thilothammal, R. Prema, C.S. Rex Sargunam and Nalini Ramamurthy, "Dengue fever epidemic in Chennai – A study of clinical profile and outcome", Indian Pediatrics 2002; 39:1027-1033.



12. Vector-borne infections In: Medical Microbiology 3rd edn, Ed Mims C, Dockrell HM, Goering R V, Roitt I, Wakelin D, Zuckerman M, Elsevier Mosby, 2004; 383- 385.
13. Nair P S, Jain A, Khanduri U, Kumar V. “Study of Fever Associated with thrombocytopenia”. JAPI 2003 Dec; 51:1173.
14. Deole Siddharth, David E J, Kulkarni PM. “Viral Haemorrhagic Fever”. JAPI 2003; 51:1180.
15. Watt G, Jongsakul K. Acute undifferentiated fever caused by infection with Japanese encephalitis virus. Am J Trop Med Hyg 2003; 68:704–6.
16. Rashmi Kumar, Piyush Tripathi, Sudhakar Singh, and Gopa Bannerji. “Clinical Features in Children Hospitalized during the 2005 Epidemic of Japanese Encephalitis in Uttar Pradesh, India”. Clinical Infectious Diseases 2006; 43:123–31.
17. Sathya P. Manimunda, Attayur P. Sugunan, Subhodh K. Rai et al. Outbreak of Chikungunya Fever, Dakshina Kannada District, South India, 2008. Am J Trop Med Hyg. 2010 October 5; 83(4): 751–754.

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