



SERO-PREVALENCE OF DENGUE AND CHIKUNGUNYA COINFECTION WITH SEASONAL VARIATIONS IN TERTIARY CARE HOSPITAL, AJMER, RAJASTHAN

Microbiology

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ABSTRACT

BACKGROUND-Dengue and chikungunya fever are vector borne arboviral diseases that have been circulating globally in the various tropical and sub tropical regions. India being an endemic country for dengue and chikungunya, every or alternative year. Circulation of both the viruses along with presence of common mosquito vector (*Aedes aegypti* and *albopictus*)

AIMS AND OBJECTIVES: To study seroprevalence of dengue and chikungunya co-infection, early diagnosis and their seasonal trends.

Materials and methods-This was a prospective laboratory based study conducted at JLN Medical College and associated group of Hospitals, Ajmer from March 2018 to October 2019. Clinically suspected patients of dengue and/or chikungunya from all the outpatient and inpatient departments were enrolled as cases. Serum samples were tested for the IgM antibodies of dengue and chikungunya both by ELISA method.

RESULTS- Out of 965 samples, 156 (16.16%) found only dengue antibodies, 88 (9.11%) only chikungunya antibodies and 83 (8.6%) both antibodies. If the co-infection concluded than the total number of dengue and chikungunya positive were 239 (24.76%) and 171 (17.72%) respectively. Majority of the patients belonged to the age group of 21-30 years, followed by 31-40 years with preponderance of males over females. Maximum number of patients were reported in post monsoon.

CONCLUSION- As the clinical features of dengue and chikungunya virus infections are mostly similar, so it is advisable to test for both viruses. Fever and headache were the universal symptoms observed in Dengue, Chikungunya and co-infection. Present study shows that occurrence of dengue, chikungunya and their co-infection were more in post-monsoon season, middle age group and in males than females, so vector control, personal protective measures and early diagnosis is very important to reduce mortality rate.

KEYWORDS

Dengue, chikungunya, Co-infection, dual Infection

INTRODUCTION

Dengue and Chikungunya are vector-borne arboviral diseases that are seen in various tropical and subtropical regions of the world including India. India being an endemic country for dengue and Chikungunya, every or alternative year, there is an outbreak of one or both. Many contributing factors are responsible for this tremendous rise in cases every year. Increasing population, immune status, rainfall, poor drainage system, artificial collection of water like pots, coolers, unused tires, travel to areas endemic for dengue and Chikungunya, increasing urbanization, etc. Circulation of both the viruses along with the presence of common mosquito vector (*Aedes aegypti* and *Aedes albopictus*), coinfection with dengue and chikungunya is not uncommon^{1,2,3}.

In Asia including India, Chikungunya affected areas overlap with dengue-endemic areas and provide opportunities for mosquitoes to become infected with both the viruses and transmit them to human beings as co-infection. This co-infection poses a challenge to the clinician as they require different clinical management even though they have similar clinical manifestations⁴.

In 1964, Myers and Carney reported the first concurrent isolation of Chikungunya and dengue from a single blood sample taken from a patient in the acute phase of dengue illness in Southern India. However, these workers had difficulty in isolation of the dengue virus from that patient, because the sample predominantly contains the Chikungunya virus. This dominance of the Chikungunya virus prevented the growth of dengue virus in cell culture. Finally, isolation of the dengue virus was accomplished through pre-treatment of acute-phase serum samples with Chikungunya specific mouse antibody. This pre-pre-treated sample was inoculated in the infant mice for in vivo growth⁵.

In 1967, co-infections with dengue and Chikungunya were reported in Calcutta, India. Subsequent serological investigations confirmed the presence of two viruses in these patients.⁶

However, after a gap of more than thirty years, Chikungunya re-emerged in several Indian states. During the dengue outbreak in Delhi in 2006, the co-infection of dengue with the Chikungunya virus has been reported. In India, dengue and Chikungunya are widespread and endemic in most major states like Goa, Gujarat, Karnataka, Kerala, Haryana, Madhya Pradesh, Punjab, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal, Chandigarh, Delhi and Pondicherry. In 2018 clinically suspected cases of dengue and Chikungunya were (101192) & (57813) reported from 28 States/UTs of India respectively. Dengue and Chikungunya were widespread and endemic in most major states like Goa, Gujarat, Karnataka, Kerala, Haryana, Madhya Pradesh, Punjab, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal, Chandigarh, Delhi and Pondicherry⁶.

Dengue Virus is a single-stranded positive RNA virus belongs to the family Flaviviridae under genus flavivirus. Four serotypes of dengue virus (DENV-1, DENV-2, DENV-3, DENV-4) have been found; (5th serotype) DENV-5 also reported in October 2013 detected during screening of viral samples taken from a 37-year-old farmer admitted in Hospital Sarawak, State of Malaysia⁷.

Chikungunya virus is a single-stranded RNA genome, a 60-70 nm diameter capsid and a phospholipids envelope belongs to the genus Alphavirus under the Togaviridae family. Three phylogenetically distinct groups of CHIKV with distinct antigenic properties have been identified, namely, the Asian genotype, the West African genotype, and the East/Central/ South African (ECSA) genotype⁸.

According to a recent investigation, patients having co-infection with the Dengue and Chikungunya viruses present a clinically severe disease with a high death rate when compared to mono-infection with these viruses. Hence, the timely diagnosis of the dual infections is essential for better patient management. Both of these illnesses are associated with poor quality of life and dual infection further worsens the condition⁽⁹⁾. The present study aimed to find out the prevalence of the co-infection and the seasonal trends in both.

MATERIAL AND METHODS

A study conducted on blood samples received from all the outpatient and inpatient departments for diagnosis of dengue and Chikungunya in the Department of Microbiology J.L.N Medical College and associated group of Hospitals, Ajmer, from March 2018 to October 2019.

Total of 965 clinically suspected patients of dengue and Chikungunya from all the outpatient and inpatient departments were enrolled as cases. The detailed history was recorded in a case record register. 5-10 ml of blood was collected in a sterile plain tube from every suspected patient of dengue and Chikungunya. Clear serum was pipetted out in

labeled sterile screw-capped vials. The sera were tested for the IgM antibodies of dengue and Chikungunya both by MAC-ELISA test kits supplied by NIV, Pune.

RESULTS:

Analyses of the recruited 965 suspected cases revealed that maximum number of patients were reported in the month of October> September> August, compared to rest of months of study (Fig-1). Interestingly majority of the patients were from the age group of 21-30 years followed by the 31-40 years age group with preponderance of males over females(Chi-square = 1.0331 with degree of freedom =2, P-value = 0.5966). The Statistical Analysis of P-value is > 0.05; this shows that there is no association between gender and infections (Table 1). Dengue IgM and Chik IgM results shows that Out of the 965 samples, 156(16.16%) were positive for IgM antibodies of dengue whereas 88(9.11%) samples had Chikungunya antibodies and 83(8.6%) samples had both dengue and Chikungunya antibodies (Table-1) showing co-infection. If the co-infection concluded that the total number of patients having dengue positive was 239(24.76%) and Chikungunya positive were 171(17.72%).

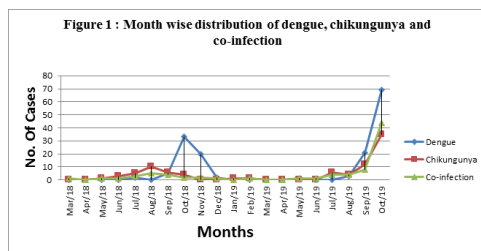
Table 1: Demographic profile of dengue, chikungunya and co-infection

Age groups	Dengue			Chikungunya			Co-infection (deng +chick)			Grand total
	Male	Female	Total	Male	Female	Total	Male	Female	Total	
0-10	01	01	02	02	0	02	01	01	02	06
11-20	29	11	40	08	04	12	17	07	24	76
21-30	49	16	65	21	10	31	16	13	29	125
31-40	20	12	32	16	08	24	15	03	18	74
41-50	02	06	08	02	03	05	02	02	04	17
51-60	02	02	04	01	05	06	02	02	04	14
61-70	01	03	04	01	01	02	01	01	02	08
>70	-	01	01	02	04	06	0	0	0	07
Total	104	52	156	53	35	88	54	29	83	327

Table 2: Dengue and Chikungunya seropositivity

Test	No.	%
Sample Status	Samples Positivity(N)	% Positivity
Dengue IgM positive	156	16.16%
Chikungunya IgM positive	88	9.11%
Dengue and Chikungunya both IgM positive (co-infection)	83	8.60%
Dengue and Chikungunya both IgM negative	638	66.11%
Total	965	100%

Chi-square value = 61.486 with degree of freedom =1, P-value = 0.0001. The P-value is 0.05, this conclude that there is a significant association among dengue, chikungunya and their co-infection



DISCUSSION

Dengue and Chikungunya are the mosquito-borne arboviral disease. They have emerged as major infectious diseases, especially in the tropical and sub-tropical regions of the world including India. In recent years, these diseases have been causing large and widespread epidemics. As the clinical features of DENV and CHIKV infections are

mostly similar, so it is advisable to test for both viruses in areas where they co-circulate. There is a rise in the number of these cases during and subsequent to the monsoon months. This period favours vector breeding and thereby increasing the number of mosquitoes; resulting in form of malaria, dengue and chikungunya cases. There has been a similar studies reported from India which shows The comparable results in respect of prevalence of co-infection using serological methods (Table- 3). There are so many studies reported in the past years which are related to the present study^{(12) (15)}. Whereas other studies have reported a very low prevalence of co-infection^{(10) (3) (11)}. Higher prevalence was also reported by a study⁽¹⁴⁾. Regional variations in the disease prevalence, density of mosquito population, sanitation facilities and the control measures would be the factors that have led to such a variable incidence of co-infection. In present study seropositivity (as shown in table -1) 16.16% of patients were positive for dengue, which is comparable with several studies reported from west Bengal^{(16) (17)}. They found dengue IgM antibodies in 15.65% & 18.9% of patients respectively. Chikungunya was detected in 9.11% of patients, which is quite similar to the study reported from Bangalore(12.5%)⁽¹²⁾.

Majority of the patients suffering from Dengue and Chikungunya infections in this study belonged to the age group 21-40 years, followed by 11-20 yrs and very few cases below 10yrs and above 50yrs, males preponderance over females (as shown in table -2) which is correlated with Anju Dinkar et al⁽¹⁴⁾ that also reported similar findings. The pattern of seasonal variation with reported cases of Dengue & Chikungunya similar to study published^{(14) (16) (11) (18)}. That reported peaks from September to November and very few cases were in the other months.

Fever was the most common symptom present in all patients followed by, headache, joint pain, myalgia, nausea/vomiting and rashes in our study which were comparable with similar findings^{(15) (13) (16)}.

Table-3: Prevalence of Dengue and Chikungunya co-infection among the various studies

S.No.	Study	Year	Place	Total sample tested for Dengue and Chikungunya	Positive for DENV &CHIKV	Prevalence of co-infection (%)
1.	Kalawat U et al (3)	2011	South India	72	2	2.7%
2.	Mohanty I et al (10)	2011-12	Southern Odisha	191	2	1.2%
3.	Modi k.p. et al (11)	2013	Gujrat	795	43	3.9%

4.	Giriraja K et al (12)	2014	Banglore	400	38	9.5%
5.	Vikram lodhey et al (13)	2010-15	Mumbai	300	20	6.7%
6.	Anju dinkar et al(14)	2016	North India	186	28	15.05%
7.	Maninder Kaur et al (15)	2018	Punjab	283	27	9.54%
8.	Present study	2018-19	Rajasthan	965	83	8.60%

CONCLUSION

As the clinical features of Dengue and Chikungunya virus infections are mostly similar, so it is advisable to test for both viruses. Fever and headache were the universal symptoms observed in Dengue, Chikungunya, and co-infection. The present study shows that the occurrence of Dengue, Chikungunya and their co-infection were more in post-monsoon season, middle-age group and in males than females, so vector control, personal protective measures and early diagnosis is very important to reduce the mortality rate.

CONFLICT OF INTEREST

Nil

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