



COINFECTION OF DENGUE AND CHIKUNGUNYA VIRUSES: A PREVALENCE STUDY IN A TERTIARY HOSPITAL AT HYDERABAD, INDIA.

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ABSTRACT **Background & objectives:** Dengue and Chikungunya fever are the endemic arboviral infections appearing to be increasing in all parts of India. This study aims to determine the prevalence of Dengue and Chikungunya co-infection among acute febrile illness cases. **Methods:** A prospective observational study was conducted including patients with an acute febrile illness whose blood samples were collected and subjected to tests like IgM & IgG ELISA for dengue virus and IgM Capture ELISA for Chikungunya virus. **Results:** Among the 90 samples that were subjected to both Dengue and Chikungunya virus tests for coinfections, 18 samples tested positive for both Dengue and Chikungunya tests confirming coinfections. **Interpretation and conclusion:** Chikungunya virus can be confused with diseases such as Dengue based on the similarity of the symptoms and sharing of vectors. Thus the differential diagnosis of these infections is essential for clinical management and epidemiological study in the tropics.

KEYWORDS : Dengue, Chikungunya, coinfection, prevalence

INTRODUCTION:

Arthropod-borne viruses are a major burden on the healthcare system worldwide.¹ Case of simultaneous infections involving different arboviruses is becoming common in areas where they circulate concomitantly. Vector density and environmental changes, along with migration and immigration contribute to the spread of these viruses. They are endemic in tropical and subtropical regions of the world and are the main causative agents of infectious diseases of importance in public health.²

Dengue virus (DENV) and Chikungunya (CHIKV) is the most rapidly spreading arboviruses (RNA virus). Dengue virus is a Flavivirus in the family Flaviviridae and is prevalent in tropical and subtropical regions in Asia, the Pacific, and Caribbean islands, and Central and South America. It is estimated that there are 50-100 million cases of dengue fever (DF) per year worldwide including more than 500,000 cases of severe dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). CHIKV is an alphavirus in the family Togaviridae which is endemic in Africa and Asia. It has been reported in nearly 40 countries and it was listed as a Category C priority pathogen by the US National Institute of Allergy and Infectious Diseases in 2008.¹

The first major epidemic of the DHF occurred in 1953-1954 in the Philippines followed by a quick global spread of the epidemic of DF/DHF. In India, the first confirmed dengue fever outbreak occurred in Kolkata in 1963-1964. Since then many reports of dengue outbreaks from various parts of India.³

CHIKV was first established during an epidemic outbreak in Tanzania during the year 1952-1953. In India, CHIKV was first isolated in 1963 in Calcutta. The virus disappeared from the country after the last reports from Maharashtra in 1973 and then reemerged in 2006 after a gap of 32 years and caused an explosive outbreak affecting 13 states.³

The main vector for the transmission of Dengue and Chikungunya viral infection is *Aedes aegypti* and a secondary vector *Aedes albopictus* is responsible for the transmission of both the viral infections. Due to many common clinical presentations and limited investigations, Chikungunya fever is often misdiagnosed with Dengue viral infection. Thus the suspected patients should be tested for both the viruses especially in the endemic areas. This is essential for an accurate and timely diagnosis of the viral infection that will assist in appropriate patient management.⁴

The tropical climate of India and the abundance of vector population offer a favorable environment for the rapid spread of these viral infections hence more studies are required to understand the pathogenesis, and complications and also to estimate the burden of

coinfection in the community. Simultaneously safety measures are required to be taken up by authorities to reduce transmission. Detailed studies will help analyze seasonal trends and to predict outbreaks. This study was hence undertaken to know the burden of coinfection in our community. The objective of the study is to determine the prevalence of the coinfection of dengue and chikungunya viral infection and also to diagnose them among the patients presenting with acute febrile illness at a tertiary care hospital.

Materials and methods: A prospective observational study was conducted for 6 months between September 2019 and February 2020 (Post Monsoon period) among 90 clinically suspected patients of dengue and chikungunya viral infections with acute febrile illness at Osmania General Hospital, Hyderabad.

Inclusion criteria:

- All the patients presenting with fever of acute onset of 6 days or more duration.
- Patients between the age of 10 – 80 years of both genders.

Exclusion criteria:

- Patients presenting with fever of less than 6 days duration.
- Patients less than the age of 10 years were excluded.

The blood samples of patients presenting with acute febrile illness who were suspected of dengue and chikungunya viral infections were collected and subjected to tests with IgM and IgG Elisa kit for Dengue virus and IgM capture Elisa kit for Chikungunya virus. The results were statistically analyzed.

RESULTS:

Among the total 90 clinically suspected patients, 64(71.1%) were seropositive of which 33(36.6%) cases tested positive for DENV and 18(20%) cases tested positive for CHIKV, and coinfections were seen in 13(14.4%) cases (DENV+CHIKV positive). There were 49(76.5%) males and 15(23.4%) females. The majority were in the 11- 20 age group. The seasonal distribution of dengue cases showed a peak during September while the cases of chikungunya and coinfection also predominated during September.

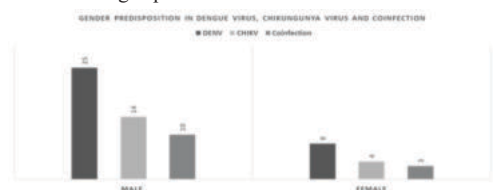


Figure – 1:

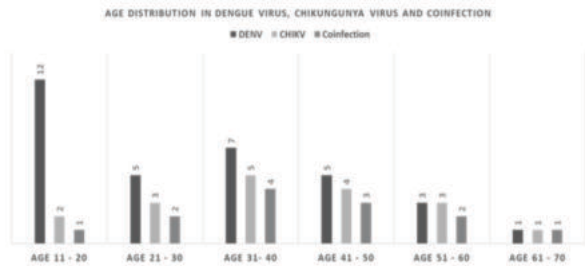


Figure – 2:

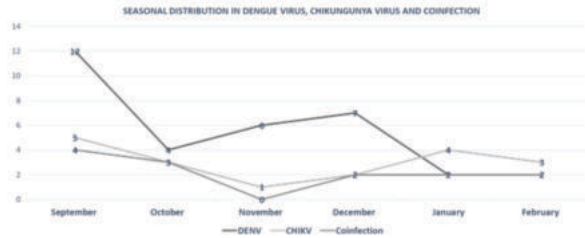


Figure – 3:

Table – 1:

S.No	Citation	Place	Year	Study design	N	Positive for coinfection	Coinfection (%)	Age	Diagnostic test (DENV/CHIKV)
1.	Atken	Delhi, India	2014	Cross sectional	87	9	10	All ages	NEL, IgM, IgG ELISA, PCR/IgM ELISA, PCR
2.	Chatur	Delhi, India	2006	Cross sectional	69	6	9	All ages	PCR/PCR
3.	Kakwal	Tirupur, India	2011	Retrospective	72	2	3	All ages	IgM ELISA/IgM ELISA
4.	Kalantze	Panama, Panama	Dec 2006 - March 2007	Cross sectional	54	3	5	14-74	IgM ELISA, Hemagglutination inhibition/ IgM ELISA, Hemagglutination inhibition
5.	Ratnasihina	Tamara, Maldives	Jan-March 2006	Cross sectional	55	10	18	Not mentioned	IgM ELISA, PCR/ IgM ELISA, PCR
6.	Lamprasopwattana	Southern Thailand	April-July 2009	Prospective Cohort Study	50	3	2	155	IgM ELISA and hemagglutination inhibition/ IgM ELISA, PCR
7.	Phommanvong	Champasak Lan, Laos	July-October 2010	Cross sectional	40	5	12.5	5-65	PCR/PCR
8.	Tan	Mumbai, Mumbai	July-October 2010	Cross sectional	116	7	6	122	IgM ELISA, PCR/ IgM ELISA, PCR
9.	Bocanegra	Santiago, Spain (infected in South America)	April 2014-2015	Retrospective	42	5	12	14.6-mean age	IgM ELISA/PCR/ IgM ELISA, PCR
10.	Mercado	Bogota, Colombia	Sept 2014- Oct 2015	Retrospective analysis	58	7	12	Not mentioned	IgM ELISA/PCR/PCR
11.	Present study	Haldwari, India	Sept 2019- Feb 2020	Prospective Observational	90	13	14.4%	11-20	IgM ELISA/IgM ELISA

N – sample size, DENV – Dengue virus, CHIKV – Chikungunya virus, NS1 – Dengue nonstructural protein 1, ELISA – Enzyme-linked immunosorbent assay, PCR – A polymerase chain reaction.

DISCUSSIONS:

Dengue and chikungunya fever are globally important arboviral infections and have been reported in several parts of India also the diseases share a common mode of transmission through different species of mosquito and also share common clinical features and are often misdiagnosed. Thus investigation for both viruses should be done especially in endemic regions carefully so that accurate and early diagnosis of coinfections would help in appropriate treatment.¹

In this present study, the samples were collected during the monsoon period and the positivity peaked in September in both Dengue virus infection and coinfection also it had male predominance and was found to be more common among the age group of 11 – 20 years old. (Figure-2) The number of cases increases during and after the months of the monsoon period because the humidity lengthens the life span of mosquitoes and increased temperatures shorten the incubation period also this study was done during the month the positivity rate is higher during the start of the monsoon period.¹ The male predominance may be due to the social bias as India remains a male-dominant country(Figure-1). The age group of 11 – 20 years is the active children group who plays near the vector sites which is responsible for the spread among this age group.

The present study had a prevalence rate of coinfection of 14.4 % which is nearly equivalent to the studies done by Bocanegra, et. al which had a prevalence of 12.5 %, and another study done by Bocanegra, et. al had a prevalence of 12 % and a study by Mercado, et. al had a prevalence rate of 12 %. A study done by Ratnasihina, et. al had the highest prevalence of 18 % while the present study only showed the highest rate of prevalence in India when compared with other studies done in India. In this study, the peak age group affected was 11 – 20

years which was almost similar to the studies done by Kularatne, et. al which specified the age group as 14 – 74 years and it also correlated with another study done by Laoprasopwattana, et. al which mentioned the age of ≤ 15 years and another study by Tun, et. al mentioned the age group of ≤ 12 years while rest of all the studies mentioned all age groups.⁵ (Table-1)

The test detection was mostly similar to the present study that used IgM and IgG ELISA kits for dengue and chikungunya viral infections and the studies cited more or less used the same ELISA methods while some studies preferred PCR and other techniques for detection.

CONCLUSION:

Both Chikungunya disease and Dengue disease can be confusing as there are similar symptoms and coinfection might be there. Hence the diagnosis of these diseases is important for an effective cure. Coinfection of dengue and chikungunya does not increase the severity but clinically suspected cases of febrile illness should be tested for both viruses, especially in endemic areas and also especially during the monsoon period so that timely diagnosis and appropriate treatment can help in better prognosis and control outbreaks.

Limitations of the study: The real-time polymerase chain reaction molecular test was not performed in the present study which is the confirmatory test and is more sensitive and specific compared to ELISA and this study was done in a single center with limited cases.

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