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Original Research Paper

Detection of co-infection with Dengue and Chikungunya viruses in patients attending a tertiary care hospital in Visakhapatnam District, Andhra Pradesh.

Author details:
Aruna Bula[1], Nigel Jose [2], Ratna kumari Poosapati [3], Kamala Puvvula [4]
1.Assistant Professor, Department of Microbiology, Andhra Medical College, Visakhapatnam.
2. Post Graduate, Department of Microbiology, Andhra Medical College,Visakhapatnam.
3. Professor, Department of Microbiology, Andhra Medical College, Visakhapatnam.
4. Professor & Head of Department, Department of Microbiology, Andhra Medical College, Visakhapatnam.
Corresponding Author:
Dr B. Aruna, Assistant Professor, Department of Microbiology, Andhra Medical College, Visakhapatnam-530002
Email: aruna_8182@yahoo.com

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ABSTRACT:
INTRODUCTION: Dengue and Chikungunya viruses are both RNA viruses sharing common mosquito vectors, *Aedes aegypti* and *Aedes albopictus*. In India, both these viral illnesses initially present with common signs and symptoms and also share a common seasonal transmission cycle. **AIMS AND OBJECTIVES:** To know about the coinfection of dengue and chikungunya viruses existing in the given study population. **MATERIAL AND METHODS:** 1135 clinically suspected dengue and chikungunya cases (IP and OP) were tested in Virology lab at KGH, Visakhapatnam from Feb 2021-July 2022 by using IgM MAC ELISA for dengue and chikungunya simultaneously (by kits supplied by NIV Pune). **RESULTS:** Out of the 1135 IP & OP patients, 517 were males (45.5%) and females were 618 (54.44%). Predominant age group who presented with symptoms and got tested was 21-30 years with 265 cases (23.34%) and coinfection rate was highest among 31- 40 years age group with 14.94 %. The total no. of dengue positive cases were 273 (24.05%) and chikungunya were 79 (6.96%). The coinfection for dengue and chikungunya was found to be 13.3% (151 cases). **CONCLUSION:** This study shows that testing for either of the viruses can lead to misdiagnosis and it is important to diagnose for both dengue and chikungunya simultaneously, at the right time for proper primary care of the patient and to avoid fatal complications.
Keywords: Coinfection, Dengue, Chikungunya, Aedes aegypti, Aedes albopictus

INTRODUCTION:

Arthropod borne diseases like dengue and chikungunya are endemic in India and they pose a major threat to global public health. DENV AND CHIKV are both enveloped positive sense single stranded RNA viruses sharing common mosquito vectors (*Aedes aegypti & Aedes albopictus)*. Dengue virus (Family *Flaviviridae*, Genus *Flavivirus*) has 5 serotypes -DENV 1-5. The genome (~10.6 kb) encodes three structural and seven non-structural proteins in a single open reading frame. The structural proteins are capsid (C), precursor membrane (prM), and envelope (E) proteins. The envelope glycoprotein is essential for viral entry into the cell. Non-structural proteins are involved in viral replication within the cell, named NS1, NS2A, NS2B, NS3, NS4A, NS4B, and NS5. [1] Infection with one serotype of DENV delivers lifelong immunity to subsequent infection by the same serotype, but it does not confer strong immunity against infection with other serotypes of DENV. Hence, an individual with severe complications like Dengue Haemorrhagic Fever or Dengue Shock Syndrome (DHF/DSS) is thought to be associated with secondary or tertiary infection. [2] Chikungunya virus (CHIKV) belongs to the genus *Alphavirus* in the family *Togaviridae* with a 60 - 70 nm diameter and has 3 genotypes /strains, East-Central-South African (ECSA), West African and Asian. The CHIKV genome encodes for three structural (C, E1 and E2) and four nonstructural (nsP 1- 4) proteins.[3] An infection with either DENV or CHIKV can lead to self-limiting fever with a clinical presentation similar to febrile illness and the viral titer usually decreases in around 10 days. However, in some dengue patients, severe dengue disease may manifest, leading to the lethal haemorrhagic fever or shock syndrome. Debilitating polyarthralgia is a symptom unique to CHIKV infection, which may usually last for a few days but may be prolonged for weeks, months, or even years . [4] A severe chikungunya viral infection can cause neurological and optical manifestations. [5] Infants, elderly, and people with comorbidities are at risk for more severe disease. The first documented case of dengue and chikungunya coinfection in

humans in India was reported in October 1964 from Vellore, South India. [6] Though the coinfection was reported in many parts of India till date, very few studies were being done in Andhra Pradesh so far. So the present study was conducted to know about the prevalence of coinfection of DENV and CHIKV existing in the given study population in Visakhapatnam District, Andhra Pradesh.

MATERIALS AND METHODS:

The study was carried out in Virology lab at KGH, Visakhapatnam from Feb 2021-July 2022. Sera separated from a total of 1135 clinically suspected dengue and chikungunya cases (IP and OP) were subjected to IgM MAC ELISA for dengue virus, chikungunya virus and both dengue and chikungunya viruses by using National Institute of Virology (NIV) IgM Capture ELISA kits for DENV & CHIKV. Mono infection is defined as positive IgM Capture ELISA for only one of these viral infections either with DENV or with CHIKV. Coinfection was defined as positive IgM Capture ELISA for both infections, DENV and CHIKV as well.

RESULTS:

In the present study, out of the 1135 clinically suspected dengue and chikungunya cases tested (both IP & OP patients), predominant age group who presented with symptoms and got tested was 21-30 years with 265 cases (23.34%) followed by 0-10 years with 244 cases (21.49%) and 11-20 years with 197 cases (17.35%). [Table 1] Out of these 517 were males (45.55%) and females were 618 (54.44%).[Table 2] Out of the total 1135 samples, 503 samples (44.31%) were seropositive for one or both viruses and 632 samples were seronegative (55.68 %). [Table 3] The total no. of dengue mono infection cases were 273 (24.05%) and chikungunya mono infection cases were 79 cases (6.96%), while the coinfection for dengue and chikungunya was found in 151 cases (13.3%). [Figure 1] The coinfection rate was slightly higher in females with 76 cases (50.33%) than males with 75 cases (49.66%). [Figure 2]

The coinfection rate was seen to be highest among 31-40 age group with 14.94%. [Table 1]

Table 1: Age wise distribution of study participants (n = 1135)

Age group	Total number of study participants	No of coinfection positive cases	Percentage
0 -10	244 (21.49 %)	36	14.75 %
11-20	197 (17.35 %)	22	11.16 %
21-30	265 (23.34 %)	34	12.83 %
31- 40	174 (15.33 %)	26	14.94 %
41-50	122 (10.74 %)	17	13.93 %
51-60	64 (5.63 %)	8	12.50 %
> 60	69 (6.07 %)	8	11.59 %

Table 2: Gender wise distribution of study participants (n = 1135)

Gender	Total number of study participants	Number of coinfection positive cases	Percentage
Male	517 (45.55%)	75 (49.66%)	14.50 %
Female	618 (54.44%)	76 (50.33%)	12.29 %

Table 3: Percentage distribution of samples (n=1135)

Test result	No. of positive cases	Percentage
Seropositive	503	44.31 %
Seronegative	632	55.68 %
TOTAL	1135	100 %

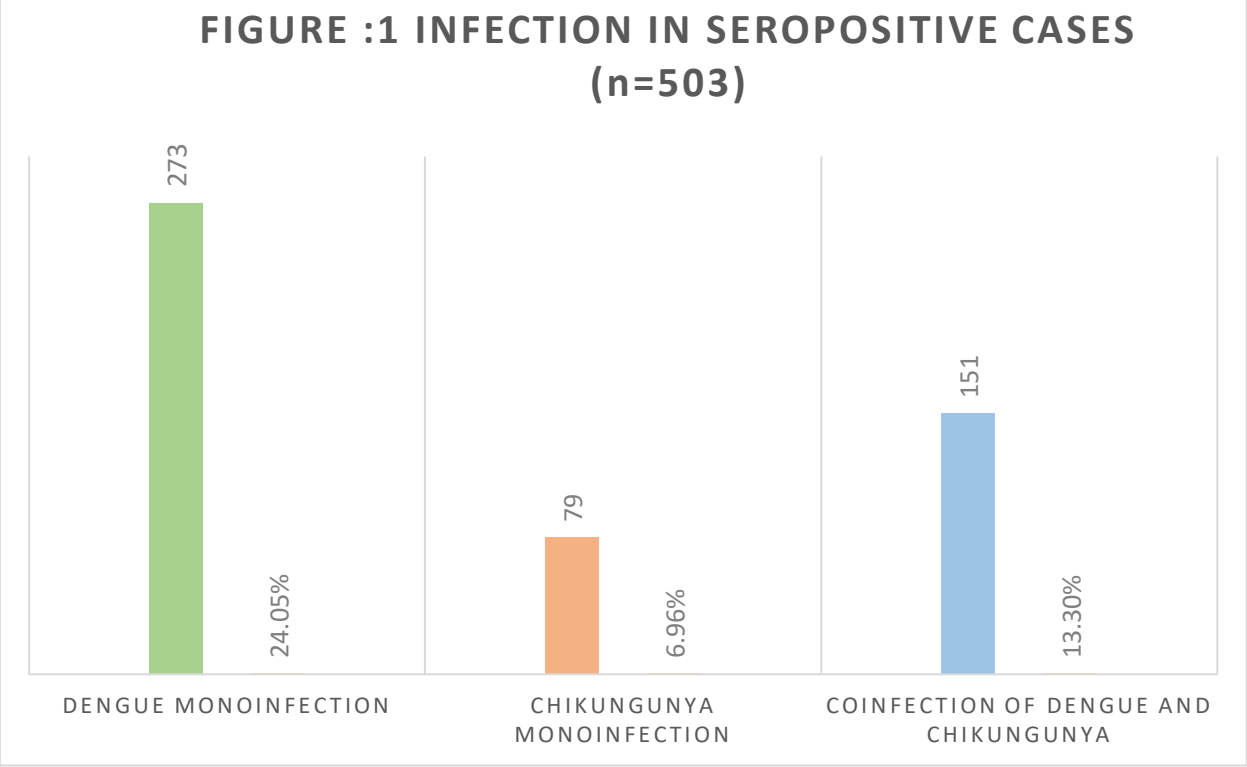

Figure 2 : Gender wise distribution of coinfection cases (n=151)

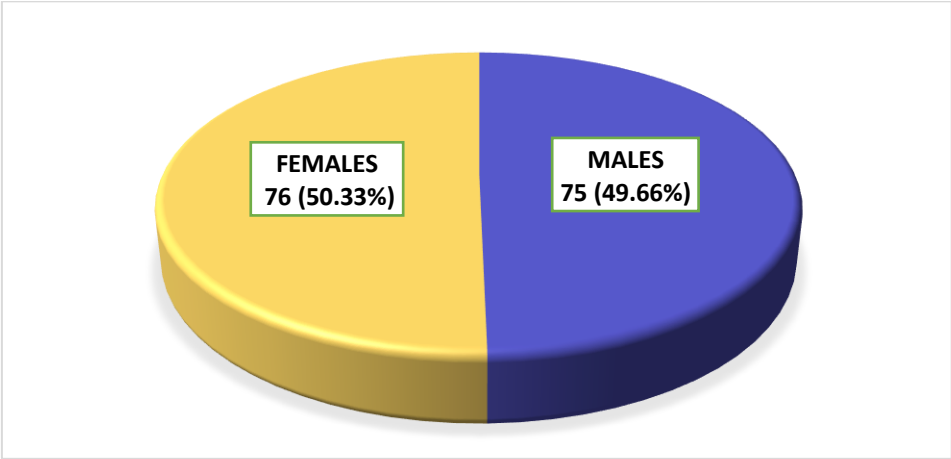

Table 5: Prevalence of coinfection of dengue and chikungunya in different studies conducted in India

S.no	Author	Place	Year	No. of samples tested	Percentage of coinfection
1	Taraphdar D et al.	West Bengal	2010	550	(68) 12.4%
2	Shaikh N et al.	Karnataka	2010 -13	6554	(532) 8.11%
3	Kalawat U et al.	Tirupati	2011	72	(2) 2.7%
4	Saswat T et al.	Odisha, Maharashtra	2013	204	(28) 13.72 %
5	Londhey V et al.	Mumbai	2015	300	(30) 10 %
6	Kaur M et al.	Amritsar	2016	283	(27) 9.54%
7	Singh J et al.	Varanasi	2016	121	(13) 10.74%
8	Smita Deshkar et al.	Nagpur	2016 -17	2153	(64) 2.97%
9	Chawda H et al.	Rajkot	2017	1605	(60) 3.73%
10	**Present study**	**Visakhapatnam**	**2021-22**	**1135**	**(151) 13.3%**

DISCUSSION:

Dengue and chikungunya infections are the most common mosquito borne infections in India as per the National Vector Borne Disease Control Programme (NVBDCP),Government of India. A concurrent viral infection in humans can occur due to bite of a mosquito that is infected with both the viruses or bites with two different mosquitoes each infected with a separate virus.[5] Patients having coinfection with the dengue and chikungunya viruses present with overlapping symptoms like fever, chills, myalgias, joint pains, fatigue, nausea, vomiting and headache which makes it difficult to diagnose clinically. Severe disease clinically with a high mortality rate and the requirement of mechanical ventilation and blood transfusion is comparatively more in the coinfected patients when compared to mono infection with these viruses.[5] Thrombocytopenia and hepatic dysfunction were also found to be dominant in the dengue and coinfection groups.[7] The coinfection rate in the present study among males and females was almost the same and was highest among 31 - 40 age group followed by 0-10 years. The total no. of only dengue positive cases were 273 (24.05%) and chikungunya were 79 (6.96%), while the coinfection for dengue and chikungunya was found in 151 cases (13.3%). No specific antiviral agent is indicated for dengue or chikungunya. Treatment is mainly symptomatic and supportive. Moreover prescription of arthralgia alleviating NSAIDS in chikungunya patients can lead to severe bleeding in patients with thrombocytopenia or DHF and missing out diagnosis of chikungunya and not treating it appropriately can lead to severe morbidity.

CONCLUSION:

Dengue fever has a high incidence rate which leads to testing of the symptomatic patients for dengue virus only and rarely for chikungunya infection. This study shows that testing for either of the viruses can lead to misdiagnosis and it is important to diagnose for both dengue and chikungunya simultaneously especially in

endemic areas, at the right time for proper primary care of the patient and to avoid fatal complications.

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Conflicts of interest:
There are no conflicts of interest.

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