ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 12, Issue, 01, pp.9946-9949, January, 2020

DOI: https://doi.org/10.24941/ijcr.37893.01.2020

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

SEROPREVALENCE OF MONO-INFECTION AND CO-INFECTION WITH DENGUE AND CHIKUNGUNYA IN CHILDREN IN A TERTIARY CARE HOSPITAL

[1,*]Dr. Kiranmai R., [2]Dr. Satyanarayana O., MD., DLO., [3]Dr. Srinivasa Rao CH., M.D., [4]Dr. Rajaram G., MD., D.D and [5]Dr. Janardhana Raju B., M.D.

[1,*]Post Graduate, Department of Microbiology, S.V. Medical College, Tirupati,
[2]Professor, Department of Microbiology, S.V. Medical College, Tirupati
[3]Professor and Head, Department of Microbiology, S.V. Medical College, Tirupati
[4]Associate Professor, Department of Microbiology, S.V. Medical College, Tirupati,
[5]Assistant Professor, Department of Microbiology, S.V. Medical College, Tirupati

ARTICLE INFO

Article History:
Received 24th October, 2019
Received in revised form
20th November, 2019
Accepted 19th December, 2019
Published online 30th January, 2020

Key Words:
Dengue, Chikungunya,
Mono-Infection, Co-Infection.

ABSTRACT

Background: Dengue and Chikungunya infections are increasing in worldwide. As there is similarity between these viruses in seasonal transmission cycle and clinical presentation, it becomes difficult to distinguish them without specialized diagnostic techniques. **Aim and objectives:** To estimate the sero prevalence of Dengue and Chikungunya mono-infection and co-infection in Pediatric population and to analyze the outcome of all positive cases. **Method:** The study was conducted for a period of one year from November 2018 to October 2019. Blood samples were collected from suspected Paediatric fever cases. Serum was separated and tested for both Dengue and Chikungunya IgM antibodies by ELISA method in Microbiology department. **Result:** Out of 300 samples tested, 113 were IgMposition for Dengue/Chikungunya or both. Among these, 54 were positive only for Dengue, 31 for Chikungunya only and 28 for both viruses. Mortality was higher in co-infection than in mono-infection. **Conclusion:** Simultaneous screening for both viruses in endemic areas would help to improve arboviral surveillance and also potentially aid in clinical management of these infections.

Citation: ***Dr. Kiranmai R., Dr. Satyanarayana O., MD., DLO., Dr. Srinivasa Rao CH., M.D., Dr. Rajaram G., MD., D.D and Dr. Janardhana Raju B., M.D.*** **2020.** "Seroprevalence of mono-infection and co-infection with dengue and chikungunya in children in a tertiary care hospital", *International Journal of Current Research*, 12, (01), 9946-9949.

INTRODUCTION

Dengue and Chikungunya infections appeared to be increasing in India (Rianthavorn, 2010). Over the last few decades, the DENV has spread throughout most of the tropical and subtropical regions of the world, and these areas have become endemic (Rianthavorn, 2010; Ernould, 2005). DENV and CHIKV are RNA viruses, and human transmission occurs through the bite of mosquitoes belonging to *Aedes* species. The broad geographic distribution of the *Aedes aegypti* and *Aedes albopictus* vectors has allowed for the widespread transmission of Chikungunya in Dengue endemic areas (Ernould, 2005). Since 1996 Dengue infection has been widely prevalent in India. It has been reported from 29 states and 6union territories (Cecilia, 2014). As per NVBDCP data for the year 2017, it is estimated that total Dengue cases in India and Andhra Pradesh were 1, 88, 401 and 4,925 cases respectively and confirmed Chikungunya cases were 12,548 and 108 cases respectively (4. nvbdcp.gov.in).

Corresponding author: **Dr. Kiranmai, R.,**
Post Graduate, Department of Microbiology, S.V. Medical College, Tirupati,

Co-infection of Dengue and Chikungunya viruses in humans has been reported in India since 1967 (Gollins, 1986). As there is a similarity between the DENV and CHIKV in seasonal transmission cycle and clinical presentation, it becomes difficult to distinguish between these two viruses without specialized serological or molecular diagnostic techniques[6]. There are many studies regarding the association of subsequent infections with multiple serotypes of DENV and the risk of severe disease forms like DHF and DSS. But there are limited studies on co-infection or sequential infection with CHIK and DENV and any association of these viruses with a more severe clinical disease (Gollins, 1986; Cardosa, 1983; Kliks, 1989; Lin, 2003; Falconar, 1997; Rothman, 2003; Stephenson, 2005).

Aims and objectives3

AIM: To estimate the sero prevalence of Dengue and Chikungunya mono-infection and co-infection in the Pediatric population.

OBJECTIVES

- To study the clinical features of Dengue and Chikungunya in children
- To analyze the outcome of all the positive cases of mono-infection and co-infection in the Pediatric population
- To know the age and sex-wise distribution and urban and rural distribution of these infections.

METHOD OF THE STUDY

The present study was conducted in the Department of Microbiology, S.V. Medical College, Tirupati, from the date of approval of the protocol by the Institutional Ethics Committee of S.V. Medical College. The study included a total number of 300 pediatric patients suffering from fever and joint pains.

Type of study: Cross-sectional study

Study period: 12 months from the approval of the Ethics committee

Inclusion criteria:

- Clinically suspected cases of Dengue.
- Clinically suspected cases of Chikungunya.
- Children of the age group 1 month to 12 years and either sex.

Exclusion criteria

- The age group of less than one month.
- Proven cases of malaria.
- Proven cases of enteric fever.
- Those who do not give consent.

Sample collection: A total number of 300 blood samples were collected from patients admitted in the Department of Pediatrics, S.V.R.R.GGH with clinical features suggestive of Dengue and Chikungunya infection.

The blood sample was obtained from patients by venipuncture following strict aseptic precautions and after taking consent from their guardians. The blood was allowed to clot at room temperature and then centrifuged and serum was separated.

Storage of serum sample: The serum samples were refrigerated at 2 – 8^{0}C stored frozen (at -20^{0}C), if not tested within two days. Each sample was tested for Dengue and Chikungunya separately by using IgM Capture ELISA method ollowing the manufacturer's instructions (Kits by NIV, Pune, India) (Virology:www.niv.co.in).

RESULTS

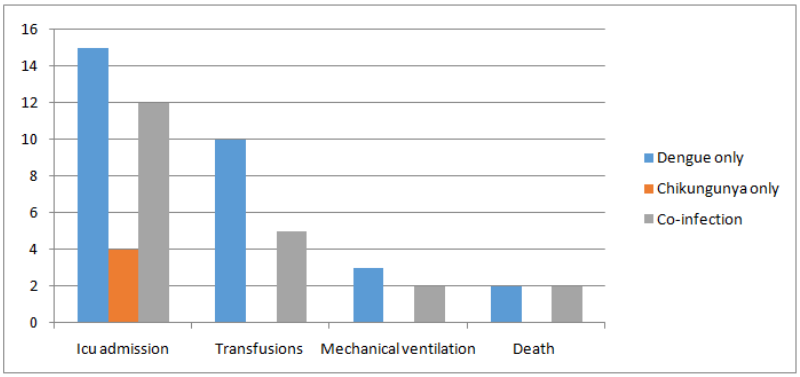
Age wise distribution of fever cases from which samples were collected showed that many patients were in the age group of 5 -10 years (60.17%) and more cases were from rural areas(59.33%).Out of 300 samples tested,113 were positive for IgM serology for Dengue/Chikungunya or both. Among the 113 ELISA positive cases, 54 were positive only for Dengue IgM, 31 were positive for ChikungunyaIgM only and 28 are positive for both Dengue and Chikungunya IgMELISA. Maximum number of IgM ELISA positive cases ocurred during the months of September (12 cases), October (18 cases) and November (22 cases).

In the present study 103 (91.93%)of the ELISA positive cases were with fever history of 5 to 8 days. 6 of the ELISA positive cases presented with fever history of more than 8 days. After analysing the prevalence of clinical features among the ELISA positive cases, fever was present in 100% of the cases followed by body pains in 43 (38.0 5%) cases, rash, vomiting , abdominal pain, headache, loose motions and edema cases. Hemorrhagic manifestations were seen in 7(12.96%) cases with only Dengue and in 2 (7.14 %) cases positive for co-infection. Nohemorrhagic manifestations were seen in cases presenting with Chikungunya mono-infection.

Platelet count among ELISA positive cases

Platelet count	Dengue only	Chikungunya only	Co-infection	Total
<50,000/µl	10	0	5	15 (13.27%)
50,000-1 lakh/µl	13	1	8	22 (19.46%)
1 lakh-1.5lakh/µl	11	9	5	25 (22.12%)
>1.5lakh/µl	20	21	10	51(45.13%)
Total	54	31	28	113

Morbidity and mortality among ELISA positive cases



Comparison of ELISA positive cases among various studies

Study	Total samples	Total ELISA positive cases	Percentage
Present study	300	113	37.66%
Rao et al (2019)	293	95	32.42%
Singh et al (2018)	1800	121	6.72%
Dinakar et al (2017)	186	108	58.06%
Gandhi S et al(2015)	364	175	48.07%
Chipwaza et al (2014)	364	93	25.54%
Taraphdar et al (2012)	550	303	55.09%

Comparison of IgM ELISA positive cases

Study	Total ELISA positive samples	Dengue	Chikungunya	Co-infection
Present study	113/300(37.66%)	54(18%)	31(10.33%)	28(9.33%)
Rao et al (2019)	95/293(32.42%)	74(25.3%)	17(5.8%)	4(1.3%)
Dinakar et al(2017)	108/186(50.06%)	57(30.65%)	23(12.37%)	27(15.05%)
Gandhi S et al(2015)	175/364(40.08%)	96(26.4%)	54(14.8%)	25(6.8%)
Chipwaza et al(2014)	97/364(26.64%)	76(20.9%)	17(4.7%)	4(1%)

Comparison of mortality among ELISA positive cases

	Dengue only	Chikungunya only	Co-infection
Present study	2 (3.70%)	-	2 (7.14%)
Singh et al(2018)	1 (0.98%)	-	-
Gandhi et al (2015)	3 (2.0%)	-	3 (12.0%)
Chahar et al (2009)	-	-	1 (16.69%)

DISCUSSION

The *Aedes aegypti* mosquito transmits both the Chikungunya and dengue viruses. Chances of co-infection are more if the mosquito carries both these viruses. Therefore in areas where both these viruses co- circulate the problem of coinfection is more pronounced. As the dengue fever has high mortality rate, symptomatic patients are tested only for dengue virus and in only rare cases tested for chikungunya viral infection. This is a very important reason why the Chikungunya cases go undiagnosed in the dengue endemic areas, and the true burden of Chikungunya virus infection has been missed. Therefore the investigation for both these viruses should be done especially in endemic areas. In the present study, males were more than the females and more cases from rural areas. This finding was similar to the observation of Chipwaza *et al.* study(2014) and the study of Morch et al.(2017). Prevalence of clinical features among the ELISA positive cases showed that fever and body pains were present in all the cases. Hemorrhagic manifestations were seen in 7(13%) of the cases with only dengue and in 2 (7.14 %) cases positive for dengue and Chikungunya co-infection. Similar findings of clinical presentation were reported in the study by Singh et al (2018) and Dinakar *et al.* (2017).

Conclusion

Our study suggests that dual infection with Chikungunya and Dengue viruses is associated with a more severe clinical disease, than with mono-infection. Further studies are required which will help in understanding the pathogenesis of this probable increase in severity of co-infection. These viruses are spreading to new areas in this part of the state, as there is no herd immunity to these viruses. Factors such as low socio-economic status, overcrowding and poor sanitation facilitate the growth of the Aedes mosquito which contribute to the spread of dengue and Chikungunya viruses to wider areas. Therefore, simultaneous screening for Dengue, Chikungunya and co-infections in the endemic areas would help to improve the quality of arboviral surveillance and also potentially aid in the clinical management of these infections.

REFERENCES

Cardosa MJ, Porterfield JS, Gordon SI. 1983. Complement receptor mediates enhanced flavivirus replication in macrophages. *Journal of Experimental Medicine*. Jul 1;158(1):258-63.

Carrillo-Hernández MY., Ruiz-Saenz J., Villamizar LJ., Gómez-Rangel SY., Martínez-Gutierrez M. 2018. Co-circulation and simultaneous co-infection of dengue, chikungunya, and zika viruses in patients with febrile syndrome at the Colombian-Venezuelan border. BMC infectious diseases., 18(1):61.

Cecilia D. 2014. Current status of dengue and chikungunya in India. WHO South-East Asia journal of public health. Jan 1;3(1):22. nvbdcp.gov.in

Chipwaza B., Mugasa JP., Selemani M., Amuri M., Mosha F., Ngatunga SD., Gwakisa PS. 2014. Dengue and Chikungunya fever among viral diseases in outpatient febrile children in Kilosa district hospital, Tanzania. PLoS neglected tropical diseases. Nov 20;8(11):e3335.

Dinkar A., Singh J., Prakash P., Das A., Nath G. 2018. Hidden burden of chikungunya in North India; a prospective study in a tertiary care centre. Journal of infection and public health. Jul 1;11(4):586-91.

Ernould S, Walters H, Alessandri JL, Llanas B, Jaffar MC, Robin S, Attali T, Ramful D, Combes JC. 2008. Chikungunya in paediatrics: epidemic of 2005-2006 in Saint-Denis, Reunion Island. Archives de pediatrie: organe officiel de la Societe francaise de pediatrie. Mar;15(3):253-62.

Falconar AK. 1997. The dengue virus nonstructural-1 protein (NS1) generatesantibodies to common epitopes on human blood clotting, integrin/adhesin proteins and binds to humanendothelial cells: potential implications in haemorrhagic fever pathogenesis. *Archives of virology*. May 1;142(5):897-916.

Furuya-Kanamori L, Liang S, Milinovich G, Magalhaes RJ, Clements AC., Hu W, Brasil P, Frentiu FD, Dunning R, Yakob L. 2016. Co-distribution and co-infection of

chikungunya and dengue viruses. BMC infectious diseases. Dec;16(1):84.

Gandhi BS, Kulkarni K, Godbole M, Dole SS, Kapur S, Satpathy P, Khatri AM, Deshpande PS, Azad F, Gupte N, Bharadwaj R. 2015. Dengue and chikungunya co-infection associated with more severe clinical disease than mono-infection. *Int J Healthcare Biomed Res*., Apr;3(3):117-23.

Gandhi BS., Kulkarni K., Godbole M., Dole SS., Kapur S., Satpathy P., Khatri AM., Deshpande PS., Azad F., Gupte N., Bharadwaj R. 2015. Dengue and chikungunya co-infection associated with more severe clinical disease than mono-infection. *Int J Healthcare Biomed Res*., Apr;3(3):117-23.

Gollins SW, Porterfield JS. 1986. A new mechanism for the neutralization of enveloped viruses by antiviral antibody. Nature. May;321(6067):244.

Gollins SW, Porterfield JS. 1986. A new mechanism for the neutralization of enveloped viruses by antiviral antibody. *Nature*., 321(6067):244.

Kaur M., Singh K., Sidhu SK., Devi P., Kaur M., Soneja S., Singh N. 2018.Coinfection of chikungunya and dengue viruses: A serological study from North Western region of Punjab, India. *Journal of laboratory physicians.* Oct;10(4):443.

Kliks SC., Nisalak A., Brandt WE., Wahl L., Burke DS. 1989. Antibody-dependent enhancement of dengue virus growth in human monocytes as a risk factor for dengue hemorrhagic fever. The American journal of tropical medicine and hygiene. 1;40(4):444-51.

Kumar R., Tripathi P., Tripathi S., Kanodia A., Pant S., Venkatesh V. 2008. Prevalence and clinical differentiation of dengue fever in children in northern India. Infection. Oct 1;36(5):444.

Lin CF., Lei HY., Shiau AL., Liu CC., Liu HS., Yeh TM., Chen SH. Lin YS. 2003. Antibodies from dengue patient sera cross-react with endothelial cells and induce damage. Journal of medical virology. Jan;69(1):82-90.

Mørch K., Manoharan A., Chandy S., Chacko N., Alvarez-Uria G., Patil S., Henry A., Nesaraj J., Kuriakose C., Singh A., Kurian S. 2017. Acute undifferentiated fever in India: a multicentre study of aetiology and diagnostic accuracy. *BMC infectious diseases*. Dec;17(1):665.

National Institute Of Virology:www.niv.co.in

Rao PN., Van Eijk AM., Choubey S., Ali SZ., Dash A., Barla P., Oraon RR., Patel G., Nandini P., Acharya S., Mohanty S., 2019. Dengue, chikungunya, and scrub typhus are important etiologies of non-malarial febrile illness in Rourkela, Odisha, *India. BMC infectious diseases*. Dec;19(1):572.

Rianthavorn P, Prianantathavorn K, Wuttirattanakowit N, Theamboonlers A, Poovorawan Y. 2010. An outbreak of chikungunya in southern Thailand from 2008 to 2009 caused by African strains with A226V mutation. *International Journal of Infectious Diseases*., Sep 1;14:e161-5.

Rothman AL. 2003. Immunology and immunopathogenesis of dengue disease. *Adv Virus Res.,* Jan 1;60:397-419.

Shah I, Katira B. Clinical and Laboratory Abnormalities due to Dengue in Hospitalized Children in Mumbai in 2004.

Singh J., Dinkar A., Singh RG., Siddiqui MS., Sinha N., Singh SK. 2018. Clinical profile of dengue fever and coinfection with chikungunya. *Tzu-Chi Medical Journal*. Jul;30(3):158.

Stephenson JR. 2005. Understanding dengue pathogenesis: implications for vaccine design. Bulletin of the World *Health Organization*., 83:308-14.

Taraphdar D., Sarkar A., Mukhopadhyay BB., Chatterjee S. 2012. A comparative study of clinical features between monotypic and dual infection cases with Chikungunya virus and dengue virus in West Bengal, India. The *American journal of tropical medicine and hygiene.* Apr 1;86(4):720-3.

****