Original Article

ISSN (O): 2347-3363; ISSN (P): 2347-3355

Evaluation of Dengue and Chikungunya Infections in Children

Avadhesh Kumar Gupta

Assistant Professor, Department of Paediatrics, Venkateshwara Institute of Medical Sciences, Gajraula, UP, India.

Abstract

Background: The aim is to evaluate dengue and chikungunya infections in children. **Subjects and Methods:** One hundred five children age ranged 9-17 years of both genders were selected for this prospective, observational study. Serological confirmation for dengue was performed by determining IgM level. Molecular detection of the virus Viral RNA from DENV and CHIKV were detected using reverse transcription-polymerase chain reaction (RT-PCR) method. **Results:** Age group 9-11 years comprised of 23, 12-14 had 48 and 15-17 years had 34 children. CHIKV was detected in 30, DENV in 52 and DENV- CHIKV in 23 cases. Common symptoms seen in CHIKV, DENV and DENV- CHIKV patients were cough in 80%, 62% and 61%, diarrhea in 54%, 67% and 54%, rash in 90%, 82% and 67%, headache in 87%, 90% and 55%, nausea in 74%, 62% and 43%, oedema in 69%, 76% and 37%, abdominal tenderness in 72%, 82% and 42% and myalgia in 24%, 75% and 64% respectively. A non- significant difference was observed (P> 0.05). **Conclusion:** Results of the study reveals that among all infection, dengue virus infection was predominantly seen among children followed by chikungunya virus infection. Maximum cases were seen in age group 12-14 years.

Keywords: Dengue Virus Infection, Children, Chikungunya, Abdominal Tenderness.

Corresponding Author: Avadhesh Kumar Gupta, Assistant Professor, Department of Paediatrics, Venkateshwara Institute of Medical Sciences, Gajraula, UP, India.
E-mail: avadheshdr@yahoo.co.in

Received: 09 October 2021 **Revised: 17 December 2021** **Accepted: 29 December 2021** **Published: 25 January 2022**

Introduction

Viral infections transmitted by Aedes mosquitoes are still a considerable health concern in tropical countries. Dengue is an endemic epidemic disease worldwide.[1] The chikungunya virus (CHIKV) has been present in Africa and Asia since many years, its presence in America was detected in 2013 and since then, more than 2 million cases have been reported in the continent. Although CHIKV belongs to the alphavirus genus from the Togaviridae family and dengue virus (DENV) belongs to the Flavivirus genus, both cause similar febrile syndromes and share many signs and symptoms, especially in children, which leads to misdiagnosis.[2] CHIKV infection causes higher fever than that caused by DENV infection and begins abruptly; patients have reported arthralgia/arthritis, rash, back pain, and severe myalgias that could develop into severe joint pain in adults and may last for weeks or months after acute infection.[3,4]

Various arboviruses are most likely important and are gaining more prominence as observed through an increase in reported activity and epidemic activity of diseases such as dengue and chikungunya.[5] Moreover, malaria may as well have been over-diagnosed in different parts of world. Most arbovirus infections are asymptomatic, but can as well cause a broad spectrum of manifestations, ranging from nonspecific flu-like syndrome to severe complications.[6,7] Considering this, we performed present study to evaluate dengue and chikungunya infections in children.

Subjects and Methods

A sum total of one hundred five children age ranged 9-17 years of both genders were selected for this prospective, observational study. All parents gave their written consent for the study. Ethical approval for the conduction of the study was taken into consideration.

Demographic profile of each subject was recorded. Children with symptoms such as fever, rash, edema, headache, myalgias, or arthralgias was recorded. In all, 5 ml blood samples were taken to evaluate and biochemical variables. Immunochromatography-based rapid diagnostic tests were performed for dengue detection of NS1 antigen detection and IgM/IgG antibodies. Serological confirmation for dengue was performed by determining IgM levels using the UMELISA

Dengue IgM Plus and anti-DENV high-affinity IgG antibodies were detected by using the Capture IgG Elisa kit. Molecular detection of the virus Viral RNA from DENV, and CHIKV were detected using reverse transcription-polymerase chain reaction (RT-PCR) method. Results were studied statistically using SPSS version 21.0 with the level of significance set below 0.05.

Results

Table 1: Distribution of children based on age group

Age group (Years)	Number	P value
9-11	23	>0.05
12-14	48	
15-17	34	

Age group 9-11 years comprised of 23, 12-14 had 48 and 15-17 years had 34 children. A non- significant difference was observed (P> 0.05) [Table 1].

Table 2: Type of viral infection in children

Viral infection	Number	P value
CHIKV	30	<0.05
DENV	52	
DENV- CHIKV	23	

CHIKV was detected in 30, DENV in 52 and DENV- CHIKV in 23 cases. A significant difference was observed (P< 0.05) [Table 2, Figure 1].

Common symptoms seen in CHIKV, DENV and DENV-CHIKV patients were cough in 80%, 62% and 61%, diarrhea in 54%, 67% and 54%, rash in 90%, 82% and 67%, headache in 87%, 90% and 55%, nausea in 74%, 62% and 43%, oedema in 69%, 76% and 37%, abdominal tenderness in 72%, 82% and 42% and myalgia in 24%, 75% and 64% respectively. A non-significant difference was observed (P> 0.05) [Table 3, Figure 2].

Discussion

Dengue and chikungunya are major global health concerns due to their continued spread and intensifying epidemic activities throughout most of the tropical and subtropical regions of the world.[8,9] Regular outbreaks of dengue have been reported throughout most of the tropical and sub-tropical regions of the world for several decades while chikungunya epidemics have attained global distribution within the past ten years; yet largescale epidemics of dengue fever and chikungunya fever has only recently presented as an emerging phenomenon in

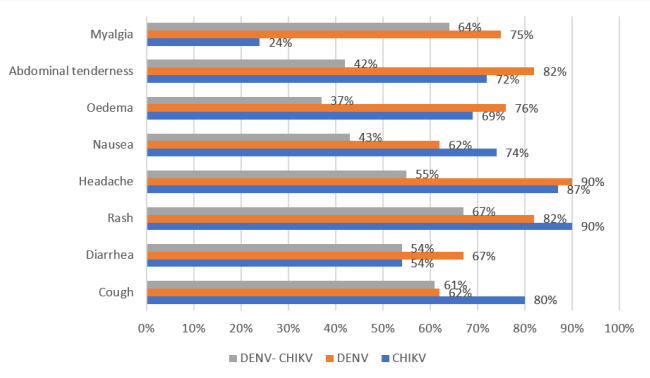

Figure 2: Assessment of symptoms in children

Africa.[10,11] We performed present study to evaluate dengue and chikungunya infections in children.

Our results showed that age group 9-11 years comprised of 23, 12-14 had 48 and 15-17 years had 34 children. Kajeguka et al,[12] in their study found that out of a total of 1100 participants recruited, 91.2 % (n = 1003) were malaria negative by mRDT. Out of these, few of the participants (<5 %) were dengue IgM or IgG positive. A total of 381 participants had fever out of which 8.7 % (33/381) met the defined criteria for probable dengue, though none (0 %) was confirmed to be acute cases. Chikungunya IgM positives among febrile participants were 12.9 % (49/381) while IgG positives were at 3.7 % (14/381). A total of 74.2 % (283/381) participants met the defined criteria for probable chikungunya and 4.2 % (11/263) were confirmed by PCR to be acute chikungunya cases. Further analyses revealed that headache and joint pain were significantly associated with chikungunya IgM seropositivity.

Our results revealed that CHIKV was detected in 30, DENV in 52 and DENV- CHIKV in 23 cases. Vernon et al,[13] compared 117 patients with chikungunya infection diagnosed with reverse transcription-polymerase chain reaction (RT-PCR) with 917 dengue RT-PCR-positive adult patients (including 55 with DHF). They compared dengue fever (DF), DHF, and chikungunya infections by evaluating clinical characteristics of dengue and chikungunya; developing classification tools via multivariate logistic regression models and classification trees of disease etiology using clinical and laboratory factors; and assessing the time course of several clinical variables. At first presentation to hospital, significantly more chikungunya patients had myalgia or arthralgia, and fewer had a sore throat, cough (for DF), nausea, vomiting, diarrhea, abdominal pain, anorexia or tachycardia than DF or DHF patients. It was seen that platelets <118×109/L was the only distinguishing feature for DF versus chikungunya with an overall correct classification of 89%. For DHF versus chikungunya using platelets <100×109/L and the presence of bleeding, the overall

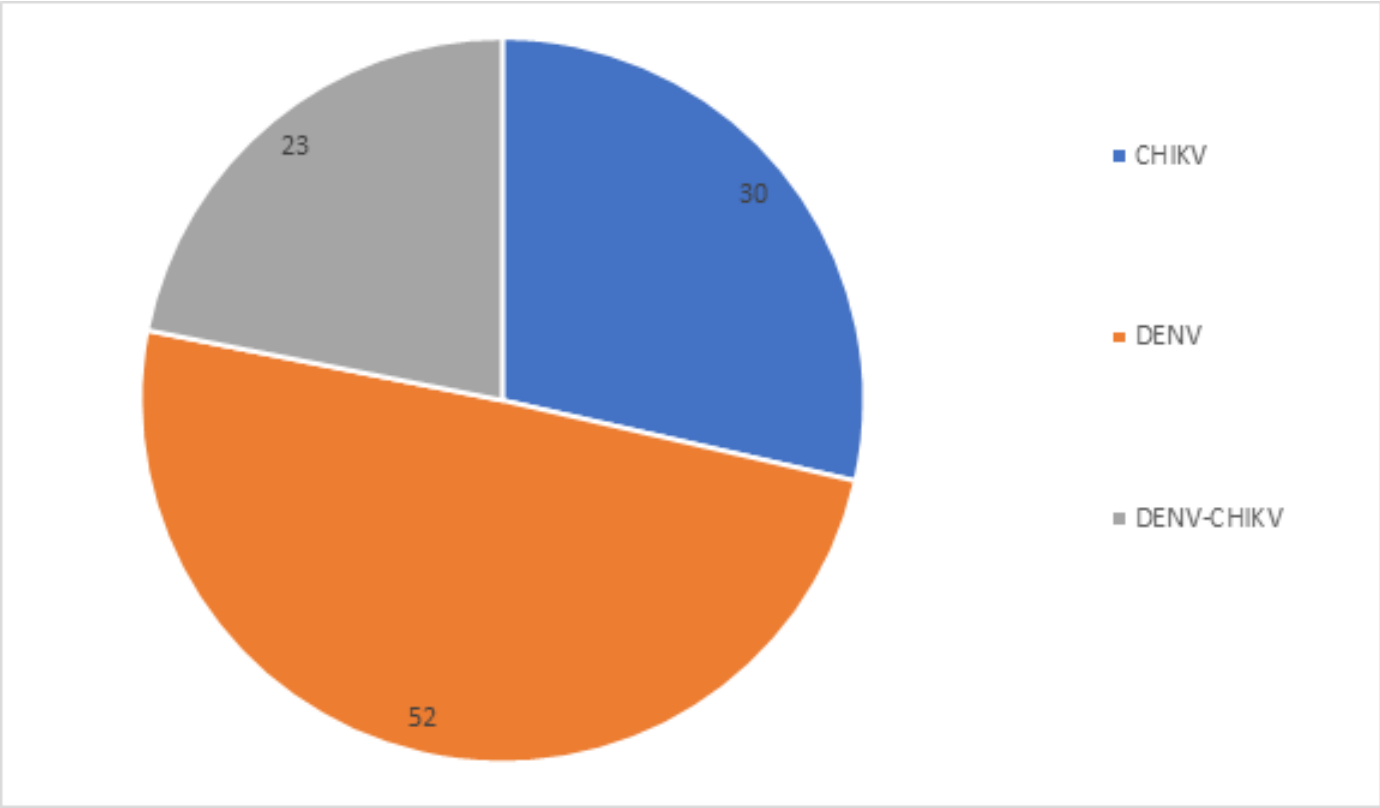

Figure 1: Type of viral infection in children

Table 3: Assessment of symptoms in children

Symptoms	CHIKV	DENV	DENV- CHIKV	P value
Cough	80%	62%	61%	>0.05
Diarrhea	54%	67%	54%	>0.05
Rash	90%	82%	67%	>0.05
Headache	87%	90%	55%	>0.05
Nausea	74%	62%	43%	>0.05
Oedema	69%	76%	37%	>0.05
Abdominal tenderness	72%	82%	42%	>0.05
Myalgia	24%	75%	64%	>0.05

correct classification was 98%. The time course analysis supported platelet count as the key distinguishing variable.

We observed that Common symptoms seen in CHIKV, DENV and DENV- CHIKV patients were cough in 80%, 62% and 61%, diarrhea in 54%, 67% and 54%, rash in 90%, 82% and 67%, headache in 87%, 90% and 55%, nausea in 74%, 62% and 43%, oedema in 69%, 76% and 37%, abdominal tenderness in 72%, 82% and 42% and myalgia in 24%, 75% and 64% respectively. Castellanos et al,[14] enrolled 345 febrile children for 12 months in a pediatric clinic. All patients were diagnosed as severe dengue at admission. Molecular detection and serology tests identified 143 CHIKV-positive (41.4%), 20 DENV-positive (5.8%), and 123 DENV-CHIKV coinfection patients (35.7%). DENV or CHIKV serology test results of these double-infected patients yield poor performance to confirm patient cases. every time as double or triple infections.

Paternina-Caicedo et al,[15] evaluated clinical and laboratory differences between dengue and chikungunya in children <24 months of age. A platelet count <150 000 cells/ml at

emergency admission best characterized dengue, with a sensitivity of 67% and specificity of 95%. The algorithm developed with classification and regression tree analysis showed a sensitivity of 93% and specificity of 38% to diagnose dengue. This study provides potential differential characteristics between chikungunya and dengue in young children, especially low platelet counts.

Conclusion

Results of the study reveals that among all infection, dengue virus infection was predominantly seen among children followed by chikungunya virus infection. Maximum cases were seen in age group 12-14 years.

References

1. Sam IC, Kamarulzaman A, Ong G, Veriah RS, Ponnampalavanar S, Chan YF. Chikungunya virus-associated death in Malaysia. Trop Biomed. 2010;27(2):343–347.
2. Silva LA, Dermody TS. Chikungunya virus: epidemiology, replication, disease mechanisms, and prospective intervention strategies. J Clin Invest. 2017;127(3):737–749. Available from: https://dx.doi.org/10.1172/JCI84417.
3. Aregawi MW, Ali AS, Al-Mafazy A, Molteni F, Katikiti S, Warsame M. Reductions in malaria and anaemia case and death burden at hospitals following scale-up of malaria control in Zanzibar. Malar J BioMed Central Ltd. 1999;10:46.
4. O'meara WP, Mangeni JN, Steketee R, Greenwood B. Changes in the burden of malaria in sub-Saharan Africa. Lancet Infect Dis. 2010;10(8):545–55. Available from: https://doi.org/10.1016/s1473-3099(10)70096-7.
5. Ishengoma DS, Mmbando BP, Segeja MD, Alifrangis M, Lemnge MM, Bygbjerg IC. Declining burden of malaria over two decades in a rural community of Muheza district, north-eastern Tanzania. Malar J. 2013;12:338. Available from: https://doi.org/10.1186/1475-2875-12-338.
6. Karema C, Aregawi MW, Rukundo A, Kabayiza A, Mulindahabi M, Fall IS, et al. Trends in malaria cases, hospital admissions and deaths following scale-up of anti-malarial interventions. Rwanda Malar J. 2000;11:236. Available from: https://doi.org/10.1186/1475-2875-11-236.
7. D'acremont V, Lengeler C, Genton B. Reduction in the proportion of fevers associated with Plasmodium falciparum parasitaemia in Africa: a systematic review. Malar J. 2010;9:240. Available from: https://doi.org/10.1186/1475-2875-9-240.
8. Awando J, Ongus J, Ouma C, Mwau M. Seroprevalence of Anti-Dengue Virus 2 Serocomplex antibodies in out-patients with fever visiting selected hospitals in rural parts of western Kenya in 2010-2011: A cross sectional study. Pan Afr Med J. 2013;16(73):1–10. Available from: https://doi.org/10.11604/pamj.2013.16.73.2891.
9. Vairo F, Nicastri E, Meschi S, Schepisi MS, Paglia MG, Bevilacqua N, et al. Seroprevalence of dengue infection: a cross-sectional survey in mainland Tanzania and on Pemba Island, Zanzibar. Int J Infect Dis. 2012;16(1):44–46. Available from: https://doi.org/10.1016/j.ijid.2011.09.018.
10. Vairo F, Nicastri E, Yussuf SM, Cannas A, Meschi S, Mahmoud M, et al. IgG against dengue virus in healthy blood donors, Zanzibar, Tanzania. Emerg Infect Dis. 2014;20(3):465–468. Available from: https://doi.org/10.3201/eid2003.130150.
11. Weller N, Clowes P, Dobler G, Saathoff E, Kroidl I, Ntinginya NE. Seroprevalence of alphavirus antibodies in a cross-sectional study in southwestern Tanzania suggests endemic circulation of chikungunya. PLoS Negl Trop Dis. 2014;8:2979.
12. Kajeguka DC, Kaaya RD, Mwakalinga S, Ndossi R, Ndaro A, Chilongola JO, et al. Prevalence of dengue and chikungunya virus infections in north-eastern Tanzania: a cross sectional study among participants presenting with malaria-like symptoms. BMC Infect Dis. 2016;16(183):1–9.
13. Lee VJ, Chow A, Zheng X, Carrasco LR, Cook AR, Lye DC, et al. Simple clinical and laboratory predictors of Chikungunya versus dengue infections in adults. PLoS Negl Trop Dis;6(9):1786. Available from: https://doi.org/10.1371/journal.pntd.0001786.
14. Castellanos JE, Jaimes N, Coronel-Ruiza C, Rojas JP, Mejía LF, Villarreal VH, et al. Dengue-chikungunya coinfection outbreak in children from Cali, Colombia in 2018-2019. Int J Infect Dis. 2021;102:97–102. Available from: https://doi.org/10.1016/j.ijid.2020.10.022.
15. Paternina-Caicedo A, Hoz-Restrepo FDL, Díaz-Quijano F, Caicedo-Torres W, Badillo-Viloria A, Bula-Anichiarico M, et al. Features of dengue and chikungunya infections of Colombian children under 24 months of age admitted to the emergency department. J Trop Pediatr. 2018;64(1):31–38. Available from: https://doi.org/10.1093/tropej/fmx024.

How to cite this article: Gupta AK. Evaluation of Dengue and Chikungunya Infections in Children. Asian J. Clin. Pediatr. Neonatol. 2021;9(4):18-21.

DOI: dx.doi.org/10.47009/ajcpn.2021.9.4.3

Source of Support: Nil, **Conflict of Interest:** None declared.