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Research Article

BURDEN OF DENGUE AND CHIKUNGUNYA CO-INFECTION IN A TERTIARY CARE HOSPITAL

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ABSTRACT

In India, concurrent infection of CHIKV and DENV had been reported since 1964 from different States. Both diseases have some common signs and symptoms that include fever, rashes, joint pain, nausea, headache, and vomiting and even the risk factors are the same or similar. Our study was aimed to report the proportion of patients co-infected with DENV and CHIKV in one year and the association of co-infection with disease severity among patients. In our study, 14.57% samples were reactive for Dengue serology and 39.57% samples were positive for Chikungunya infection in clinically suspected cases while coinfection was found in 5.78% samples. Dual infection was more common in males (58.3%) compared to females (41.7%). Majority of cases were from the age group of <20 years (42.1%) followed by 21-40 years (40.8%). Our findings suggest that there is urgent need to differentiate dual infections from mono-infections since the clinical course is unlikely to follow routine pattern and management strategies would require tailoring accordingly.

INTRODUCTION

Dengue has been contemplated as one of the major global public health issue by the WHO, with estimated 390 million annual infection spread across more than 125 countries [1]. There is also evidence of rapid expansion of Chikungunya in numbers and geographical areas involved. Ravi V *et al* in his report of 2006, has placed the figure of Chikungunya infected people in India at 1.5 million [2]. Chikungunya, caused by an alpha virus of family Toga viridae, clinically presents with high grade fever of sudden onset, rash and joint pains etc. Dengue virus a flavivirus, through any of its four serotypes causes dengue fever characterized by severe headache, myalgias and bone pains etc; some of the dengue fever cases may land into critical complications like dengue haemorrhagic fever and dengue shock syndrome. Both these pathogens are transmitted mainly by the same vector Aedes aegypti and sometimes A. albopictus. Since the vector is same and both these infections manifest at around the same time, it appears reasonably certain that epidemiological factors for these two infections must be spatiotemporally related [3].

In the literature there are some reports wherein they have studied the correlation between severity of disease and dengue -chikungunya co-infection. However only few studies projected high rate of severity and poor clinical outcomes in co-infected patients [4].

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The findings of our study are in corroboration with the few studies that have projected unfavorable outcomes in mixed infections. Our study was aimed to report the proportion of patients co-infected with DENV and CHIKV in one year and the association of co-infection with disease severity among patients.

MATERIALS AND METHODS

Our hospital is one of the important sentinel sites for dengue and chikungunya infection diagnosis and management. As a part of sentinel activity, blood samples of all the suspected cases were referred to the Dept. of Microbiology for investigation as per the guidelines of National Vector Borne Disease Control Program (NVBDCP) [5]. Hence, all such samples from suspected cases of dengue or chikungunya referred to the department of Microbiology from Jan 2016 to December 2016 were included in the study irrespective of the age, sex or any co-morbid illness in the patient. The samples referred for the second time for retesting and with concordant results with the previous testing, were not included in the study so that it doesn't affect the prevalence data. Dengue and Chikungunya are notifiable diseases, and one of the criteria for notification is that dengue and chikungunya cases should be reactive in MAC ELISA for IgM antibody. Dengue cases reactive in NS1Ag ELISA are also notifable. All the serum samples received were tested for both Dengue and Chikungunya IgM antibodies. In the present sentinel surveillance, MAC ELISA kits supplied and standardized by National Institute of Virology (NIV), Pune for detecting IgM antibody against dengue and chikungunya virus were used.

The sensitivity and specificity for the CHIK IgM antibody capture ELISA is 95 % and 98%, respectively, and for dengue IgM antibody capture ELISA is 98.53% and 98.84%, respectively. The tests were carried out following the manufacturer's instruction manual.

RESULTS

A total of 3856 serum samples from suspected cases were tested for Dengue and Chikungunya during the period from January 2016 to December 2016, out of which 562 (14.57%) samples were positive for Dengue serology and 1526 (39.57%) samples were positive for Chikungunya infection. There were 223 (5.78%) samples which were positive for both dengue and chikungunya serology as shown in table 1.

Table 1 Monthly distribution of Dengue and Chikungunya co-infection cases

Months	Total cases tested	Dengue positive	Chikungunya positive	Dual positive cases
January	23	3	1	Nil
February	16	1	1	Nil
March	21	Nil	Nil	Nil
April	21	Nil	Nil	Nil
May	16	Nil	Nil	Nil
June	41	4	1	Nil
July	126	8	3	Nil
August	615	111	161	33
September	1523	176	725	84
October	939	148	431	72
November	386	94	156	28
December	129	17	47	6
Total	3856	562 (14.57%)	1526 (39.57%)	223 (5.78%)

A seasonal peak was seen in the months of August to November (table 1). Dual infection was more common in males (58.3%) compared to females (41.7%). Majority of cases were from the age group of <20 years (42.1%) followed by 21-40 years (40.8%) as shown in table 2.

Fever was seen in all cases (100 %), while arthralgia and myalgia were observed in 97.7% and 95% respectively. Thrombocytopenia seen in 54.3% and blood transfusion was given in 15.7% while complications like hemorrhagic manifestations and hypotension were seen in 8.1% and 4.5% cases respectively [Table 3].

DISCUSSION

In 2012, dengue was classified by the World Health Organization (WHO) as the 'most important mosquito-borne viral disease in the world' due to significant geographic spread of the virus and its vector into previously unaffected areas and the associated cost burden it brings due to the morbidity and hospitalization [6]. Co-infection with DENV and CHIKV is becoming more prevalent due to increased co-circulation of both viruses in various parts of the country. Serological investigations in Southern India also indicate that the two viruses can co-exist in the same host. Dual infections may be the result of single bite of the vector carrying both the viruses and the outcome of bite by different vectors. Concurrent infections may result in illness with overlapping signs and symptoms, making diagnosis and treatment difficult for physicians [7,8]. Thus, in clinically suspected cases of Dengue or Chikungunya fever, it appears extremely essential that fever patients are screened for both the viruses in our study, 14.57% samples were reactive for Dengue serology and 39.57% samples for Chikungunya infection in clinically suspected cases. However co-infection was evidenced in 5.78% samples in our study. The prevalence of co-infection using serological methods have been reported as 2.7% by Kalawat *et al*. [9], 2.8% by Omarjee *et al*. [10], 12.4% by Taraphdar *et al*. [3] and 6.7% in londhey *et al*.[11]. The findings of our study are in line with that of Londhey *et al* [11].

There was a remarkable rise in the number of cases in the months of August and September.

Table 2 Age-wise and sex-wise distribution of co-infected cases

Months	Dual positive cases	Males	Females	<20 yrs	20-40 yrs	40-60 yrs	>60 yrs
January	Nil	Nil	Nil	Nil	Nil	Nil	Nil
February	Nil	Nil	Nil	Nil	Nil	Nil	Nil
March	Nil	Nil	Nil	Nil	Nil	Nil	Nil
April	Nil	Nil	Nil	Nil	Nil	Nil	Nil
May	Nil	Nil	Nil	Nil	Nil	Nil	Nil
June	Nil	Nil	Nil	Nil	Nil	Nil	Nil
July	Nil	Nil	Nil	Nil	Nil	Nil	Nil
August	33	19	14	13	13	6	1
September	84	50	34	36	34	6	8
October	72	44	28	32	29	5	6
November	28	14	14	13	10	3	2
December	6	3	3	-	5	1	-
Total	223	130 (58.3%)	93 (41.7%)	94 (42.1%)	91 (40.8%)	21 (9.4%)	17 (7.6%)

Table 3 Clinical features among Co-infected Cases

Clinical Features	Co-infected cases (%) (Total-223)
Fever	223 (100%)
Myalgia	212 (95%)
Arthralgia	218 (97.7%)
Rash	153 (68.6%)
Headache	169 (75.8%)
Nausea/ Vomiting	117 (52.5%)
Thrombocytopenia	121 (54.3%)
Blood transfusion given	35 (15.7%)
Bleeding complications	18 (8.1%)
Hypotension	10(4.5%)

The trend continued in October and November and then it declined in the month of December. These observations could be a reflection of the meteorological trends, i.e., rainfall and temperatures averages in Delhi which directly influence the vector activity. The seasonality of transmission increased in the monsoon and post monsoon season as has been reported in other studies [12, 13]. The increase in number of cases starting in the month of August suggests instituting rigorous anti vector measures in the preceding months of June and July. Temperature is known to play a role in adult vector survival, viral replication, and infective periods [14].

In our study, dual infection was more common in males (58.3%) compared to females (41.7%). Majority of cases were from the age group of <20 years (42.1%) followed by 21-40 years (40.8%) while only 7.6% cases were in the age group of > 60 yrs as shown in table 2. These findings were similar to the pattern shown by Kalawat *et al*. and other studies [9, 15]. The reason for this, however, could not be explained. Several studies have been done to describe the severity of dengue-chikungunya coinfection. Two studies, Chahar *et al*. [4] and Gandhi *et al*. [16] have described increased severity with coinfection. The mortality rate in Gandhi *et al* was 12% in coinfected patients as compared to 2% in monoinfected patients [16]. Various other studies did not report any increase in mortality with coinfection [3, 10].

Differentiation between two infections is also important because of differences in treatment and, misdiagnosis can also hamper epidemiological understanding of both diseases. Misdiagnosis of dengue fever as chikungunya risks delaying or disrupting dengue-specific intensive supportive treatment which can have a ten-fold impact on likelihood of progression from dengue fever to severe disease. It also risks inappropriate prescription of arthralgia-alleviating nonsteroidal anti-inflammatory drugs (NSAIDS) which could lead to severe bleeding in patients with thrombocytopenia or Dengue Hemorrhagic Fever (DHF). If chikungunya infection is misdiagnosed as dengue, it masks the true geographical extent of CHIKV and population at risk of infection [17]. In some patients chikungunya can progress to cause chronic arthritis. Hence these patients have to be followed up on a long term basis [11].

CONCLUSION

In this study, there is clear evidence that dengue and chikungunya co-infections was the result of widespread co-circulation of these two viruses and it can be logically inferred that this number of dual infection is likely to see further increase. Anticipating that mixed or dual infections may follow more severe clinical course, these infections would require strict monitoring for immediate institution of therapeutic interventions to minimize associated morbidity and mortality. Epidemiological factors that have played role in providing increased opportunities to the vector and viruses for expansion need to be investigated in the background of increasing population, crumbling civic amenities and unprecedented environmental changes. Since fevers are endemic to our country, clinicians stationed in the fever clinics need to be more vigilant about the problem of mixed infections so that they may stratify their treatment strategies to minimize complications. Because the treatment strategies would require the epidemiological background of vector competence to spread across national barriers coupled with sharing of factors allowing co-circulation of both the viruses, it can be scientifically anticipated that the cases of co-infection may see an unprecedented increase and clinical course of these dual infections would require strict monitoring for immediate institution of therapeutic interventions and minimize associated morbidity and mortality. Hence there is urgent need for separate diagnosis of monoinfection v/s coinfection.

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