Evaluation of Dengue and Malaria co-infection in Rohilkhand Region of Northern India

Lautika Sonkar[1], Ved Prakash[2], Deepika Verma[3], Saumya Agarwal[4]

ABSTRACT

Introduction: Both dengue and malaria are mosquito borne diseases, which are associated with high morbidity and mortality thus posing a worldwide public health problem. Both infections are endemic in tropical regions, leading to co-infections. Concurrent infections of malaria and dengue are when both the diseases occur simultaneously in an individual. Because of the similar clinical presentation between these two infections, the diagnosis of malaria and dengue co-infections might be either misdiagnosed or misinterpreted as mono-infections. This study was aimed to evaluate the dengue and malaria co-infection from this region.

Material and methods: A total number of 994 patients suffering from acute febrile illness were included in the study and screened for malaria and dengue infection. Blood sample from each febrile patient was collected in plain and EDTA vacutainer and were sent to the laboratory. The screening for malarial parasite was done by both rapid immunochromatographic test and microscopic examination of peripheral blood films (both thin and thick). Dengue screening was done by rapid immunochromatographic test as well as by dengue MAC ELISA.

Results: 295 (29.67%) were found to be infected with dengue infection. Malaria parasite was found in 685 (68.91%) patients. Among them 430 (62.77%) cases were infected with *Plasmodium vivax* while 255 (37.22%) of cases were due to *Plasmodium falciparum* infection. Dengue and malaria co-infection was present in 30 (3.40%) patients with *Plasmodium falciparum* (53.33%) in most of the cases.

Conclusion: The finding of this study indicates that dengue-malaria co-infection is not uncommon. Both the infections presents clinically indistinguishable clinical features, early diagnosis of concurrent infection can be lifesaving.

Keywords: Dengue, Malaria, Co-Infection.

INTRODUCTION

Malaria and dengue both are mosquito borne diseases, which are associated with high morbidity and mortality thus posing a worldwide public health problem.[1]

Malaria is caused by protozoan *Plasmodium spp* usually transmitted by Anopheles mosquito and Dengue, a viral disease caused by single stranded RNA virus belongs to the family *Flaviviridae* is also a mosquito-borne disease.[2]

In tropical countries like, India where both the vectors coexist, simultaneous occurrence of malaria and dengue in an individual cannot be ruled out. Because of the similar clinical presentation between these two infections, the diagnosis of malaria and dengue co-infections might be either misdiagnosed or misinterpreted as mono-infections.[3]

Although dengue and malaria co-infection is rare, but not very uncommon.[4,5] There are very few published reports of co-infections from this region till date and transmission of dengue and malaria co-infection is not well documented and studied. Therefore, this study was aimed to evaluate the dengue virus and malaria co-infection from this region

MATERIAL AND METHODS

This cross sectional study was conducted from June to November 2018 at Rohilkhand Medical College and hospital, Bareilly. The study was conducted after taking the ethical approval from ethical committee of the institute. A total number of 994 patients suffering from acute febrile illness were included in the study and screened for malaria and dengue infection.

Inclusion criteria for the study population were patients with febrile complaints (temperature > 37° C), headache, myalgia, nausea / vomiting and generalized rash.

Blood sample from each febrile patient was collected in plain and EDTA vacutainer and were sent to the laboratory.

The screening for malarial parasite was done by microscopic examination of peripheral blood films (both thin and thick) stained with Leishman's stain for identification of *Plasmodium species*.

Malarial antigen parasitic lactate dehydrogenase (pLDH) was also detected by rapid immunoassay in human whole blood by Malaria card test (MAL CARD, J MITRA & Co. Pvt Ltd.) to diagnose infection with *plasmodium falciparum* and other *plasmodium species*. ADVANTAGE MAL CARD is an immunochromatographic card test having sensitivity and specificity of about 100% and 98.2% respectively.

Dengue screening was done by rapid immuno-

[1]Assistant Professor, Department of Microbiology, Rohilkhand Medical College & Hospital, Bareilly, Uttar Pradesh, [2]Professor and Head, Department of Microbiology, Rohilkhand Medical College & Hospital, Bareilly, Uttar Pradesh, [3]Professor, Department of Microbiology, Rohilkhand Medical College & Hospital, Bareilly, Uttar Pradesh, [4]Assistant Professor, Department of Microbiology, Rohilkhand Medical College & Hospital, Bareilly, Uttar Pradesh, India

Corresponding author: Dr Lautika Sonkar, Assistant Professor, Department of Microbiology, Rohilkhand Medical College & Hospital, Bareilly, Uttar Pradesh, India

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chromatographic test (J. MITRA & Co. Pvt. Ltd.) detecting NS1 antigen along with Ig M/Ig G antibodies in human serum/plasma. All the samples positive for NS1, Ig M or Ig G or both by screening test were further evaluated by Ig M Ab capture ELISA. The samples positive for Ig M antibodies by MAC ELISA were reported as positive for dengue infection.[6] The clinical, haematological and other laboratory parameters were also collected and analysed.

RESULTS

A total of 994 blood samples collected from patients suffering from acute febrile illness were screened for dengue malaria infection. Out of the 994 samples studied, 309 were seropositive by rapid immuno-chromatographic test for dengue, while dengue MAC ELISA test showed positive results in 295 (29.67%) patients (table 1).

Out of 994 samples, malaria parasite was found in 685 (68.91%) patients. Among them 430 (62.77%) cases were infected with *Plasmodium vivax* while 255 (37.22%) cases were due to *Plasmodium falciparum* infection. The results of immunochromatographic card test and peripheral blood smear for malaria has been tabulated in table 2.

Dengue malaria co-infection was present in 30 (3.40%) patients. *Plasmodium falciparum* (53.33%) was present in most of cases as shown in table 3.

Complications like hepatomegaly/jaundice 40% (12) and hemorrhagic manifestations 16.66% (5) were more common in dengue and malaria co-infection cases due to *P. falciparum* (table 4).

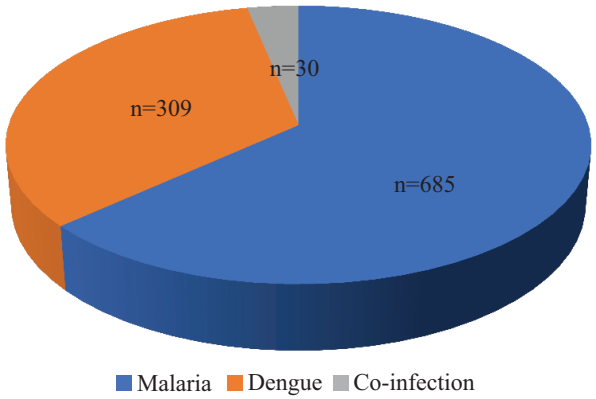

Figure-1: Distribution of patients suffering from acute febrile illness (n= 994)

DISCUSSION

Both dengue and malaria are preventable vector borne diseases. In endemic countries, there is always a possibility of coexistence which may be misdiagnosed or misinterpreted as mono-infection due to overlapping of clinical symptoms. In the present study, 295 (29.67%) patients were found to be suffering from dengue infection from this region. Dengue is a re-emerging viral infection. Several outbreaks of dengue are encountered every year with increase in the number of cases as well as severity of disease. As there is no specific treatment and since the vaccine is still under developmental phase, treatment is mainly supportive management.[7]

Malaria fever during the rainy season in tropical countries like India is not uncommon. An increased incidence of malaria cases especially during the month of July to September has also been noted from Bareilly region from the last two consecutive years with high occurrence of malaria due to *P. vivax*. A similar study from Bareilly region had also

Total no of patients	Malaria positive cases		Dengue positive casas		Co-infection
n=994	685		309		30
	BY PBS	By rapid ICT test	Dengue immunoassay	MAC ELISA	
	680	685	309	295	

Table-1: Distribution of Malaria and Dengue infection in patients of acute febrile illness

	P. vivax		P. falciparum	
Total no of malaria positive cases n= 685	PBS	ICT	PBS	ICT
	428	430	252	255

Table-2: Comparative evaluation of peripheral blood smear for serologically (by card test) diagnosed malaria cases

	P. vivax n (%)	P. falciparum n (%)	P.vivax and P.falciparum n (%)
Co-infection with dengue n=30	13(43.33%)	16 (53.33%)	1(3.33%)

Table-3: Distribution of malarial parasite in dengue and malaria co-infection cases

Clinical features	P.vivax n (%)	P. falciprum n (%)	P.vivax and P. falciprum n(%)	Total n(%)
Fever	19 (63.33)	10 (33.33)	1 (3.33)	30 (100)
Hepatomegaly/jaundice	4 (13.33)	7 (23.33)	1 (3.33)	12 (40)
headache	1 (3.33)	2(6.66)	1 (3.33)	4 (13.33)
Joint pain	1 (3.33)	2 (6.66)	0	3 (10)
Haemorrhagic manifestation	2 (6.66)	2 (6.66)	1 (3.33)	5 (16.66)
Rash/petechiae	0	1 (3.33)	0	1 (3.33)

Table-4: Clinical presentation of dengue cases showing co-infection with malaria

been reported 49.2% cases with *P. vivax* and 28.57% cases with *P. falciparum*.[8] Most of the other published studies also found similar findings.[9,10,11]

In our study 685 (68.91%) cases of malaria were diagnosed with 430 (62.77%) cases of *P. vivax* and 255 (37.22%) cases of *P. falciparum*. This year we observed the sudden upsurge in *Plasmodium falciparum* cases. This can be due to increase in the species prevalent in particular geographical region. Though the cases of *P. falciparum* have continuously been rising from this region. No study reporting the outbreak of *P. falciparum* has been published till date from this region. Although officials had reported high incidence of *P. falciparum* malaria cases from Bareilly district and adjoining areas in 2018. This can be explained due to presence of large number of water-bodies and stagnant water in paddy fields after rain, all of which enhance malaria transmission, serving as good vector breeding sites.[12] Change in the geographical and climate conditions like high rain fall and increased humidity, socio economic conditions of the patients, knowledge about the health care and public health practices also affects mosquito breeding sites.[13,14]

In this study, the incidence of dengue and malaria co-infection was 3.40%. *Plasmodium falciparum* (53.33%) was present in majority of cases. Parul D. Shah et al.[9] reported 3.14% incidence of concurrent dengue and malaria infection with predominant *P. vivax* co-infection. Several other studies on dengue-malaria co-infection have reported their data varying from 1% in French Guiana[15,] 6% in India[16] and 27% in Pakistan.[17] In endemic areas; both dengue and malaria can co-exist in the same patient. Both dengue and malaria presents similar signs and symptoms but the treatment of these two illnesses is different. Failure to recognize the co-infection would delay the initiation of proper therapy and results in increased morbidity and mortality. This becomes more so important when *P. falciparum* coexist with dengue.

In our study, we observed the clinical presentation of co-infection were more like dengue mono-infection. Therefore, clinically it is difficult to diagnose dengue-malaria co-infection. Complications like hepatomegaly/ jaundice 40% (12) and haemorrhagic manifestation 16.66% (5) were more observed in dengue and malaria co-infections with maximum cases in *P. falcipraum* infected cases.Therefore, screening for malaria should be done in dengue positive cases after clinical and haematological evaluation. Similar finding were found in study done in Pakistan.[11] It is important to note that haemorrhagic manifestations are uncommon in falciparum malaria, where as in dengue they are present. as both dengue and malaria can cause thrombocytopenia, any one may be responsible for haemorrhagic manifestation. Because of this atypical presentation malaria with bleeding manifestations are considered as severe malaria cases and treated accordingly.[18]

Dengue and malaria co-infection cases with *P. falciparum* infection results in more complications and severity with atypical presentation due to increased virulence. But the benign outcome has also been observed in some studies.[10,11] Similarly we had also observed the better outcome in most of the cases in our study. Early diagnosis and treatment in such atypical presentation may result in better outcome.[1]

Our study highlights the three main points. First, dengue and malaria co-infection is not uncommon in a geographical area where both the mosquito vectors coexist. Second, sudden increase in *P. falciparum* from this region. Third, concurrent infections have more atypical presentation simulating dengue mono-infection especially when *P. falciparum* is implicated. In all febrile patients dengue and malaria infection must be suspected. If one of the infection confirmed first, then it should not perclude the possibility of co-infection.

CONCLUSION

The finding of this study indicates that dengue-malaria co-infection is not uncommon. Both the infections presents clinically indistinguishable clinical features, early diagnosis of concurrent infection can be lifesaving. There is need to increase the awareness about co-infection as malaria is treated by use of anti-malarial drugs, but there is no specific treatment, or vaccine for dengue. Any delay in appropriate treatment of dengue and malaria co-infection may lead to fatal outcome.

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