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Original Research Article

Clinico-hematological profile of children with Dengue and co-infection with Malaria: a hospital based study

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ABSTRACT

Background: The two most common vector borne diseases in the world are malaria and dengue. Co-infection infection is not unusual in a geographical region such as India, wherein both the vectors coexist. This study aimed to determine whether simultaneous malaria and dengue infection is serious in children than mono infection alone.
Methods: In this study all children with fever of less than 7 days duration were included in the study. Clinical inspection and laboratory analysis were performed in all instances, following a detailed history. Children were categorized under 3 categories, malaria (M), dengue (D) and coinfection (DM). For any statistical difference between groups, their clinical as well as hematological parameters were analyzed. SPSS software was used for the statistical studies.
Results: Malarial chills fever was also found in a substantial percentage of children with dengue. Superficial as well as profound bleeding were seen more often in the coinfected DM groups than D or M alone. In M group alone, jaundice and diarrhea were noted. In the segregated M and DM groups, the neurological indication, neurological involvement such as altered sensorium and seizure was noted at the same rate, whereas, there had been no occurrence in D group. Anemia was reported in all children, but M group showed the highest drop.
Conclusions: Severity criteria, neurological involvement such as altered sensorium and seizures were reported at same rate both in malaria and coinfection, whereas, none of the patients with dengue showed signs of seizure. Anemia relative to hematologic parameters, was considerably more prevalent in the malaria patients. Presence of bleeding in malaria and jaundice in dengue patients, should be considerably investigated for a coinfection.

Keywords: Coinfection in children, Dengue, Hematological parameters, Malaria, Neurological manifestation, Vector-borne diseases

INTRODUCTION

Malaria and dengue are two of the most prevalent mosquito borne viral diseases reaching alarmingly large ratios worldwide. The first coinfection of these diseases was reported in 2005, describing characteristic similar symptoms of the diseases. In a geographical location like India where both vectors coexist, simultaneous infection with both of these is not uncommon. Consequently, the clinical manifestations of both the infections are very much similar making the diagnosis difficult at times. The clinico hematological parameters of dengue intersect with diseases like hepatitis A and malaria, which, could also contribute to misdiagnosis. Coinfections should be speculated of feverish patents, and if the preconditions are found to be strong, further diagnosis of the patients besides dengue, should also be considered in order to minimize mortality rates.[1,2]

Though, there have been reports of concurrent infections in adults but it has not been studied well in children therefore, this study was planned to find out if concurrent infection with both malaria and dengue is more severe than mono infection alone in children.

METHODS

This cross sectional observational study was conducted at Pediatric department of Jawaharlal Nehru Medical College and Hospital, Aligarh, India, during an outbreak of dengue from July 2017 to November 2017. All children suffering with fever of less than seven days duration were evaluated for inclusion in this study. After taking consent a detailed history, clinical examination and laboratory investigations were done in all the cases. Those presenting with clinical features suggestive of dengue like headache, myalgia, retro orbital pain and petechiae were labeled as probable cases. Diagnosis of dengue was confirmed by detection of NS1 Antigen detection by ELISA method and positive titer of anti-dengue IgM antibody in the sera.[3]

All the positives were investigated simultaneously for malaria, which, was confirmed by thick and thin smear microscopy and QBC method. All the patients were classified and treated as per the WHO guidelines for dengue and malaria.[3-5] For analysis purpose, children were grouped into three groups, Dengue (D), Malaria (M) and co infection (DM) with both dengue as well as malaria. Their clinical as well as hematological parameters were analyzed for any statistical difference between the groups.[6]

Statistical analysis

The SPSS (IBM) statistical tool was used in this study for data manipulation and interpretation of results. All the data were expressed in terms of mean with standard deviation and percentages. Differences between qualitative variables were determined by chi-square tests and quantitative variables by unpaired t tests. P value of <0.05 was considered as significant.

RESULTS

A total of 164 children admitted during the study period qualified for inclusion in the study (Figure 1). After excluding 25 cases, which, had fever due to other causes, there were 87 definite cases of dengue out of, which, 74 (53.2%) had mono infection with Dengue and 13 (9.3%) had infection with both dengue as well as malaria.

Out of total 139 case 52 (37.4%) were positive for malaria alone. In the coinfection group (DM), 11 children had *Plasmodium falciparum* and 2 had *Plasmodium vivax* on species identification and in the isolated malaria group (M), 42 had *Plasmodium falciparum*, 6 had *Plasmodium vivax* and 4 had mixed infection.

Table 1 shows the clinical features of the three groups. Fever with chills, a characteristic of malaria was seen in a significant proportion of children with dengue as well. Children with malaria presented with headache, vomiting, pallor, abdominal pain, hematuria and neurological involvement mainly, whereas, children with isolated dengue had fever with chills, vomiting and bleeding in the form of petechiae, hematemesis and melena as the predominant presenting manifestations.

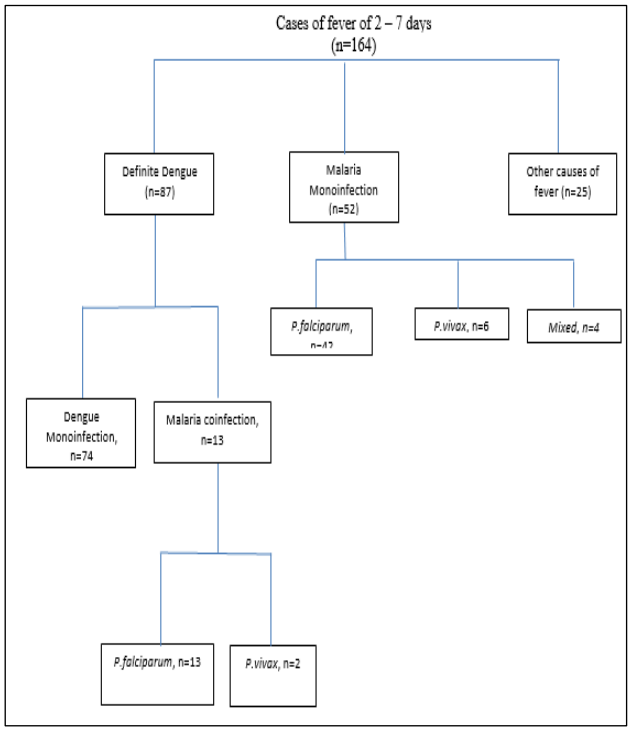

Figure 1: Flowchart of Dengue/Malaria coinfection.

Children with concurrent infection had manifestations clinical symptomatology more like dengue with myalgia, headache, retro orbital pain and pruritus as the main complaints.[2]

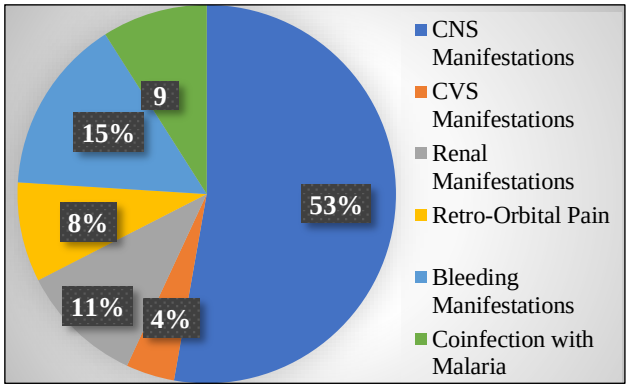

Figure 2: Clinical manifestations of the study.

Bleeding manifestations both superficial as well as deep were more frequently observed in coinfected group than either mono infection alone (15.3, 10.8 and 5.7%

respectively). Jaundice was solely observed in malaria and diarrhea though, observed in dengue was not seen in any of the concurrent infections cases.

Neurological manifestations like seizures and altered sensorium were observed with the same frequency in isolated malaria and coinfection group (7.6% and 15.3% respectively), whereas, there were no cases presenting with seizures in dengue mono infection (Figure 2). Hepatosplenomegaly was a common presentation across all the groups more so in the DM group but the difference was not statistically significant (p=0.23).

Superficial bleeding manifestations like petechiae were not observed in isolated cases of malaria, whereas, it was present in 2.7% and 23% of cases of dengue and co infection respectively.

Laboratory investigations (Table 2) showed anemia in all the groups but maximum fall in hemoglobin was observed in the malaria mono infection, whereas, increased hematocrit was observed in the D group. Maximum bilirubin rise was observed in the of malarial group. There were 5 mortality deaths in the dengue group, 3 in the malaria group and 1 in the co infection group.

Table 1: Clinical profile of the three groups, isolated dengue, isolated malaria and dengue malaria co-infection.

	Dengue mono-infection(D) n=74	Malaria mono-infection(M) n= 52	Co-infection (DM) n= 13	p-value D vs. DM	p-Value M vs. DM
Age(years)	10.64+/-2.82	5.67+/-4.44	7.04+/-5.01		
Gender(M:F)	47:27	30:22	10:3		
Fever	74(100)	52(100)	13(100)		
Chills	34(45.9)	21(40.3)	9(69.2)	0.1	0.06
Myalgia	15(20.2)	11(21.1)	7(53.8)	0.01	0.01
Headache	7(9.4)	12(23)	9(69.2)	0.001	0.001
Retro-orbital pain	6(8.1)	1(1.9)	1(7.6)	0.9	0.2
Arthralgia	5(6.7)	2(3.8)	1(7.6)	0.9	0.05
Pruritus	3(4.0)	1(1.9)	3(4.0)	0.1	0.03
Rash	4(5.4)	2(3.8)	3(23)	0.03	0.02
Vomiting	53(71.6)	28(53.8)	5(38.4)	0.01	0.3
Diarrhea	3(4.0)	4(7.6)	0(0)	0.4	0.3
Abdominal pain	37(50)	18(34.6)	3(23)	0.07	0.4
Petechiae	2(2.7)	0(0)	3(23)	<0.01	<0.01
Hematemesis, malena	8(10.8)	3(5.7)	2(15.3)	0.6	0.2
Altered mental status	1(1.3)	8(15.3)	2(15.3)	0.01	1
Seizures	0(0)	4(7.6)	1(7.6)	0.01	0.3
Pallor	11(14.8)	24(46.1)	6(46.1)	<0.01	1
Jaundice	0(00	3(5.7)	0	-	0.3
Hypotension	17(22.9)	4(7.6)	1(7.6)	0.2	1
Hepatomegaly	3(4.0)	20(38.4)	9(69.2)	0.2	0.3

DISCUSSION

Most of the available data is from the adult population, with few recent studies in the pediatric age group. Certain studies like in Brazilian Amazon included children as a part of their study.[6] In our study, prevalence of co infection with dengue and malaria was found to be 9.3%. This figure is close to 10.3% as found by Arundhati and Niharika during an outbreak in 2014 in Mumbai.[7] In other studies, in adult population, prevalence has ranged from 3% to as high as 32.6%.[8-10] Thus, it seems that the occurrence of coinfection, which, has been well documented in adults is equally common in children. Though there is a wide range of prevalence, different demographic profile, patient selection criteria and method of infection confirmation could account for the same.[11] Majority of cases of malaria in our study were due to *Plasmodium falciparum* as observed in other Indian studies, whereas, *P. vivax* was found predominantly in others.[9-14] Fever with chills, which, is considered a typical characteristic in malaria was commonly observed in dengue as well as in concurrent infection, a finding, which, was not noted in the adults. Myalgia, headaches

were observed more frequently in coinfection than either infection alone. The same has been observed in adults as well.[7,9] Retro orbital pain characteristically seen in dengue was also observed in co infection but the difference was not statistically significant (p>0.005). Thus, the clinical features in co infection in children resembled more to that of dengue, a finding similar to that observed in adults.[7-9] Bleeding manifestations both superficial like petechiae and deep like and hematemesis and melena were more frequently observed in coinfection, a finding similar to that in adults.[6,7] whereas, in a study in Pakistan, they were not found to be more significant in coinfection.[12]

In our study, jaundice was observed only in isolated malaria infection (5.7%), similar was observed by Assir et al, in a study in Pakistani adults.[12] Severity parameters like altered sensorium and seizure were noted with the same frequency in malaria and coinfection (15.3% and 7.6%) respectively, whereas, none of the dengue patient had seizure as the manifestation. This was in variance with other studies by Arundati and others who noted bleeding manifestations, renal dysfunction and jaundice to be more noticeable in the coinfected group.[6,7,11-13]

Among compared hematological parameters, anemia was notably more in the malaria group mean Hb 7.6g/dl as against 11.49 and 9.73 in dengue and co infection respectively).[15] Study observed anemia to be more common in coinfection group.[6] Though, bleeding manifestations, more common in co infection, have been observed similar to adults but incidence of jaundice was not observed in adults.[7,11,12]

In our study the mortality was marginally higher in coinfection group 7.6% as compared to malaria (5.7% and dengue 6.7%). Similar was observed by Arundati and Niharika, in Indian adults in Mumbai subpopulation, whereas, Mohapatra et al. in his study found mortality to be marginally high in the malaria group.[7,10]

CONCLUSION

Concurrent infection in children is as frequent as in adults and it mimics dengue more as compared to malaria. Children have the same symptomology as adults and severity is not more in co infection as observed in some of the studies in adults. This could be due to the early presentation of coinfected cases as suggested but this aspect was not assessed in our study. Another limitation of our study is that it being a hospital based study; its results cannot be extrapolated to the general population. Nevertheless, this calls for having a low threshold for investigating to rule out co infection in isolated dengue and malaria cases as the definite management of dengue remains supportive, whereas, antimalarial needs to be added in cases of malaria. Presence of jaundice in probable dengue cases and bleeding manifestations in malaria patients should alert the clinician to investigate for the presence of coinfection.

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