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A COMPARATIVE STUDY BETWEEN PRIMARY & SECONDARY DENGUE CASES IN A TERTIARY CARE HOSPITAL IN WEST BENGAL.

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ABSTRACT

INTRODUCTION: Dengue, an arthropod borne viral disease which is transmitted to humans through the bite of infected Aedes mosquitoes, can result in a range of clinical presentations from mild febrile illness like dengue fever (DF) to severe presentations like dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) which can turn fatal.While majority of primary dengue cases are asymptomatic/ mild symptomatic, secondary dengue infected cases usually have more complications and require critical care support.

AIMS: To find out proportion of Dengue IgG among NS1 reactive cases, study their clinical-demographic profiles.

MATERIALS AND METHODS: Blood collected from patients suffering from acute febrile illness less than 5 days and more than 5 days duration were tested for Dengue NS1and Dengue IgM respectively. Samples reactive for Dengue NS1 were further tested for dengue IgG by ELISA. Results obtained were analysed and interpreted.

RESULTS: Out of 2286 blood samples suspected for Dengue during the study period (March 2021 to February 2022), only 134 samples were NS1 reactive and amongst them, 21 (16%) had early detection of IgG antibodies while the rest 113(84%) cases were primary dengue infection.

CONCLUSIONS: It is evident that patients who suffer from Secondary Dengue infections require more supervision and critical care support. This highlights the importance of Dengue IgG detection in the early phase of the disease in order to predict the complications of dengue which can save many more lives. Nevertheless, Primary dengue infections can also be severe, hence should be monitored closely under supervision.

KEYWORDS: Severe Dengue, Dengue IgG,NS1Antigen

INTRODUCTION:

Dengue is an arthropod borne viral disease that is transmitted to humans through the bite of infected Aedes mosquitoes.[1,2] It is common in tropical and subtropical regions of the world and leads to approximately 50-100 million infections each year with 24,000 deaths.[3,4]

Majority of primary dengue fever cases are asymptomatic/ mild symptomatic with rare cases of fatality while secondary dengue infections often lead to severe dengue in the form of dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) which can turn fatal.[5,6,7]The major symptoms in Dengue Hemorrhagic fever (DHF) and Dengue Shock Syndrome (DSS) can include high fever, abdominal pain, persistent vomiting, hemorrhagic events, shock and circulatory failure. DHF and DSS has a fatality rate as high as 40% and hence, can be life threatening.[8]

We know that secondary dengue infection cases are more severe and have a higher mortality rate, but in this study, we found that all secondary dengue cases may not always lead to severe dengue while on the other hand, all severe dengue cases may not be due to secondary dengue infection. Therefore, early detection of Dengue IgG by ELISA often helps us predict prognosis of disease and the need for hospital monitoring, yet one should not be complacent for primary dengue infections.

AIM: To find out the proportion of Primary and Secondary Dengue infection amongst Dengue fever cases based on Dengue IgG detection in NS1 reactive cases.

To delineate the differences of demographic, clinical and laboratory parameters among primary and Secondary dengue cases, if any.

METHODOLOGY: The study is a hospital based, cross-sectional, observational study conducted at Virology Unit, Department of Microbiology, School of Tropical Medicine, Kolkata. The study period was from March 2021 to February 2022. All samples of acute febrile illness patients attending the Unit of Virology were included in this study.

MATERIALS AND METHODS: Blood collected from patients suffering with acute febrile illness / suspected dengue was tested for Dengue NS1 (if fever < 5 days) using DENGUE NS1 Ag MICROLISA ELISA kit. Dengue NS1 reactive cases were subjected for dengue IgG by ELISA using DENGUE IgG MICROLISA ELISA kit. Results obtained were analyzed and interpreted.

RESULTS: Out of 2286 patients of acute febrile illness only 134 (5.86%) patients were NS1 reactive. Amongst the 134 NS1 reactive patients, 21(16%) had secondary dengue infection showing early IgG detection in NS1 reactive samples, while the rest 113(84%) patients had primary dengue infection being only NS1 or NS1 & IgM reactive or only IgM reactive.

Among primary dengue infections 63(55.8%) cases were males and 50(44.2%) were females while among the cases with secondary dengue infection, 9(42.9 %) were males and 12(57.1%) were females. Among the 113 primary dengue cases, 68(60.17%) belonged to the age group 16 - 35 years indicating that young adults are affected the most, while among the 21 secondary dengue cases maximum patients belonged to the age group of 16 – 25years (23.8%) and 36 - 45 years (23.8%).

Dengue reactive cases were seen throughout the one-year study period of March 2021- February 2022 with an upsurge of cases during the months of October, November and December 2021.

Table 1: - Clinical features of Primary and Secondary dengue infected cases in the study

Clinical symptoms of primary and secondary infection	**Primary Infection Number (%)**	**Secondary Infection Number (%)**
Fever< 5 days	113(100)	21(100)
Joint pains	79(69.9)	18(85.7)
Headache	90(79.6)	18(85.7)
Retro-orbital pain	30(26.5)	8(38)
Rash	42(37.1)	18(85.7)
Abdominal pain	17(15)	6(28.5)

Bleeding manifestations	2(1.7)	5(23.8)
Myalgia	101(89.3)	19(90.4)
Anorexia	34(30)	7(33.3)
Vomiting	57(50.4)	11(52.3)
Generalised weakness	95(84)	19(90.4)
Loose stools	5(4.4)	0

The clinical features of primary and secondary dengue infection like rash, abdominal pain and bleeding manifestations were much higher in secondary dengue infection than primary dengue. (statistically significant p-value < 0.05, at 0.05 level of significance)

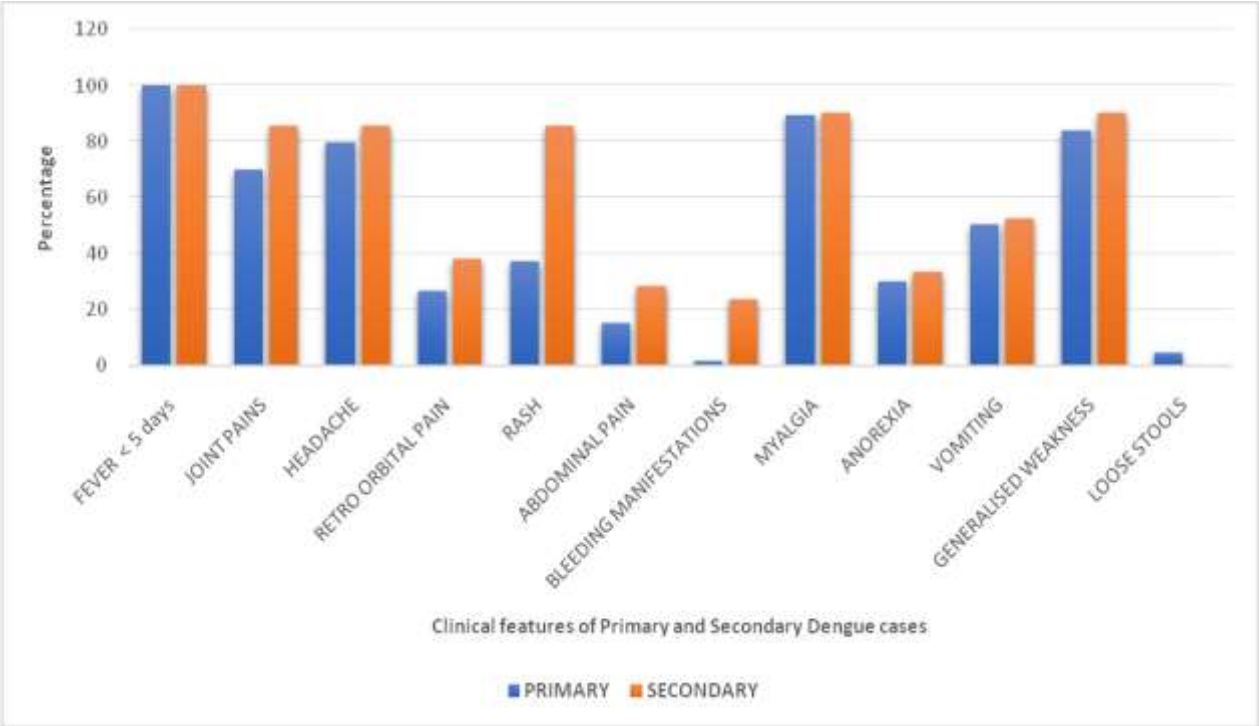

Fig 1 - Clinical features of Primary and Secondary dengue infected cases (Percentage wise)

Table 2: - Laboratory parameters and radiological findings of primary and secondary dengue cases

Lab parameters and findings		**Primary dengue cases**	**Secondary dengue cases**	**p-value**
Hemoglobin(gm/dl)	<10	39 (34.5%)	10 (47.6%)	p = 0.25
	>10	74 (65.5%)	11 (52.4%)	p = 0.25
PLC (/µl)	< 50,000	1 (0.9%)	3 (14.3%)	p < 0.001
	50,000–1,00,000	10 (8.8%)	7 (33.3%)	p < 0.001
	> 1,00,000	102 (90.3%)	11 (52.4%)	p < 0.001
TLC (/mcL)	< 4000	11 (9.7%)	4 (19%)	p = 0.72
	4000 – 11000	99 (87.6%)	15 (71.4%)	p = 0.72
	> 11000	3 (2.7%)	2 (9.5%)	p = 0.72
AST(IU/L)	> 80	7 (6.2%)	9 (42.9%)	p < 0.001
ALT(IU/L)	> 80	4 (3.5%)	6 (28.6%)	p < 0.001
USG findings	Ascites	3 (2.7%)	5 (23.8%)	p < 0.001
Chest X ray findings	Pleural effusion	3 (2.7%)	4 (19%)	p < 0.001
	Diffuse infiltration in lungs	0 (0%)	1 (4.8%)	p < 0.001
	Chest consolidation	2 (1.8%)	0 (0%)	p < 0.001

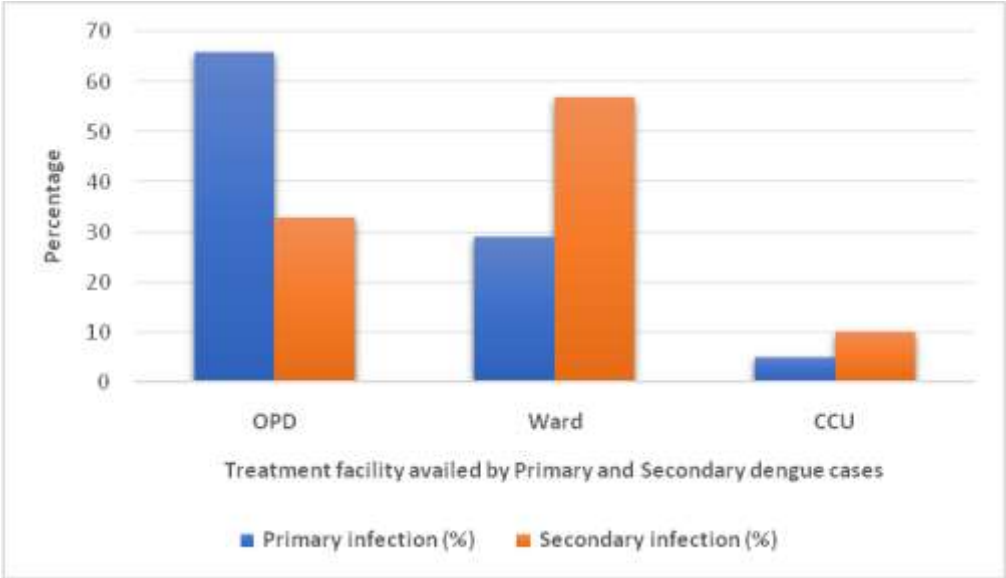

Fig 2 – Treatment facility availed by Primary and Secondary Dengue cases.

Figure 2: shows that out of 113 primary dengue infected cases, 66% received treatment at home, 29 % were treated in hospital wards and 5 % needed admission in CCU.
In comparison among 21 secondary dengue infected cases, 33 % were treated at home, 57 % were treated in the hospital wards and 10 % required admission in CCU.
p-value :-$p < 0.001$

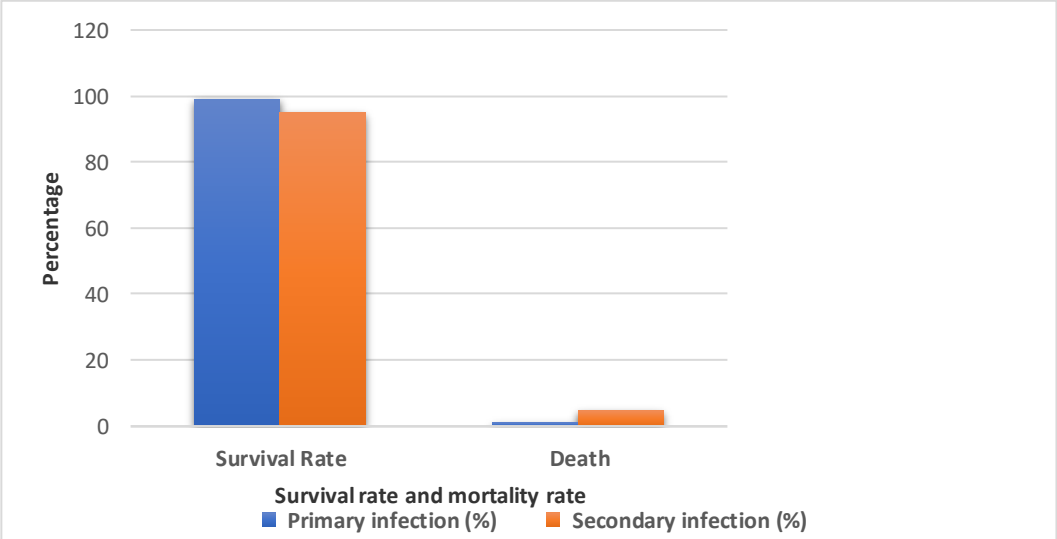

Fig 3 -Recovery and mortality rate of Primary & Secondary Dengue Infection
Figure 3: shows that out of 113 primary dengue infected cases, 99.1% recovered and 0.9% death was recorded whereas out of 21 secondary dengue infected cases, 95.2% had recovered with 4.76 % death.
p-value: - $p < 0.001$

DISCUSSION:
In the present study, primary infected cases had a slight male preponderance (males -55.8%, females -44.2%) whereas in secondary infection percentage of females were slightly more than males (females- 57.1%, males-42.9 %). This can be explained by more exposure of males to outdoor either due to occupational or recreational works in a conservative Indian social background.[8,9]However, female sex is one of the risk factors for severe dengue, apart from high body mass index and high viral load.[10,11]

Upon analyzing the month-wise distribution of dengue cases a seasonal upsurge of cases was identified from the months of August to December in the year 2021 with a peak in the month of November. The correlation between the occurrence of dengue cases with monsoon and post monsoon season is clearly evident in our study which can be explained by the fact that there is increased vector density due to increase breeding of mosquitoes in the stagnant fresh water during the rainy season.

Previous studies have shown that majority of the patients of dengue belonged to the age group 16 – 35 years which was similar to our study.[8,12] As per our study, majority of Dengue reactive cases in Primary infection (60.17%) and secondary infection (38.1%) were of age group 16 - 35 years.

In our study, both primary dengue cases and secondary dengue cases presented with fever for less than 5 days. Even though a higher percentage of rash (85.7%), retro orbital pain (38%), vomiting (52.3%), abdominal pain (28.5%) and bleeding manifestations (23.8%) were observed in secondary dengue cases, yet a smaller percentage of these clinical signs and symptoms were also observed among primary dengue cases.

Similarly, although anaemia (Hb% <10 gm/dL), leucopenia (<4000/µl), thrombocytopenia (platelet count < 1,00,000/µl), high serum AST levels (>80 IU/L), high serum ALT levels (>80 IU/L), free fluid accumulation in abdomen (23.8%) and pleural effusion (19%) were observed in higher percentages among secondary dengue cases, yet it was not exclusive. These findings were also observed in a small proportion of primary dengue cases.

In our study, among the 113 primary dengue cases, 2 cases (1.7 %) suffered from severe dengue in which one patient was diagnosed as dengue haemorrhagic fever and recovered while another patient was diagnosed with Expanded dengue syndrome and expired. Among 21 secondary dengue cases, 4 cases (19 %) suffered from severe dengue in which two patients developed DSS both of whom recovered with supportive treatment; two other patients developed DHF among whom one patient survived while the other patient expired. Five patients had co-infection of dengue with malaria in which all recovered.

Therefore, even though prolonged hospital stay, critical care admission and death were observed more among secondary dengue cases, yet they were also seen in smaller numbers among primary dengue cases.

CONCLUSION:

It is evident that patients who suffer from Secondary Dengue infection suffer from more complications as well as require more supervision and critical care support. This highlights the importance of Dengue IgG detection in the early phase of the disease in order to predict the complications of Dengue which can save many more lives.

However primary dengue infection can also have severe Dengue or Expanded Dengue syndrome of which clinicians should remain vigilant.

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Conflicts of interest: None