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To assess the changes in hematological parameters in dengue and malaria fever

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***Abstract*---**Introduction: Dengue fever is the most common cause of arboviral disease. Dengue fever presents with confusing clinical profile and dengue is diagnosed by reverse transcription polymerase chain reaction. Hematological parameters like platelet count, hematocrit, leucocyte count and peripheral smear findings will aid in the diagnosis of dengue fever whereas malaria which is responsible for Leukemia, anemia and thrombocytopenia. Method: Total number of cases was 138. Out of which 121 Dengue IgM positive cases and for Malaria 107 rapid card test positive and smear positive cases were selected. period of 1 year. Jan 2020 to Sep 2021. Result: dengue incidence is 66.10% up to 30yrs of age group, where as in Malaria incidence is 60.90%. Dengue is more common in females(64.50)% than Males(35.50%) as compared to malaria. Reduction in RBC count less than 4 million is more common in malaria (48.76) than dengue (48.76%). anemia is more common in malaria(74.76%) compared to dengue(46.23%). Conclusion: Raised hematocrit, thrombocytopenia, leucopenia, and atypical lymphocytes in the peripheral smear will aid in the early diagnosis of dengue infection. Hematological changes and their diagnostic values in malaria infected patients found out that hemoglobin levels, white blood cell counts, and platelet counts were significantly reduced.

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Introduction

Dengue fever and malaria are the most common arthropod borne diseases of mankind and emerged as a global public health problem. Malaria is a protozoan disease transmitted by the bite of infected Anopheles mosquitoes. Symptoms of malaria are non-specific; there may be a prodromal period of tiredness and aching followed by fever, which may last from 6 to 10 hours. Dengue is a viral infection and is transmitted by Aedes aegypti.[1] Dengue occurs throughout the year with increased transmission during Mansoon season. This is due to higher mean temperatures and the shorter extrinsic incubation period in the vector and to higher humidity and enhanced survival of adult mosquitoes. Dr. Benjamin Rush's description of a Philadelphia epidemic in 1780 was the earliest description of dengue, the break-bone fever. Subsequently, sporadic outbreaks were reported throughout the tropics and subtropics. Although dengue fever had been described in the 18th century, the virus was isolated only during World War II. In 1956, severe forms of the disease, dengue hemorrhagic fever/dengue shock syndrome were described for the first time.[2]

Dengue virus particles are 40 to 50 nm in diameter and have a spherical nucleocapsid surrounded by a lipid bilayer envelope with small surface. Projections representing E-glycoprotein dimers anchored to virus membrane. The lipid envelope is covered densely with surface projections comprising 180copies of the membrane and 180 copies of the envelope glycoproteins.[3] Most dengue virus infections are subclinical. Self-limited dengue fever is the usual outcome of infection but an immuno-pathogenic response in some Patients, usually in the setting of heterogonous immunity, produces a syndrome of dengue hemorrhagic fever.[4]

Material and Method

This is a Hospital based observational prospective study to be carried out in the Central Lab, Department of Pathology, N.S.C.B. Medical College, Jabalpur M.P.For Dengue 121 Dengue IgM positive cases and for Malaria Total 107rapid card test positive and smear positive cases were selected and studied for hematological changes. A hospital based prospective observational Study. Study duration was for a period of 1 year from January 2020 to September 2021. According to proforma detailed history regarding age, sex, nature and duration of illness were taken. Clinical examination findings were noted. Venous blood was collected in EDTA vial. Hemoglobin (Hb), haematocrit (HCT), RBC indices like MCV (mean corpuscular volume), MCH(mean corpuscular hemoglobin), MCHC (mean corpuscular hemoglobin concentration), total leucocyte count, differential leucocyte counts, platelet Count (PLC), platelet distribution width (PDW), mean platelet volume (MPV), Plateletcrit (Pct) was measured using EDTA blood sample in automated hematology analyzer.

Inclusion Criteria

- Patients of dengue fever and malaria.
- Age > 15 Years.

Exclusion Criteria

- No associated disease.

Result

Table 1: Age distribution in dengue and malaria patient

AGE GROUP	GROUP				TOTAL	
	DENGUE		MALARIA			
	N	%	N	%	N	%
UPTO 20 YEARS	34	28.10%	29	27.10%	63	27.60%
21– 30 YEARS	46	38.00%	30	28.00%	76	33.30%
31– 40 YEARS	18	14.90%	25	23.40%	43	18.90%
41– 50 YEARS	16	13.20%	14	13.10%	30	13.20%
51– 60 YEARS	5	4.10%	7	6.50%	12	5.30%
>60 YEARS	2	1.70%	2	1.90%	4	1.80%
TOTAL	121	100.00%	107	100.00%	228	100.00%

Chi square = 4.53; P = 0.476

- Dengue and malaria both are common in younger age (15-30) group. In dengue incidence is 66.10% up to 30 yrs of age group, where as in Malaria incidence is 60.90%.
- There is no significant difference of incidence in dengue and malaria in Same age group (P-value=0.476).
- Dengue and malaria both are seen in people of all age groups.

Table 2: Sex distribution in dengue and malaria patient

Sex	**Group**				**Total**	
	Dengue		**Malaria**			
	N	**%**	**N**	**%**	**N**	**%**
Female	78	64.50%	51	47.70%	129	56.60%
Male	43	35.50%	56	52.30%	99	43.40%
Total	121	100.00%	107	100.00%	228	100.00%

In above table, dengue is more common in females (64.50) % than Males (35.50%) as compared to malaria which is significant (p<0.05).

- In cases of malaria incidence are same in male and female.

Table 3: RBC count

Rbc Count	Group			
	Dengue		Malaria	
	N	%	N	%
>=4.0million/µl	62	51.24%	27	25.23%
<4.0million/µl	59	48.76%	80	74.77%

Chi square = 16.14, P value = <0.0001

- RBC Count less than 4 million is common in cases of malaria 74.77%
- Reduction in RBC count less than 4 million is more common in malaria (48.76) than dengue (48.76%) and it is highly significant with P-value < 0.001.

Table 4: Haemoglobin concentration

Hb gm%	Group			
	Dengue		Malaria	
	N	%	N	%
<5	5	4.13%	16	14.95%
5-10	51	42.15%	64	59.81%
10-15	61	50.41%	25	23.36%
>15	4	3.31%	2	1.87%

Chi square = 22.19, P value = <0.0001

- As above mentioned, table anemia is more common in malaria (74.76%) compared to dengue (46.23%).
- Severe anemia is also common is malaria (14.95%) as compared to dengue (4.13%).
- Normal hemoglobin (Hb-10-15g/dl) is seen in most cases of dengue (50.41%).

- Hb > 15 gm% is more common in dengue than malaria.
- Difference of level of hemoglobin between dengue and malaria is significant with P-value < 0.001.

Discussion

Clinical description of dengue complicated by hemorrhages, shock and death were reported in outbreaks in Australia in 1897, Greece in 1928 and in Formosa in 1931.Mosquito borne transmission of infection by Aedes aegypti was demonstrated in 1903 and its viral etiology in 1906. Sabin isolated the virus in1944 and established the existence of dengue viral serotypes. After World War II, the start of a pandemic with intensified transmission of multiple viral serotypes began in Southeast Asia, leading to outbreaks of dengue hemorrhagic fever. In the last 25 years, a similar pattern of intensified viral transmission and increased dengue hemorrhagic fever incidents has been established in south west Asia, the Americas and Oceanic, fueled by secular changes toward urbanization, population growth and mobility.[5]

After the female mosquito feeds on a viremic person, viral replication in the mosquito over one to two weeks (extrinsic incubation period) occurs before it can transmit the virus on subsequent feeding attempts. Feeding attempts may occur several times a day over the insect‘s lifetime of one to four weeks. Adult mosquito shelter indoors and bite during one to two hour intervals in the morning and later afternoon. In areas with endemic transmission, one of every twenty hours may contain an infected mosquito.[6]

The extensive increase in vascular permeability is associated with immune activation, as manifested by increased levels of plasma soluble tumor necrosis factor receptor (sTNFR), interleukin (IL)-8, interferon (IF) gamma and other mediators and local endothelial production of IL-8, RANTES (Regulated on activation, normal T expressed and secreted) with apoptotic endothelial cell death.[7] Increased levels of the TNF alpha, soluble CD8 and solubleIL-2 are higher in patients with dengue hemorrhagic fever than in dengue fever, which indicates an activation of cross reactive memory of CD4 and CD8 T cells in response to a second infection.[8]

Anti-dengue virus IgM antibody is produced transiently during primary and secondary infections. Patients with primary dengue virus infections, IgMAntibodies develop rapidly and are detectable on days 3 to 5 of illness in half of the hospitalized patients. Studies of the dynamic antibody response showed that anti-dengue virus IgM levels peak at about 2 weeks post infection and then decline to undetectable levels over 2 to 3 months. Anti-dengue virus IgG appears shortly afterwards.[9]

Anemia due to Plasmodium infection is a major health problem in endemic area for young children and pregnant women. One arbitrary definition Of malarial anemia in such a setting would be hemoglobin less than 8 g/dl, which is equivalent to a haematocrit of less than 24% in a parasitemic Individual. Some definitions have incorporated a minimal parasite density, such as 10,000/µl, to define malarial anemia. A definition of severe malarial anemia (SMA) is less

problematical. The World Health Organization has defined SMA as hemoglobin less than 5 g/dL or a haematocrit less than 15%seen in the context of malaria but without specifying parasitemia.[10]

Hematologic changes, which are the most common complications, play a major role in these fatal complications. These changes involve red blood cells, leukocytes, and hemostasis. They include anemia, cytoadherence of infected red cells, leukocytic changes followed by the induction of cytokines, thrombopathy and coagulopathy, particularly disseminated intravascular coagulation (DIC).[11]

Conclusion

Significant hematological dysfunction occurs in patients with dengue and malaria across all cell lines. The presence of thrombocytopenia is common. Hematological finding in patients of dengue and malaria. The presence of severe anemia is also significantly associated with malaria. These findings along with a clinical suspicion should prompt to differentiate dengue and malaria. All febrile patients must be tested for both malaria and dengue in case of concurrent infections which could lead to severe disease with complications.

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