PLATELET COUNT & HAEMATOCRIT AS EARLY INDICATORS IN ACUTE DENGUE ILLNESS

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INTRODUCTION
The dengue viruses, a group of four closely related viruses in the Flavivirus family (dengue virus serotypes 1–4), are most important flavivirus from the standpoint of human morbidity.¹,² It is estimated that as many as 100 million dengue infections occur annually, principally in tropical and sub-tropical areas inhabited by the mosquito vectors, Aedes aegypti and Aedes albopictus.³ As India is a tropical country, it is not spared from DENGUE infection. Most dengue virus infections in children have minimal or no symptoms and cannot be easily distinguished clinically from other viral infections.⁴

ABSTRACT:
BACKGROUND: The clinical diagnosis of dengue fever (DF), especially in the early phase of illness, is not easy. Laboratory findings such as thrombocytopenia and a rising hematocrit in DF cases are usually observed by day 3 or 4 of the illness. Several studies have revealed a variable prevalence of thrombocytopenia and rising in hematocrit. MATERIALS & METHODS: Blood samples of hospitalised all suspected dengue infected patients in different wards of P.D.U. HOSPITAL, RAJKOT were collected in EDTA anticoagulated bulb were analysed in Central Clinical Laboratory on automated Cell Counter for platelet count and hematocrit (HCT). Simultaneously, Patient’s demographic profile & clinical data & socioeconomic status were recorded. RESULTS: From all of the above data collected & studied, we found that, there is increase in number of cases of DENGUE infection during monsoon season. The disease has higher prevalence in rural area & with low socioeconomic class. The decrease in platelet count & rising hematocrit occurs in acute dengue illness. CONCLUSION: As it is possible to halt progression of DENGUE FEVER towards DENGUE HAEMORRHAGIC FEVER by using platelet & hematocrit like haematological parameters as early laboratory indicators of acute dengue illness and decrease morbidity & mortality due to Dengue Haemorrhagic Fever by prompt management.

Keywords: Dengue Fever (Df), Dengue Haemorrhagic Fever (Dhf), Dengue Shock Syndrome (Dss), Platelet Count (Pc), Hematocrit(Hct)

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Classic dengue fever (DF) is an acute illness characterized by fever, in the presence of high continuous fever, hemorrhagic manifestations & retro-orbital headache, severe myalgias, and occasionally skin rash, which lasts from 5 to 7 days.⁵ In a small percentage of dengue infections, a more severe form of disease, known as dengue hemorrhagic fever (DHF). DHF is characterized by acute fever associated with hemorrhagic diathesis and a tendency to develop shock (dengue shock syndrome), which distinguishes it from DF. Abnormal hemostasis and plasma leakage are the two Patho physiological hallmarks of DHF, which are manifested clinically as thrombocytopenia (Thrombocytopenia and Platelet Transfusions in Dengue Haemorrhagic Fever and Dengue Shock Syndrome ; Dengue Bulletin – Vol 27, 2003 ) and hemoconcentration (or pleural effusion).⁶,⁷,⁸ These characteristic features of DHF typically occur simultaneously with defervescence, while the early clinical features of DHF are indistinguishable from DF. A clinical definition of DHF established by the World Health Organization (WHO)
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is based on the presence of high continuous fever, hemorrhagic manifestations (including at least a positive tourniquet test), hepatomegaly, thrombocytopenia (platelet count <100,000/mm3), and hemoconcentration (hematocrit increased by >20% above baseline value). The WHO definition further subdivides DHF into four grades on the basis of the presence of spontaneous bleeding and the presence and severity of shock. Several hundred thousand cases of DHF are reported to WHO annually, although this is likely to be an underestimate of the true burden of disease.

Table 1: Clinical and laboratory measures of disease severity in the study population, according to final diagnosis assigned

<table>
<thead>
<tr>
<th>Measure</th>
<th>OFI</th>
<th>DF</th>
<th>DHF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoconcentration, * no. (%)</td>
<td>19/10</td>
<td>3/28</td>
<td>12/25</td>
</tr>
<tr>
<td></td>
<td>5 (18)</td>
<td>(11)</td>
<td>(48)</td>
</tr>
<tr>
<td>Elevation of hematocrit at peak, %</td>
<td>10.5</td>
<td>11.4</td>
<td>22.8</td>
</tr>
<tr>
<td>increase over convalescent, mean</td>
<td>(8.8)</td>
<td>(7.0)</td>
<td>(15.7)</td>
</tr>
<tr>
<td>(SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thrombocytopenia, † no. (%)</td>
<td>5/112</td>
<td>5/32</td>
<td>23/28</td>
</tr>
<tr>
<td></td>
<td>(4)</td>
<td>(16)</td>
<td>(82)</td>
</tr>
</tbody>
</table>

NOTE:
DHF, dengue hemorrhagic fever;
DF, dengue fever;
OFI, other nondengue febrile illnesses.
* Peak hematocrit during observation >20% above hematocrit at follow-up (convalescence). Follow-up hematocrit values were not available for all study subjects.
† Platelet nadir £100,000 cells/mL.

MATERIALS & METHODS
All Dengue suspected hospitalised patient’s blood sample was drawn and personal medical history was elicited & recorded. The demographic profile was also collected. A venous blood specimen was collected each morning, up to a maximum of five blood draws during hospitalization. The suspected dengue cases are confirmed by serological test in Serology laboratory, Department of Microbiology, P.D.U. Govt. Medical College, Rajkot by ELISA test method which detect IgG type of antibody against dengue virus. The platelet count & hematocrit value was measured by using AUTOMATED CELL COUNTER (SYSMEX – KX21 ) at Central Clinical Laboratory(CCL) , Department of Pathology , P.D.U. Medical College, Rajkot amongst the patient of dengue diagnosed cases & taking treatment in P.D.U. Hospital, Rajkot. The age, sex, demographic, socioeconomii , clinical data of the patient, result of the dengue serological test, platelet count & hematocrit on admission and during hospitalization were recorded at C.C.L., PATHOLOGY department.

RESULT
Total 100 patients of dengue were studied in this study & the analysed data in tabulated form is as under.

DISCUSSION
Excellent descriptions of the clinical spectrum of dengue virus infection have been reported However, the design of this study is unique because of the prospective enrollment of subjects with undifferentiated fever, close inpatient observation throughout the illness, and standardized observations using established case definitions. This permits a detailed comparison of clinical and laboratory features between patient with documented dengue virus infection and those with non dengue fever for studying virological and immunological events early in the course of dengue virus infection.(Green S, et al., unpublished data).
All of the above leads us to conclusion that there is direct relationship between monsoon season and dengue cases due to breeding pattern of it’s vector mosquito *Aedes aegypti* and *Aedes albopictus* due to collection of stagnant water in wastes like tyre , shell ,tanks etc places. There is also increase of disease in rural population due to water collection in farms & poor hygienic condition at home which inhabitates its
vector mosquito. There are more cases of dengue infection in urban areas due to increase breeding of mosquito at developing industrial & construction site and also stagnant water collection in residents mainly in Air Cooler, Air conditioner, Water tanks, Sanitation places, etc. (Defrost-water-collection trays of refrigerators – A potential breeding habitat of Aedes aegypti in dengue and chickungunya-infested areas of southern India; Dengue Bulletin – Volume 31, 2007)\textsuperscript{12} The low socioeconomic class is affected more of dengue due to overcrowding & poor hygienic condition in their houses. So, more family members are affected from same disease at a common time.\textsuperscript{13} clinically, the cases of dengue are confused with other viral infection at early stage. But thrombocytopenia (<100000 /cumm) & rising hematocrit (>20% above baseline) which are characteristic of DHF, can be used as early indicators of acute dengue illness. So, by managing cases in early stage, we can decrease morbidity & mortality due to the disease.\textsuperscript{14}

### Table 2: Blood parameters

<table>
<thead>
<tr>
<th>Blood parameters</th>
<th>Haematocrit (&gt;20% baseline)</th>
<th>Haematocrit (&lt;20% baseline)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platelet count (&lt;100000 /cumm)</td>
<td>36</td>
<td>62</td>
<td>98</td>
</tr>
<tr>
<td>Platelet count (&gt;100000 /cumm)</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>64</td>
<td>100</td>
</tr>
</tbody>
</table>

In small percentage of cases of DHF, the hemoconcentration was not found, it is mostly due to aggressive fluid therapy or oral fluid intake or infrequent hematocrit determinations. This is particularly notable since a minority of subjects with DHF in our study reached severity grade 3 or 4, so that many of our subjects might not have been hospitalized or as having DHF if they had not been included in this study. Our data therefore support the position that plasma leakage recognized and thrombocytopenia is critical features that distinguish DHF from DF.\textsuperscript{5} At the same time, these data support the recommendation that other clinical findings besides hemoconcentration should be considered. Leucopenia is also well described as a feature of dengue infection and is felt to relate to bone marrow suppression by infection. Our study expands on these observations to show that the presence of leucopenia, especially affecting the neutrophil and monocyte lineages, was useful for distinguishing neutrophil and monocyte lineages, was useful for distinguishing dengue infections from other febrile illnesses in this population. We also saw an increased percentage of atypical lymphocytes (data not shown), as has been described.\textsuperscript{15,16} However, neither the percentage nor absolute number of atypical lymphocytes in our subjects with dengue virus infection was significantly higher than in subjects with OFI prior to fever day 0, the day of effervescence, so this finding was not an early indicator. Other investigators have reported that elevations of AST and ALT levels are common in dengue infections, both DF and DHF\textsuperscript{5,17}

### CONCLUSION

As it is possible to halt progression of dengue fever towards dengue haemorrhagic fever by using platelet & hematocrit like simple easy haematological parameters as early laboratory indicators of acute dengue illness and decrease morbidity & mortality due to dengue haemorrhagic fever by prompt management. There is increase in number of cases of DENGUE infection during monsoon season. The disease has higher prevalence in rural area & with

![Socioeconomical difference in dengue cases](image-url)
low socioeconomic class. So, simultaneously health department of government & Non Government Organisation should advertise for precautionary steps which can avoid mosquito breeding in monsoon season as well as individual awareness regarding clinical manifestation of the disease & personal hygiene which can halt this deadly infection.

REFERENCES