EVALUATING THE ROLE OF EOSINOPHIL PERCENTAGE AND ABSOLUTE EOSINOPHIL COUNT AS HEMATOLOGICAL MARKERS OF RECOVERY IN CHILDREN WITH DENGUE FEVER AGED 1 TO 12 YEARS

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Abstract
Background: The objective of the study was to evaluate the role of eosinophil percentage and absolute eosinophil count as hematomological markers of recovery in children with dengue. Methodology: This study was a retrospective record based observational study done at the department of paediatrics, Kanyakumari Government Medical College and Hospital between January 2022 to December 2022 on 39 children admitted with dengue fulfilling the inclusion and exclusion criteria. Children with Dengue NS1 Antigen or Dengue IgM positive admitted in the department of paediatrics, Kanyakumari government medical college and hospital were included in the study. Children less than one year and more than 12 years of age, children with clinical and laboratory features of dengue who are not Dengue NS1 Antigen or Dengue IgM positive, children with co-infections, worm infestation, allergy, asthma, hematological disorders, malignancy, chronic illness and peripheral eosinophilia were excluded from the study. Complete blood count was done at admission which included total leukocyte count, differential count, hematocrit and platelet count. Absolute Eosinophil count was calculated from total leukocyte count and eosinophil percentage. The eosinophil percentage and absolute eosinophil count at onset of recovery phase was recorded. Statistical significance was assessed at P value less than 0.05. Results: Of the 39 children with dengue included in the study, 19 (48.7%) were male and 20 (51.3%) were female. The mean age of the study participants was 8.13 ± 2.76 years. The mean eosinophil percentage on admission and at recovery for the study participants were 3.67 ± 1.578% and 12.2 ± 6.174% . The mean absolute eosinophil count on admission and at recovery for the study participants were 963.00 ± 585.221 cells/cu.mm and 229.74 ± 122.552 cells/cu.mm. A statistically significant rise was observed in eosinophil percentage and absolute eosinophil count at the onset of recovery phase in our study. (P Value <0.05). Conclusion: Eosinophilia can be used as a hematological marker of recovery in dengue fever.

INTRODUCTION

Dengue was identified as one of the four main infectious diseases threatening global health in the new five year strategic plan announced by World Health Organization (WHO) in January 2019.¹ As per global modelled data, India contributes to around a third of the global dengue burden.² As per the data published by the National Center for Vector Borne Diseases Control (NCVBDC), Ministry of Health & Family Welfare, Government of India, the total number of dengue cases in India in 2021 was 1,93,245 of which 6039 dengue cases were notified from Tamil Nadu. In the same year, deaths due to dengue fever in India was 346 of which 8 were from Tamil Nadu.³ Dengue is a mosquito borne viral disease with seasonal pattern. Dengue virus belong to the genus flavivirus. There are four dengue serotypes which may be in circulation singly or more than one serotype might be in circulation at a time in an area. Dengue virus are transmitted by the bite of female Aedes mosquito, Ae. aegypti being the most common vector in urban areas. Severe dengue is a leading cause of serious illness and death in several countries. Patients with severe dengue may present with...
manifestations like shock, plasma leakage, bleeding and organ involvement. There is no specific treatment for dengue. Early detection and proper management lowers fatality rates of severe dengue to below 1%.⁴

This study was done with the objective of evaluating the role of eosinophil percentage and absolute eosinophil count as hematological markers of recovery in children with dengue.

MATERIALS AND METHODS

This study was a retrospective record based observational study done at the department of paediatrics, Kanyakumari Government Medical College and Hospital between January 2022 to December 2022 on 39 children admitted with dengue fulfilling the inclusion and exclusion criteria. Details were collected retrospectively using case records. Children with Dengue NS1 Antigen or Dengue IgM positive admitted in the department of paediatrics, Kanyakumari government medical college and hospital were included in the study. Children less than one year of age and more than 12 years of age, children with clinical and laboratory features of dengue who are not Dengue NS1 Antigen or Dengue IgM positive, children with co infections, worm infestation, allergy, asthma, hematological disorders, malignancy, chronic illness and peripheral eosinophilia on admission were excluded from the study.

A total of 59 children were admitted with dengue fever in the study period, of which 20 were excluded from the study after applying the exclusion criteria. After obtaining informed consent from the parents, demographic details and clinical details of illness were recorded in a predesigned questionnaire. Complete blood count was done at admission which included total leukocyte count, differential count, hematocrit and platelet count. Absolute Eosinophil count was calculated from total leukocyte count and eosinophil percentage. Further investigations and repeat complete blood count were done as per patient’s clinical indication. The eosinophil percentage and absolute eosinophil count at admission and at onset of recovery for the study participants is shown in Figure 1 and 2.

The distribution of eosinophil percentage and absolute eosinophil count on admission and at recovery for the study participants is shown in Figure 1 and 2.

Table 1: Mean eosinophil percentage and absolute eosinophil count among the age groups at admission and at onset of recovery

<table>
<thead>
<tr>
<th>Age</th>
<th>Laboratory parameter</th>
<th>At admission</th>
<th>At onset of recovery phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 4 years</td>
<td>Eosinophil Percentage (%)</td>
<td>3.50±1.732</td>
<td>8.25±4.992</td>
</tr>
<tr>
<td></td>
<td>Absolute Eosinophil Count (cells/cu.mm)</td>
<td>236.00±206.819</td>
<td>733.25±640.321</td>
</tr>
<tr>
<td>5 to 8 years</td>
<td>Eosinophil Percentage (%)</td>
<td>3.81±1.424</td>
<td>12.69±5.016</td>
</tr>
<tr>
<td></td>
<td>Absolute Eosinophil Count (cells/cu.mm)</td>
<td>206.56±109.042</td>
<td>845.25±369.963</td>
</tr>
<tr>
<td>9 to 12 years</td>
<td>Eosinophil Percentage (%)</td>
<td>3.58±1.742</td>
<td>12.63±7.174</td>
</tr>
<tr>
<td></td>
<td>Absolute Eosinophil Count (cells/cu.mm)</td>
<td>232.41±204.470</td>
<td>961.74±599.959</td>
</tr>
</tbody>
</table>

RESULTS

Of the 39 children with dengue included in the study, 19 (48.7%) were male and 20 (51.3%) were female. The mean age of the study participants was 8.13 ± 2.76 years. Of the 39 children, 4 (10.3%) were aged 1 to 4 years, 16 (41.0%) were between 5 to 8 years and 19 of the children (48.7%) were aged 9 to 12 years. Of the 39 children, 8 (20.5%) were with mild symptoms and 31 (79.5%) were with moderate to severe symptoms. 21 (53.8%) of the children were treated in the pediatric intensive care unit.

The mean eosinophil percentage and absolute eosinophil count among the age groups and genders at admission and at onset of recovery is shown in Table 1 and 2.

Figure 1: Eosinophil percentage distribution on admission and at onset of recovery.

Figure 2: Absolute Eosinophil Count distribution on admission and at onset of recovery.
The mean eosinophil percentage and mean absolute eosinophil count on admission and at recovery for the 39 children enrolled in the study is shown in table 3. A statistically significant rise was observed in eosinophil percentage and absolute eosinophil count at the onset of recovery phase in our study.

Table 3: Mean eosinophil percentage and absolute eosinophil count in male and female at admission and recovery

<table>
<thead>
<tr>
<th>Laboratory parameter</th>
<th>At admission</th>
<th>At onset of recovery phase</th>
<th>P value (paired t test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eosinophil Percentage (%)</td>
<td>3.67±1.578</td>
<td>12.2±6.174</td>
<td>&lt;0.05 (Statistically significant)</td>
</tr>
<tr>
<td>Absolute Eosinophil Count (cells/cu.mm)</td>
<td>222.17±167.479</td>
<td>890.51±503.681</td>
<td>&lt;0.05 (Statistically significant)</td>
</tr>
</tbody>
</table>

DISCUSSION

Hematological parameters have a major role in the diagnosis and management of dengue fever. An increase in hemoglobin, hematocrit and monocyte count and a decrease in total count and platelet count are major hematological parameters that help in the diagnosis of dengue. Serial monitoring of hematocrit and platelet count are done as a part of management of dengue as per standard guidelines. The hematological parameters of recovery in dengue are increase in platelet count and decrease in hematocrit and hemoglobin. The role of eosinophil percentage and absolute eosinophil count are less commonly studied. This study was undertaken to evaluate the feasibility of using eosinophil percentage and absolute eosinophil count as a marker recovery in dengue in children.

It has been observed that in acute phase of several viral illnesses, there was fall in eosinophil concentration due to inflammation and during convalescence, the eosinophil concentrations rose to normal or high.[5] A study done among 96 dengue patients at Chettinad Hospital and Research Institute, Chennai, Tamil Nadu, India, in 2019 observed a significant increase in eosinophil percentage and absolute eosinophil count during recovery similar to our study.[6] A study among 716 dengue patients done by Faheem Anwar et al (2018) observed a decrease in eosinophil count during acute phase of dengue.[7] Eosinopenia in acute phase has also been observed in the study at China by F X Qui et al. (8) Eosinophilia has been demonstrated during recovery phase of dengue in several studies.[9–11]

CONCLUSION

A statistically significant increase in eosinophil percentage and absolute eosinophil count in the recovery phase of dengue fever was observed in our study. We conclude that in dengue fever, eosinophilia can be used as a hematological marker of recovery in clinical practice.

REFERENCES

3. DENGUE/DHF SITUATION IN INDIA :: National Center for Vector Borne Diseases Control (NCVBDC) [Internet]. [cited 2023 Nov 29]. Available from: https://ncvbdc.mohfw.gov.in