Short Communication

Characteristics of children hospitalized with dengue fever in an outbreak in Rio de Janeiro, Brazil

Diana Giraldo\textsuperscript{a}, Clemax Sant’Anna\textsuperscript{b}, André Reynaldo Santos Périssé\textsuperscript{a}, Maria de Fatima Pombo March\textsuperscript{b}, Ana Paula Souza\textsuperscript{b}, Analucia Mendes\textsuperscript{b}, Marcia Bonfin\textsuperscript{b}, Cristina B. Hofer\textsuperscript{c,*}

\textsuperscript{a} Escola Nacional de Saúde Publica / Fundação Oswaldo Cruz, Rio de Janeiro, Brazil
\textsuperscript{b} Instituto de Puericultura e Pediatria Martagão Gesteira – Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil
\textsuperscript{c} Preventive Medicine Department, School of Medicine – Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil

1. Introduction

In 2009, the World Health Organization (WHO) proposed a classification system for dengue fever (DF). Dengue fever was categorized as with or without warning signs (abdominal pain or tenderness, persistent vomiting, clinical fluid accumulation, mucosal bleed, lethargy, restlessness, liver enlargement >2 cm, increase in hematocrit with rapid decrease in platelet count); or severe dengue: if the patient presented plasma leakage, leading to shock or respiratory distress due to fluid accumulation; severe bleeding; and/or severe organ involvement.\textsuperscript{1}

In 2008 there was a large epidemic of DF in Rio de Janeiro, Brazil,\textsuperscript{2} so the aim of this paper is to describe the clinical characteristics of children who were admitted to the Instituto de Puericultura e Pediatria Martagão Gesteira (IPPMG) during this epidemic, from November 2007 to April 2008, with DF, and to evaluate whether the clinical signs and symptoms cited by WHO as warning signs predicted severe dengue in this population.

2. Methods

This is a retrospective cohort study of all children who were admitted with a diagnosis of DF to the IPPMG from November 2007 to April 2008. The IPPMG is a paediatric hospital in Rio de Janeiro, with 80 beds and eight paediatric intensive care unit (PICU) beds. There was a reference and counter-reference service organized at this hospital and the communities’ clinics around it during the epidemic. All febrile children with signs and symptoms of DF, as defined by the Brazilian Ministry of Health (BMH), who required admission were referred to the IPPMG, and patients who...
were evaluated and did not need to be admitted or were discharged were referred to community clinics. The BMH definition of DF was fever up to seven days, with at least two of the following signs/symptoms: headache, retro-orbital pain, myalgia, arthralgia, lethargy or rash (with or without bleeding). Children who required admission were those with warning signs, also defined by BMH: abdominal pain, persistent vomiting, postural hypotension, painful hepatomegaly, bleeding manifestations, drowsiness or irritability, decreased urine volume, hypothermia, increased hematocrit, decreased platelet count, respiratory distress. Patients without those signs but with a chronic disease, such as malignancy, HIV, asthma, sickle cell disease, diabetes, immune deficiency, previous prematurity, renal, cardiac or liver disease were also admitted.

The patients’ charts were reviewed by a paediatric resident, who collected all clinical data. Dengue fever was classified either as dengue or severe dengue by the PICU or the ward staff during patients’ admitance.

This study was reviewed and approved by the IPPMG Ethical Research Committee.

2.1. Statistical analysis

All the information collected was processed in STATA version 9.0 statistical software (Stata Corp., College Station, TX, USA). Bivariate analysis was performed using Wilcoxon two-sample test or Fisher’s exact test (for categorical variables).

Variables with a P-value < 0.15 and/or variables that were cited as warning signs by WHO were included in the multivariate analysis.

A main-effects logistic regression model was fitted using the stepwise maximum likelihood estimation technique. The level of significance for removal of a variable in backward regression was 0.10. The Pearson’s χ² goodness of fit test, as well as the Hosmer-Lemeshow test were used to evaluate fitness of the model.

3. Results

One hundred and eighty-one patients with DF were admitted to the IPPMG from November 2007 to April 2008. They were aged from 4 months to 15 years (median 8.7 years old); 93 (51.4%) were male. Thirty patients (16.6%) were classified as having severe dengue, and 27 (14.9%) presented with haemodynamic instability or shock. There were no deaths among these patients.

The presence of shock among our study participants ranged from 9–50%, but the case-fatality rate in other paediatric studies, and in the Rio de Janeiro population, was higher than in ours (0.7–9.3%). We believe that we did not have any fatalities due to the referral system built in to our community.

We were able to perform serology in only 47 patients (IgM qualitative) during their admittance; 85% were positive (41/47). This test was performed just once, and some before the fifth day of disease, consequently serology test negativity did not necessarily rule out dengue. This also reflects an epidemic situation when, due to logistic reasons, the serology could not be performed to all the population, and the definition of a dengue case used was linked to the occurrence of other cases in the same location and time.

The frequency of any clinical manifestation was the same between patients who had the dengue serology test and those that did not.

The crude and adjusted comparisons of the baseline clinical manifestations between patients with and without severe dengue are shown in Table 1. In line with other paediatric studies, lethargy (OR = 3.40, P-value < 0.01) and abdominal pain (OR = 2.63, P-value = 0.03) were more frequent in severe dengue patients.

A prognostic study in Thailand demonstrated that bleeding, secondary dengue infection, and haemoconcentration were associated with severe dengue in children. In this population, epistaxis, oliguria, and liver enlargement were also associated with dengue severity in 231 cases. However, both studies used a population approach, and we believe that a hospital based study, would better demonstrate the prognostic value of this clinical manifestations, since this is the setting where the decision to admit (or refer the patient to the PICU), must be made.

Among the paediatric population, abdominal pain is a frequent and non-specific complaint, and the use of it as a warning sign, such as in adults, could be a mistake. In this

Table 1
Baseline clinical manifestations of dengue fever

<table>
<thead>
<tr>
<th>Clinical manifestation</th>
<th>Severe dengue n = 30</th>
<th>Dengue fever n = 151</th>
<th>RR</th>
<th>95% CI</th>
<th>P-value</th>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic disease</td>
<td>7</td>
<td>44</td>
<td>0.77</td>
<td>0.36–1.70</td>
<td>0.52 (NS)</td>
<td></td>
</tr>
<tr>
<td>Gender–female</td>
<td>14</td>
<td>74</td>
<td>0.92</td>
<td>0.48–1.78</td>
<td>0.81 (NS)</td>
<td></td>
</tr>
<tr>
<td>Age (mean), months</td>
<td>104</td>
<td>104</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td>29</td>
<td>146</td>
<td>0.99</td>
<td>0.16–6.13</td>
<td>0.99 (NS)</td>
<td></td>
</tr>
<tr>
<td>Headache</td>
<td>17</td>
<td>92</td>
<td>0.86</td>
<td>0.45–1.67</td>
<td>0.66 (NS)</td>
<td></td>
</tr>
<tr>
<td>Lethargy</td>
<td>20</td>
<td>54</td>
<td>2.89</td>
<td>1.44–5.82</td>
<td>0.002</td>
<td>3.40 (1.45–7.99)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>23</td>
<td>96</td>
<td>1.68</td>
<td>0.77–3.70</td>
<td>0.18 (NS)</td>
<td>1.72 (0.66–4.53)</td>
</tr>
<tr>
<td>Abdominal tenderness</td>
<td>22</td>
<td>78</td>
<td>2.23</td>
<td>1.05–4.74</td>
<td>0.03</td>
<td>2.63 (1.06–5.63)</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>5</td>
<td>29</td>
<td>0.86</td>
<td>0.35–2.08</td>
<td>0.75 (NS)</td>
<td></td>
</tr>
<tr>
<td>Fluid accumulation</td>
<td>3</td>
<td>21</td>
<td>0.73</td>
<td>0.24–2.21</td>
<td>0.55 (NS)</td>
<td>0.52 (0.13–2.07)</td>
</tr>
<tr>
<td>Hepatomegaly</td>
<td>7</td>
<td>27</td>
<td>1.32</td>
<td>0.62–2.81</td>
<td>0.48 (NS)</td>
<td>0.99 (0.34–2.91)</td>
</tr>
<tr>
<td>Bleeding manifestations</td>
<td>14</td>
<td>51</td>
<td>1.56</td>
<td>0.82–2.99</td>
<td>0.18 (NS)</td>
<td>1.57 (0.68–3.67)</td>
</tr>
<tr>
<td>Retro orbital pain</td>
<td>4</td>
<td>18</td>
<td>1.11</td>
<td>0.43–2.89</td>
<td>0.83 (NS)</td>
<td></td>
</tr>
<tr>
<td>Skin rash</td>
<td>16</td>
<td>63</td>
<td>1.48</td>
<td>0.77–2.84</td>
<td>0.24 (NS)</td>
<td></td>
</tr>
</tbody>
</table>

RR: Relative risk; OR: Odds ratio; NS: Not significant.
study, we were able to validate this sign as a warning sign in the paediatric population, even adjusting for age.

We believe that this study is an important description of the clinical manifestations of dengue in paediatric patients during an epidemic in a large urban area in a developing country.

Authors’ contributions: DG and APS: study conception and design, data collection, draft and final review; CS and MFPM: study conception and design, data collection supervision, draft and final review; ARSP: data analysis, draft and final review; AM and MB: study design, draft and final review; CBH: study conception, data analysis and draft and final writing. Guarantor of the paper: Cristina B Hofer.

Acknowledgements: Mrs Andrea Fiorani for the English review.

Funding: None

Conflicts of interest: None declared.

Ethical approval: This study was approved by Instituto de Puericultura e Pediatria Martagao Gesteira – UFRJ ethical committee.

References


