A focal neurological deficit due to cerebrovascular disorder, lasting more than 24 hours is defined as a stroke(1). The reported incidence of childhood stroke (28 days to 18 years of life) is 2.6-3.1 per 100,000 children per year(2). More than half of the stroke is ischemic in origin. Acute and chronic infection appears to be an important trigger for stroke in children and young adults(3). Deterioration in the level of consciousness is common in cerebral hemorrhage(4). MRI is therefore the preliminary investigation of choice but when this is not available, CT to exclude hemorrhage is mandatory(5). The disease is frequently misdiagnosed and managed improperly. In Bangladesh, pediatricians are facing a number of acute neurological deficits in hospital but no study on childhood stroke has been done till now. Therefore, this study was undertaken to determine the predisposing factors and outcome of stroke in Bangladeshi children.

**METHODS**

This study was carried out for five years in Khulna Medical College Hospital from July 2002 to June 2007. Admitted children with acute neurological deficit attributable to a vascular cause were included in the study. Forty two children were finally diagnosed with stroke; 73.8% were male. Apart from paresis/paralysis in 35 (83.3%) cases, headache/vomiting/convulsion was the presenting problem in 28 (66.7%) cases at the onset. Infection in 17 (40.5%) children and trauma in 11 (26.2%) were the important predisposing factors. CT scan revealed ischemia and hemorrhage in 18 (42.8%) and 8 (19.1%) cases, respectively. Twenty two (52.4%) of the children recovered fully and 3 (7.2%) expired.

**Keywords:** Bangladesh, Hemorrhage, Ischemia, Outcome, Stroke.
referred to neurosurgery department. Outcome of the disease was graded on recovery of neurological function at discharge from hospital.

**RESULTS**

Among the 42 stroke patients, 31 (73.8%) were male. Twenty two (52.4%) of the patients belonged to early childhood (<5 yrs) period. Mean age of the children was 4.8±3.7 years. Thirty five (83.3%) of them had objective signs such as paresis/paralysis of one or more limb. Presentation with subjective complaints such as headache/vomiting/convulsion was found in 28 (66.7%) patients. Four patients presented with unconsciousness. Other neurologic sign such as aphasia, ataxia or visual defect was found in 15 (35.7%) patients.

Predisposing factors in relation to nature of stroke shown in Table I. Four (9.5%) children with systemic diseases included tetralogy of Fallot, severe protein energy malnutrition, nephrotic syndrome and myocarditis. CT scan findings and its relation with outcome is summarized in Table II. Seventeen patients left the hospital with residual neurological lesion such as paresis or paralysis.

**DISCUSSION**

In the present study, ischemic stroke (IS) mainly presented with headache, vomiting and convulsion, and hemorrhagic stroke (HS) presented with altered consciousness and nuchal rigidity. Exact cause could not be identified but history of infection and head injury was found in 17 (40.5%) and 11 (26.2%) cases, mostly in relation to ischemic and hemorrhagic stroke, respectively. Dehydration and cyanotic heart disease were found as important risk factors. CT scan of brain in the present series revealed the lesion in brain in the majority of cases but no abnormality was detected in 30.9% cases. Undetermined cases included, as it is believed that 10-20% of children with apparent focal ischemic event will not have evidence of vascular disease even with full investigation(1). Mortality was low (7.2%) but neurological sequelae remained in a large number (40.5%) of cases.

The mean age of the studied cases is similar to a previous study (7) but the male female ratio (2.8:1) outweighs their observation (1.5:1). The presenting feature in this study is in conformity with Baumer’s report (8). Association of IS with systemic disease such as cardiac disease and dehydration corroborates with other reports (9,10). Similar to our findings, tonsillitis, dental infection and minor head trauma has also been blamed as precipitating factor by other investigators (11,12). These factors can precipitate IS by disruption of blood flow subsequent to thromboembolism and arterial spasm (12). The percentage of negative CT scan in this series is much higher than previously reported (12%) (7). The proportion of IS to HS is little higher than an American study (3) where IS (7.8/100,000) is nearly three times more common than HS (2.9/100,000). Prognosis of HS was worse than IS which is in conformity with other studies (13,14). Data from Canadian pediatric stroke registry on ischemic stroke revealed that 12% were dead by the outcome evaluation period (15). However, the mortality figure was shown to be much higher (18%) by Chung, et al. (7).

The primary limitation of this study was the lack of MRI, which is more sensitive than CT scan and could be helpful for diagnosing undetermined cases.

### Table I: Predisposing Factors for Stroke

<table>
<thead>
<tr>
<th>Factors</th>
<th>Ischemic stroke</th>
<th>Hemorrhagic stroke</th>
<th>Undetermined stroke</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infection</td>
<td>11</td>
<td>1</td>
<td>5</td>
<td>17 (40.5)</td>
</tr>
<tr>
<td>Head injury</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>11 (26.2)</td>
</tr>
<tr>
<td>Dehydration</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2 (4.8)</td>
</tr>
<tr>
<td>Systemic diseases</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>4 (9.5)</td>
</tr>
<tr>
<td>None</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>8 (19.0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>21</td>
<td>8</td>
<td>13</td>
<td>42 (100)</td>
</tr>
</tbody>
</table>

### Table II: Outcome in Relation to CT Scan Findings

<table>
<thead>
<tr>
<th>CT scan findings</th>
<th>Full recovery</th>
<th>Partial recovery</th>
<th>Death</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemia</td>
<td>10</td>
<td>7</td>
<td>1</td>
<td>18 (42.8)</td>
</tr>
<tr>
<td>Hemorrhage</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>8 (19.1)</td>
</tr>
<tr>
<td>Infarction</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>3 (7.2)</td>
</tr>
<tr>
<td>Normal</td>
<td>7</td>
<td>6</td>
<td>0</td>
<td>13 (30.9)</td>
</tr>
<tr>
<td><strong>Total (%)</strong></td>
<td>22 (52.4)</td>
<td>17 (40.4)</td>
<td>3 (7.2)</td>
<td>42 (100)</td>
</tr>
</tbody>
</table>
WHAT THIS STUDY ADDS?

- Infections and trauma are the main risk factors for stroke in Bangladeshi children.

Further investigations like angiogram and screening for prothrombotic disorders (protein S deficiency, raised homocysteine) could not be done to determine the underlying cause. The study is further limited by lack of follow up of partially recovered cases for a prolonged period.

Contributors: CHR was responsible for the design, draft and interpretation of the study. He will act as guarantor of the paper. AAM and SMH took part in analysis and revision. KUA helped in data collection and processing. The final manuscript was approved by all the authors.

Funding: None.

Competing interest: None stated.

REFERENCES


