Original Research Article

Clinical profile and outcome of Acute Glomerulonephritis (AGN) in children from a tertiary care centre in Odisha, India

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Abstract

Introduction: Glomerulonephritis is the term reserved for the variety of renal disease in which inflammation of the glomerulus, manifested by proliferation of cellular elements, is secondary to immunologic mechanism. Acute glomerulonephritis (AGN) is major cause of morbidity in developing countries. This study is an attempt to evaluate the clinical characteristics, complications and outcome of acute nephritic syndrome.

Methods: A prospective study was conducted on all the cases found to have acute glomerulonephritis, and sample size constituted all children between 2 years to 14 years, hospitalized in pediatric department of MKCG Medical college from Feb. 2017 to Jan.2018 with acute glomerulonephritis.

Results: Out of 50 patients studied 64% were male and 36% were female. The peak age group was 5 to 10 years. Pyoderma was the most common predisposing condition (64%). Latent period between infection and onset of disease was highest in 15-21 days (38%). 86% patients had low C3 at the time of diagnosis. Majority of patients were with low complement C3 level and positive ASO titre. 92% with AGN recovered completely.

Conclusion: AGN is a significant renal problem in children and one of the common causes of hospital admissions. Early identification, monitoring and management is required to prevent morbidity and mortality.

Keywords: Children, hematuria, Acute glomerulonephritis, complement C3.

Introduction

Acute glomerulonephritis (AGN) generally presents as a syndrome of findings that include hematuria, edema, hypertension and renal insufficiency. Although the pathogenesis is not fully understood, current evidence supports that most cases of AGN are due to an immunologic response to a variety of different etiologic agents. The immunologic response, in turn, activates a number of biological processes that result in glomerular inflammation and injury. AGN may be isolated to the kidney (primary glomerulonephritis) or be a component of a systemic disorder (secondary glomerulonephritis). Diseases involving the renal glomeruli are encountered frequently in clinical practice and are the most common causes of end stage renal disease worldwide[1]. Acute post streptococcal
glomerulonephritis (APSGN) occur in under
developed countries or developing countries.[2]
(APSGN) predominantly affects children between
the ages of 5 and 15 years, with a slight
predominance of males[3]. It is an acute, reversible
disease characterized by spontaneous recovery in
the vast majority of patients. Typically, gross
hematuria and edema develop 7 days to 12 weeks
after the streptococcal infection.[1,3] Spontaneous
resolution of the clinical manifestations is
generally rapid: diuresis usually ensues within
one to two weeks, and the serum creatinine
concentration returns to base line within four
weeks. The rate at which urinary abnormalities
disappear is more variable. Hematuria usually
resolves within 6 months, but mild proteinuria is
present in 15 percent of patients after 3 years and
in 2 percent of patients after 10 years[3]. The long-
term prognosis of patients with (APSGN) has
been a subject of controversy. Although most
patients eventually have a complete recovery, hypertension, recurrent or persistent proteinuria,
and chronic renal insufficiency develop in some.
The reported incidence of chronic renal
insufficiency ranges from 0 to 10 percent. It has
been suggested that misdiagnosis, racial
differences in the risk of progression of renal
disease, and differences in the natural history of
sporadic and epidemic glomerulonephritis may
account for these discrepancies.
There are only a few studies on the clinical profile
and follow up of these patients. The analysis of
the outcome is important for a better awareness of
the long-term prognosis. This study is an attempt
to identify the various clinical manifestations of
acute nephritic syndrome and to analyse the
outcome during one year follow up period.

Methods
This was a prospective study conducted over one
year from February 2017 to January 2018. All the
cases in the age group of 2 years to 14 years,
admitted to pediatric department, with following
criteria
1. Sudden onset of oliguria and edema
2. Transient rise in blood pressure
3. Urinary findings of gross or microscopic
   hematuria or proteinuria
4. No extra renal or laboratory findings
   consistent with systemic disease

Cases with past history of renal disease or
hypertension or proteinuria were excluded from
the study.
After the cases were subjected to a detailed
history, clinical examination and investigations
and data were recorded in a pre-designed
proforma. The investigations included
hemoglobin, total and differential leukocyte
counts, ESR, gross and microscopic examination
of urine and culture, 24 hr urinary protein, serum
total protein, albumin, cholesterol, urea,
creatinine, sodium, potassium, calcium and
phosphate. Serum C3 and ASO titer were
done wherever indicated. Radiological investigations
included ultrasonography of kidney, ureter and
bladder.

Results
There were 50 cases of Acute Glomerulonephritis
in the study period of one year. Age of the patients
ranged from 0 to 15 years. Out of 50 patients,
48% (24) were of 5 to 10 years of age group [table
1]. The male-to-female ratio was found to be
1.6:1 [table2]; Pyoderma was associated with 64%
(32) of cases of AGN and 24% (12) cases had a
history of sore throat [table 3]. Decreased urinary
output (94%), puffiness of face (84%) and oedema
feet (64%). Gross haematuria seen in 64% (32) of
cases were the common clinical presentations
observed. Other symptoms were fever, vomiting,
chest pain, headache, abdominal pain, respiratory
distress and convulsion [table 4]. 86% (43)
presented with hypertension.52% had Significant
pyuria (>5 WBC/HPF), 8% (4) had no proteinuria
and 20% (10) patients had nephrotic range
proteinuria; 100% (50) cases had haematuria on
microscopic examination. Granular cast, RBC cast
and hyaline casts are seen in 11, 16 and 8 cases
respectively [table 5]. Hyperkalaemia was seen in
16% (8) cases, and 8% (4) cases had
hypernatremia, 94% (47) had hypercholesterolemia, 62% had urea levels >40 and 60% had creatinine more than >1.2. Raised CRP was seen in 12%.[table 6]. 8% had hemoglobin less than 7gm/dl. ASO titer was positive in 12%.[table 6]. 8% had hemoglobin less than 7gm/dl.

Table 1 Age Distribution

<table>
<thead>
<tr>
<th>Age</th>
<th>No. of Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5 Years</td>
<td>16</td>
<td>32</td>
</tr>
<tr>
<td>5-10 Years</td>
<td>24</td>
<td>48</td>
</tr>
<tr>
<td>10-14 Years</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
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</table>

Table 2 Sex Distribution

<table>
<thead>
<tr>
<th>Sex</th>
<th>No. of Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>32</td>
<td>64</td>
</tr>
<tr>
<td>Female</td>
<td>18</td>
<td>36</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
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</table>

Table 3 History of Preceding Infection

<table>
<thead>
<tr>
<th>Preceding Infection</th>
<th>No. of Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyoderma</td>
<td>32</td>
<td>64</td>
</tr>
<tr>
<td>Sore Throat</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>No Infection</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4 Mode of Presenting Symptoms

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>No. of Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oliguria</td>
<td>47</td>
<td>94</td>
</tr>
<tr>
<td>Puffiness Of Face</td>
<td>42</td>
<td>84</td>
</tr>
<tr>
<td>Pedal Edema</td>
<td>32</td>
<td>64</td>
</tr>
<tr>
<td>Gross Hematuria</td>
<td>32</td>
<td>64</td>
</tr>
<tr>
<td>Fever</td>
<td>27</td>
<td>54</td>
</tr>
<tr>
<td>Breathlessness</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Headache And Vomiting</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Palpitation</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Pain Abdomen</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Convulsion</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Altered Sensorium</td>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 5 Urinary Findings in AGN

<table>
<thead>
<tr>
<th>Urinary Examination</th>
<th>No. of Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Hematuria</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Microscopic Hematuria</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Pu cells &gt;5/Hpf</td>
<td>26</td>
<td>52</td>
</tr>
<tr>
<td>Cast</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RBC Cast</td>
<td>16</td>
<td>32</td>
</tr>
<tr>
<td>Granular Cast</td>
<td>11</td>
<td>22</td>
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</tbody>
</table>

Table 6 Blood Chemistry in AGN

<table>
<thead>
<tr>
<th>Investigations</th>
<th>No. of Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raised CRP</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Blood Urea(mg/dl) &gt;40</td>
<td>31</td>
<td>62</td>
</tr>
<tr>
<td>Blood Urea(mg/dl) &lt;40</td>
<td>19</td>
<td>38</td>
</tr>
<tr>
<td>Serum Creatinine (mg/dl)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;1.2</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>&lt;1.2</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>Serum Cholesterol(mg/dl)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;200</td>
<td>47</td>
<td>94</td>
</tr>
<tr>
<td>&gt;200</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Serum Sodium (meq / L)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;150</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>130-150</td>
<td>45</td>
<td>90</td>
</tr>
<tr>
<td>&lt;130</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Serum Potassium (meq/L)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;5.5</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>3.5-5.5</td>
<td>38</td>
<td>76</td>
</tr>
<tr>
<td>&lt;3.5</td>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 7 Hospital Course and Outcome

<table>
<thead>
<tr>
<th>Course in Hospital</th>
<th>No. of Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relieved and Discharged</td>
<td>46</td>
<td>92</td>
</tr>
<tr>
<td>Left Against Medical Advice</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Death</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

Discussion

AGN is relatively common in developing countries or communities that experience overcrowding, poor housing and poor hygiene and a common cause of hospitalization in children.[1,2] In the index study 80% of the subjects were from low socio economic status, where these could be the contributing factors. Majority of them (48%) were of the age group 5 to 10 years and it is found to be 1.6 times more common in boys as compared to girls. Previous studies have shown the median age at presentation of AGN to be between 6 and 8 years and male-to-female ratio as 2:1[3,4]. Which is similar to our study. Decreased urinary output (94%) Facial puffiness (97.1%), and pedal oedema (94.3%) were the most common presenting features. Gross
haematuria was seen in 25.7% cases. Hypertension occurs in approximately 80-90% of cases of AGN and cerebral complications including headache, seizures, mental status changes and visual changes occur in 30-35% of cases[6]. In the present study, we found hypertension in 86% cases. The incidence of cerebral complications is lower compared to the observations made by other studies, whereas cardiac complications are also relatively few.[7,8] The mortality was 2%. This could be due to earlier presentation in the hospital, better monitoring in the intensive care set-up, good nursing care and adequate control of hypertension. Anaemia (Hb < 10 gm/dL) was found in 86% of cases, which is comparatively higher than other studies[8]. Besides volume overload, nutritional anaemia might have contributed to it. We found nephrotic range proteinuria in 20% cases. Previous studies have shown it to vary from 1% to 32.3%.[9,10]

Though in the present study majority were pyoderma associated, we found ASO positivity to be high in 38%. We found serum C3 level to be low in 83% of the cases. Similar cases have been reported in literature.[10,11,12] The treatment of AGN is mostly supportive and the most urgent problem is hypertension. Salt restriction and loop diuretics are the first line of treatment followed by vasodilators and Angiotensin Converting Enzyme (ACE) inhibitors (Enalapril). Hypertension usually resolves within 1 to 2 weeks and rarely needs long-term treatment. In the present series almost all patients were treated with penicillin. Prognosis is usually excellent and it is more favourable in pyoderma-associated than pharyngitis-associated AGN.[13]

**Conclusion**

Any child presenting with fever along with features of nephropathy points towards the possibility of MALARIA, SCRUB TYPHUS or SEVERE SEPSIS. But nephropathy without fever almost points to possibility of immunologic disease like AGN.

In conclusion, AGN is a common renal disease requiring hospital admission in school going children. AGN is the most common cause of acute hypertension in children. It can lead to life-threatening complications like LVF, Hypertensive encephalopathy and AKI in less than 5% cases. Hence early diagnosis and prompt management are required for better outcome. Diuretics are the cornerstone of management in case of AGN. The disease is strongly influenced by poverty, overcrowding and personal hygiene. Hence, improving the socioeconomic status of the community and availability of a low cost vaccine against Group A streptococcus in future may help in elimination of the disease.

**Reference**


