

Original Article

Immediate outcome of acute glomerulonephritis in children - experience in a tertiary level hospital

Khoybar MA¹, Sultana S², Shaha AK³, Anwar MH⁴, Ashraful MF, Ruhul AS⁶, Jahangir HB⁷

Abstract

Acute Glomerulonephritis (AGN) in children is common in our country and possesses a significant hospital load. AGN is principally a disease of children where poverty, overcrowding and poor hygiene are prevailing. It is a significant cause of morbidity and mortality in developing countries. **Objective :** To see the immediate outcome of the children with AGN. **Materials and Methods:** Sixty two cases of AGN were enrolled in this study. All cases were collected from paediatric department of Sir Salimullah Medical College (SSMC) and Mitford Hospital, Dhaka during the period of September 2000 to November 2001. A thorough history was taken and chemical examination was carried out and the patient was observed during hospitalization and after discharge and recorded in a preformed questionnaire. **Results:** Total number of cases were sixty two. Eighty one percent were between 6 years to 12 years of age with male predominance. Most of them came from poor socioeconomic status (81%). All patients had generalized edema. Eighty one percent had reduced micturation, 29% had gross haematuria, 13% ascitis, 3% anuria, 2% had epistaxis with convulsion and coma. Eighty four percent had hypertension, 50% had infected scabies. Urinary RBC was found in 93.55% cases and RBC cast in 70-96% cases, blood urea over 40 mg/dl in 30.64% patient and serum creatinine over 1.0 mg/dl in 9.88% patients.

Introduction

Average period of hospitalization was 12.98 days and 19% presented with various complications. Ninety five percent were recovered completely one patient died (1.6%). Oedema disappeared by an average of 5.3 days; hypertension 5.84 days, proteinuria disappeared during hospitalization of 71.7% and 19.35% had persistent proteinuria.

Gross haematuria disappeared in 4.72 days. Period of hospitalization of 37.1% patients were 1-10 days, 53.22% were 11-20 days and 9.68% were > 28 days due to various complications. During discharge 15 patients (out of 62) had both haematuria (mild) and proteinuria (mild). After 30 days follow up only 5 patients appeared and they had both haematuria & proteinuria (mild) and blood pressure were normal.

Conclusion

Acute glomerulonephritis is causing significant sufferings in children in Bangladesh. The incidence of the disease and its sufferings can be minimized by improving the socio-economic, overcrowding and unhygienic living condition and by increasing the

awareness of the disease.

Acute Glomerulonephritis is common and in order of frequency it tops the list among the glomerular disease in children. The commonest form of AGN in children is acute post streptococcal glomerulonephritis ¹.

The glomerular disease is decreasing in frequency in the developing countries but continues to be a fairly common disorder worldwide ². It is more prevalent where poverty, overcrowding, poor hygienic living are prevailing ³. It is a significant cause of morbidity and mortality in developing countries. ^{4,5}. It possesses a significant hospital admission in Bangladesh also.

The commonest form of glomerulonephritis in childhood is acute post streptococcal GN (APS GN) and accounts for 90% of renal disease in children. APS GN is due to streptococcal infection of either skin or throat in 80-98% cases, ^{1-6, 8} and the organism is nephritogenic strain of group-A -haemolytic streptococcus.

1. *Dr. Md. Khoybar Ali, Associate Prof. Dept. of Paediatrics, Ibn Sina Medical College, Dhaka.
2. Dr. Shahin Sultana, Associate Prof. Dept. of Microbiology, Delta Medical College, Dhaka.
3. Dr. Asim Kumar Shaha, Assistant prof. Dept. of Paediatrics, Sher-E-Bangla Medical College, Barisal.
4. Dr. Maj. Md. Anwar Husain (Retd), Associate Prof. Dept. of Dermatology, Ibn Sina Medical College, Dhaka.
5. Dr. Md. Ashraful Islam, Jr. Consultant, Munshigonj Sadar Hospital, Munshigonj.
6. Dr. Md. Ruhul Amin Sarker, Assistant Prof. Dept. of Pathology, Ibn Sina Medical College, Dhaka.
7. Dr. Md. Jahangir Hossain Bhuiyan, Associate Prof. Dept. of Surgery, Ibn Sina Medical College, Dhaka.

Corresponds to: Dr. Md. Khoybar Ali, Associate Prof. Dept. of Paediatrics, Ibn Sina Medical College, 1/1-B, Kallianpur, Mirpur, Dhaka- 1216 Bangladesh. **Email:** khoibarali@yahoo.com.

Although the immediate outcome is good in children (>95% recovery), however the long term prognosis is poorer than previously thought.^{5,8}

Asymptomatic GN may be more common than is realized.⁷ Its prevalence is higher in School age (5-15 years) and rarely seen in children younger than 2 years. It occurs 1-6 weeks after an antecedent streptococcal infection.

AGN is characterized by sudden onset of gross haematuria, oedema, hypertension and varying degree of renal insufficiency.^{3,9} The clinical features depend on severity of disease; Asymptomatic disease is 1.5 to 1.9 times more frequent than clinical nephritis.¹⁰ In classical form, the signs & symptoms gradually abate (acute phase generally resolves within 2-8 weeks)^{7,9}. As diuresis begins, plasma protein concentration rises, circulatory congestion disappears and blood urea concentration falls.

Gross haematuria ceases (may continue 1-3 weeks 4,8) but proteinuria and microscopic haematuria may persist. Hyaline, granular and red blood cast are still easily found. but after a few weeks the patient feel entirely well and is eager to return to his normal activities. ASO titre begins to increase 1-3 weeks after infection, reach a maximum 3-5 weeks and returns to normal level following several months^{1,5,10}. Serum complements level (C3) is depressed and return towards normal by 6-8 weeks^{4,5,7,10}. Three to six months later the majority of patients no longer have proteinuria, but often urine still contains RBC and casts (up to 2 years or more) 1-5,7,8. Persistence of proteinuria is a marker of underlying disease.^{1,5}

Immediate outcome is more favourable in children than adults. Complete recovery occurs in over 95% of cases with APSGN. 1,2,3,5,8,9,10,11

The mortality rate varies from <1% to 13%^{1,2,5,8,11-15}. Long term outcome is very controversial^{1,5,10}. Death in acute stage due to circulatory congestion, anuria, cardiac failure or encephalopathy^{2,5,13,14}. Another 1 to 2% may undergo slow progression to chronic GN with or without recurrence of an active nephritic picture.

Objectives

To see the immediate outcome of the children with AGN.

Materials & methods

Sixty-two cases of acute glomerulonephritis were

studied. All the cases were collected from the paediatric department of Sir Salimullah Medical College and Mitford Hospital, Dhaka during the period of September 2000 to November 2001.

A detailed history was taken in each case (with a written questionnaires) including the history of puffiness of face, oedema of feet, ascitis, cough, headache, vomiting, abdominal pain, sore throat, skin infection, socioeconomic status etc. A thorough clinical examination was done and the following investigations were carried out.

1. Throat swab and swab from skin lesion (when present) after removal of the scab for culture.
2. Blood- Hb%, TC, DC, ESR, ASO titre, Blood urea, Serum creatinine, Serum total protein and, Serum albumin, Serum cholesterol
3. HbsAg
4. Urine for - Albumin, Microscopic examinations, 24 hours urinary total protein (UTP), Urine culture.
5. X-ray of the chest
6. Ultrasonography of kidney, ureter and urinary bladder.

Poststreptococcal glomerulonephritis was defined as recent onset of haematuria or history of haematuria plus either of the followings or all: oedema, renal insufficiency, hypertension, heart failure, hypertensive encephalopathy, evidence of recent streptococcal infection (positive throat/Swab culture, H/O skin infection or pharyngitis or elevated ASO titre).

After establishing the diagnosis, all of them were put to the standard treatment with a 10 days course of antibiotic to eradicate streptococcal infection. Bed rest along with a diet restricted in salt, protein and fluid (amount equal to insensible loss -400 to 500 ml/ m² body surface area per day plus one half of their daily urine output) were instituted until the acute phase has subsided, treatment of complications were also done accordingly.

Progress of the patient were monitored by daily clinical examinations including blood pressure, urine output and weekly examinations of blood urea, serum creatinine, urine for routine and microscopic examinations and 24 hours UTP.

They were discharged from the hospital after clinical and biochemical recovery i.e. when B.P and urinary output became normal, there was no gross haematuria or proteinuria and blood urea and serum creatinine levels had come down to normal. They were advised to attend the principal investigator after 10-15 days for follow up.

During the follow up period they were checked for -

1. Blood pressure
2. Oedema
3. Urine-
 - a. Albumin
 - b. Microscopic examination
 - c. 24 hours UTP.

The follow up was done for short period. The total follow up period is for 3 months after discharge of the patients- biweekly for 1 month and monthly for 2 months.

Results

Of the 62 patients 80.65% were between 6 to 12 years old. No case was below 2 years of age. Male-female ratio was 1.38 to 1.0. Eighty four percent were from rural area, 81% from poor socioeconomic status. Majority (70.19%) had skin infection. Presenting features are given in the following table. (Table No 1).

Number and percentage of patients by presenting symptoms. (Table No 1).

Symptoms	No. of patients	Percentage
1. Puffiness of face	62	100.00
2. Feet oedema	62	100.00
3. Reduced micturation	50	80.64
4. Fever	39	62.90
5. Loss of appetite	24	38.71
6. Gross haematuria	18	29.03
7. Respiratory distress	17	27.42
8. Cough	16	25.81
9. Vomiting	12	19.35
10. Chest pain	8	12.90
11. Ascitis	8	12.90
12. Abdominal pain	8	12.90
13. Headache	7	11.29
14. Anuria	2	3.22
15. Epistaxis	1	1.61
16. Convulsion/ coma	1	1.61

Reduced micturation was a prominent complaints. Urine volume of the majority of the patients (62.90%) varied from 400 ml to 800 ml in first 24 hours of admission in the hospital. Only 2 patients (3.22%) presented with anuria. Except those 2 patients none was presented with oliguria (<400 ml/ m2/ 24 hours). Microscopic haematuria was observed in 93.55% patients, significant pyuria in 22.58%, RBC cast in 70.96% and granular cast in 6.45%. Ninety one percent patient presented with 24

hours urinary total protein <0.5 gm and none with nephrotic range (>1 gm/ m2/ 24 hours). Urine culture was sterile of 74.14% cases (43 out of 58 patients) and 20.69% patients had significant growth of E. coli (12 out of 58 patients). ASO titre >200 IU/ ml in 40% cases (out of 25 patients). 6.45% cases blood urea 60 to 80 mg/ dl and > 80 mg/ dl in 1 patients. Serum creatinin was >1.5 mg/ dl in 6.45% cases. Throat swab culture showed -haemolytic streptococcus in 1 patients (out of 10); 8 patients in skin swab culture (out of 31 patients). Period of hospitalization was 1 to 36 days (average 12.98 days). Thirty seven percent patients were hospitalized for 1 to 10 days, 53.22% for 1 to 20 days and 9.68% for >28 days. Longer period of hospital staying was for the patient with complications. (Table-2).

Number and percentage of patients by period of Hospitalization (Table-2).

Period of Hospitalization (days)	No. of patients	Percentage
1-10	23	37.10
11-20	33	53.22
>28	6	9.68

Out of 62 patients 30.65% presented as uncomplicated AGN and 50% had associated problems (infected Scabies, UTI, etc) and 19.34% had complications. (Table-3).

Number and percentage of patients by different diagnosis (Table-3).

Diagnosis	No. of patients	Percentage
1. Uncomplicated AGN	19	30.65
2. AGN with infected scabies	19	30.65
3. AGN with urinary tract infection (UTI)	6	9.68
4. AGN with UTI with infected scabies	6	9.68
5. AGN with heart failure (HF)	5	8.06
6. AGN with HF with infected scabies	4	6.45
7. AGN with hypertensive encephalopathy with infected scabies with anuria	1	1.61
8. AGN with HF with anuria	1	1.61
9. AGN with HF with Ectopic kidney with infected scabies	1	1.61

Ninety five percent patients were recovered completely (clinically and biochemically) and one patient died (due to heart failure and anuria). (Table-4).

Number and percentage of patients by outcome (Table-4).

Outcome	No. of patients	Percentage
Complete recovery	59	95.16
Death	1	1.61
Discharge on risk bond	2	3.23

With meticulous treatment, the odema disappeared within 2 to 15 days with an average of 5.37 days. Hypertension disappeared within 1 to 12 days with an average of 5.84 days. Eighty three to 87% patients presented with hypertension. (Table-5).

Number and percentage of patients by period of control of hypertension (Table-5).

Period of control of hypertension (days)	No. of patients	Percentage
1-3	6	12.24
4-7	36	75.00
8-10	5	10.42
11-12	2	4.17

Fifty three patients presented with protinuria. Proteinuria disappeared in 38 patients (71.7%) during hospitalization. 19.35% had presistent proteinurea. Gross haematuria improved in most of the patients within 7 days. During discharge 15 patients had both microscopic haematuria and mild protinuria. None had hypertension (Table -6).

Number and percentage of patients by condition during discharge (Table -6).

Condition during discharge	No. of patients	Percentage
Oedema	None	
Hypertension	None	
Haematuria (Microscopic)	15	
RBC cast	None	
Proteinuria (+)	15	

Fifteen days after discharge, only 10 of them appeared for follow up and they had both haematuria

(microscopic) and proteinuria (mild).

One month after discharge only 5 of them appeared and they had both proteinuria & haematuria and their blood pressure was normal.

Discussion

AGN is common in our country . It is decreasing in the developing countries but continues to be a significant cause of mortality and morbidity in the developing countries. The prevalence is higher in school going age i.e 5 to 15 years^{1-4,11,12}. In this study peak incidence was 6 to 12 years (80.65%) with mean age of 7.96 years and range was between 2 to 12 years. Similar observation were reported by some previous study reports ^{12,16,17,18}. The predominance of incidence during pre-school and early school years probably can be attributed to the fact that at this age time children are likely to have their first exposure to haemolytic streptococcus¹⁹. pyoderma related patients are younger than those of sore throat and pyoderma associated nephritis are predominant. The patients are male predominant ^{1,8,12,13,21,22,23,24,28}. The incidence are more prevalent among the population particularly where poverty over crowding poor hygienic conditions are prevailing and more in urban children ^{3,13,15,17,25-27}. The high incidence is due to persistence of streptococcal infection in poor, overcrowded and unhygienic living condition. AGN in children accounts for about 80 to 98% cases due to streptococcal infection^{1-6,8,11,12,18,19,21,28}.

The increase incidence of complications can be explained by the fact that the less severe and milder cases do not usually come to the doctors or to a hospital and when their sufferings become more intense and not amenable by treatment given by local doctor only then they come to the hospital.

Oedema is a most common presenting feature. It may persist as long as 2 weeks^{1,4,5,8,10}. Haematuria is present is more than 90% patients and gross haematuria occur in about 25-35% patients. Gross haematuria may continue for 1 to 2 wks but microscopic haematuria for up to many months to years, which is probably of little significance ^{1,4,8,10}. Hypertension only occur in 60-80% patients, it comes to normal is majority of patients within 3 to 5 days^{5,8,10,15,23}. Proteinria is present in 75 to 80% cases, massive amounts (nephrotic range) are

uncommon (10%-cases)^{1,4,5,8,10,15}. In this study, oedema of the patients disappeared within 2 to 15 days with an average of 5.37 days and 82.26% within 7 days.

Eighty four percent patients were admitted with hypertension. Blood pressure was controlled in 94.23% within 1 to 12 days with an average of 5.84 days and 87% within 7 days. Shakur MS¹⁷ observed that high blood pressure returned to normal in majority of cases within 3 to 5 days.

Fifty three patients (85.48%) were admitted with different grades of proteinuria. disappeared in 38 patients (71.7%) during hospitalization with an average of 6.68 days and persisted in 12 patients (19.35%). Fifty eight (93.35%) patients had haematuria and 18 patients (31%) has gross haematuria. It disappeared within 7 days with an average of 4.72 days. The immediate prognosis of acute PSGN is quite favourable in children. Complete recovery occurs in over 95% of children with modern management. Mortality in acute stage varies and results from circulatory congestion, heart failure, hypertensive encephalopathy and acute renal failure. A few enter a rapidly progressive phase with persisting proteinuria, haematuria and azotemia; death occurs some months from the onset. Another 1 to 2% patients may under go slow progression to chronic GN, ultimately to end stage renal failure^{1,3,5,8,10}. In this study of 62 patients 59 (95.16%) were recovered completely (both clinically and biochemically). One patients (1.61%) died in acute phase from heart failure and anuria. Complete recovery in AGN was found in different ranges extending from 62.7 to

100% and case fatality rate from 0 to 13% in different studies^{13,15,16,23,28,29}.

During discharge 15 patients had both proteinuria (mild) and haematuria (mild) and long term follow up of these patients was not continued.

Conclusion

AGN is causing significant mortality and sufferings of children in Bangladesh. The incidence was more among the poor socioeconomic classes. Vulnerable age was between 6 to 12 years. Most of the patients were admitted with different types of problems associated with AGN.

In conclusion, it can be presumed that though mostly recovered, AGN in children should not be taken as a benign condition. Timely and proper intervention is necessary and long term follow up should be done in every patients.

The incidence of the disease and its fatal complications can be minimized by improving the socio-economic, over crowded and unhygienic living condition, by increasing the awareness of association of nephritis with sore throat and skin infection, by early and proper treatment of the cases with streptococcal pharyngitis and skin infection (particularly infected scabies) and by the proper management of the cases.

Limitations

This study was performed in a tertiary and referral hospital of Bangladesh. So the data may not represent the true picture at the community level.

References

1. Glasscock RJ, Cohen Ah, Adler SG. Primary Glomerular Diseases. Brenner and Reector's. *The Kidney*, 5th ed. Saunders, 2: 1392-1473.
2. Cortan, Kumar, Collins. Robbin's, Pathologic Basis of Disease. 6th ed. HarcourtAsia, Saunders, 942-952.
3. Forfer and Arneils. Disorders of Urogenital System. AGN. Text Book of Pediatrics. 5th ed. Churchill Livingstone, 960-62.
4. Cole BR and Madgril LS. Acute Proliferative Glomerulonephritis and Crescentic Glomerulonephritis. Hollyday MA, Barret TM, Avner ED. Paediatric Nephrology, 3rd ed. 697-718.
5. Rahman H, Muinuddin G, Hossain MM. Acute Post-streptococcal Glomerulonephritis in Children - A Review Article. *Bangladesh J. Child Health* 1998; **22**(1/2): 25-31.
6. Akbar MS, Hossain Monir. Nephrology. Synopsis of Child Health. 1995; 253.
7. Hossain MM. Editorial, Acute Glomerulonephritis in Children: Bangladesh Perspective. *Journal of Bangladesh College of Physicians and Surgeons* Sep 1995; **13**(3): 87-88.
8. Begum T, Rashid HU, Islam MN. Acute Post-streptococcal Glomerulonephritis - A Review. *Bangladesh Renal J* 1996; **15**(2): 84-91.
9. Nelson. Acute Post-streptococcal Glomerulonephritis. Behrman RH, Kliegman RM, Jenson HB. Nelson Text Book of Pediatrics. 16th ed. 1581-82.
10. Ahmed S. Acute Post-streptococcal Glomerulonephritis - A Review. *Bangladesh Renal J* 1994; **13**(1): 28-35.
11. Shiva F, Far RR, Behjati MR. AGN in children. *JPMJA J*, Pak Med Association, 1994; **44**(5): 116-8.
12. Ghai OP, Gupta P, Paul VR. Disorders of Kidney and Urinary Tract. AGN. Essential Paediatrics. 5th ed. 366-68.
13. Nahar N, Selim SH. Clinical Presentation of AGN. *Bangladesh Journal of Child Health* 1985; **9**(3): 175-78.
14. Hutchison JH and Cockburn F. Diseases of Urinary Tract. AGN. Practical Paediatric Problems. 6th ed.
15. Sheikh MAH, Absar MN. AGN in Children: Clinical Profile and Immediate Prognosis - A Study of 100 cases. *J. of Bangladesh College of Physicians and Surgeons* Sep 1995; **13**(3).
16. Islam AKMS, wadud MA. Prevalence of AGN among patients with secondarily infected scabies. *Bangladesh Renal Journal* 1994; **13**(1): 10-12.
17. Shakur MS, Khorshed MS, Dash PK. Skin Lesions, A Major Association Acute Nephritis in Children. *DS (Child) H J* 2000; **16**(2): 5-11.
18. Begum T, Rashid HU, Islam N, Rouf MH. Streptococcal Grouping and typing in post-streptococcal GN and in streptococcal skin infection. *Bangladesh Renal Journal* 1999; **18**(2): 46-49.
19. Madaio MP. Post-streptococcal Glomerulonephritis, Jacobson HR, Striker GE, Klahr S. *The Principles and Practice of Nephrology*, Philadelphia, BC Decker, 1999: 262-65.
20. Berrios X, Quensney G, Morale et al. Acute Rheumatic fever and Post-streptococcal Glomerulonephritis in an open population. Comparative study of epidemiology and bacteriology. *J. Lab. Clinical Med.* 1986; **108**(6): 535-42. PMID:3783026.
21. Begum T, Rashid HU, Islam MN, Jashimuddin. Immune Response in Acute Post-streptococcal Glomerulonephritis. *Bangladesh Renal Journal* 2000; **19**(1): 5-8.
22. Ahmed J, Rouf MA, Haque KMHS S, Rashid HU. Role of ADNase B in the Diagnosis of Streptococcal infection and its sequelae. *Bangladesh Renal J* 1994; **13**(1): 16-18.
23. Sarkissian A et al. An epidemic of Acute Post-infectious GN in Armenia. *Arch. Dis. Child* Oct 1997; **77**(4): 342-4.
24. Streeton, A-C-L et al. An epidemic of APSGN among aboriginal children. *J- Paediatr-child-Health* 1995; **31**(3): 245-8. <http://dx.doi.org/10.1111/j.1440-1754.1995.tb00795.x>. PMID:7669388.
25. Dieng MT et al. Scabies complicated by AGN in children. *Dakar-Med*, 1998; **43**(2): 201-4. PMID:10797963.
26. Faruq Q-O et al. Prevalence of streptococcal sore throat in the school children in Dhaka. *Bangladesh Med Res Council Bulletin* 1995. **21**(3): 87-94.
27. Begum Hosne Ara. A clinical profile and prognosis of AGN in children, Dissertation: January 1983.
28. Rashid HU, Ahmed S, Fatima N. Post-streptococcal Acute Glomerulonephritis in Children: Clinicopathological study and short term prognosis. *Bangladesh Renal Journal* 1994; **13**(1): 4-9.
29. Rahman M, Rahman MH, Chowdhury D. Post-streptococcal AGN in Bangladesh - A follow up study of 250 patients. *Bangladesh Renal J* 1988; **7**(2): 46-51.