

Acute Glomerulonephritis: A 7 Years Follow up of Children in Center of Iran

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Abstract- Acute glomerulonephritis (AGN) is a type of renal disease which indicates the inflammation of glomerulus and nephrons. This study was carried on 94 children, <15 years old with the diagnosis of AGN who were admitted to Qom and Yazd's hospitals between 2000 and 2006. Data were collected using hospital records on admission, progression notes and outpatient follow up. Among 94 patients, 55.3% were male and 44.6% were female. Mean age of patients was 8.2 ± 2.7 years old. Acute post streptococcal glomerulonephritis (APSGN) was reported in 92.5%, membranoproliferative glomerulonephritis in 4.2%, hemolytic uremic syndrome in 2.1% and IgA nephropathy in 1.06%. There was no significant differences between GN types and gender ($P=0.54$). Clinical manifestation included edema in 68.8%, oliguria in 36.3%, gross hematuria in 69.1%, HTN in 61.7% and anuria in 1.06%. Microscopic hematuria was detected in all patients. In the time of follow up none of patients had hypertension, 3.1% had proteinuria and 6.3% had microscopic hematuria. APSGN is the most common causes of AGN in Qom and Yazd's children. Early diagnosis and treatment of APSGN may protect children from long term morbidity and mortality and improve quality of life.

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Introduction

Acute glomerulonephritis (AGN) is a type of renal disease which indicates the inflammation of glomerulus and nephrons most commonly at the age of 2-15 years old (1,2). Clinical manifestations of AGN include edema, hypertension and hematuria, usually in association with oliguria and azotemia (3). Chronic glomerulonephritis (GN) is most often associated with other systemic disease such as diabetes mellitus, hepatitis, or systemic lupus erythematosus and usually affect 10-20 years old persons (1). Acute post streptococcal glomerulonephritis (APSGN) is the most common type of acute post infectious GN which is the classic feature of acute nephritic syndrome (4,5). Children with APSGN usually have a past history of streptococcal pharyngitis or streptococcal skin infection (3). Although some studies reported severe renal complications such as chronic and progressive renal

failure in association with APSGN, the disease prognosis is usually benign in children (5-8). Diagnosis of APSGN is usually based on clinical findings and past history of streptococcal infection. According to the morbidity of the disease, long term follow up is necessary.

Thus, if the unusual and prolonged disease course or abnormal serologic findings was observed, other paraclinical investigations should be applied.

Since few studies are carried on AGN and APSGN in Iran, this study was performed to evaluate children with APSGN who were admitted in Qom and Yazd's hospitals between 2000 and 2006 and assess the disease course in these patients in 7 years period.

Materials and Methods

A retrospective descriptive analytic study was carried on 94 children less than 15 years old with the diagnosis of

acute glomerulonephritis who were admitted to Qom and Yazd's hospitals between 2000 and 2006. Medical records of all patients were reviewed. Diagnosis of AGN was based on clinical manifestations including hematuria (tea-colored or cola-colored urine), edema and hypertension with past history of streptococcal infection (pharyngitis or impetigo) (3). Laboratory findings such as proteinuria, complement deficiency, increased blood urea and positive β streptococcus group A reaction were confirmed the diagnosis. Urinary protein excretion more than 40 mg/m²/hr was defined as nephrotic syndrome, proteinuria, between 4-40 mg/m²/hr as abnormal and less than 4 mg/m²/hr was considered as normal range (3). Indications for renal biopsy were steroid-resistant nephrotic syndrome, persistent hematuria or proteinuria, onset of nephrotic syndrome at <1 year or >8 years of age, clinical presentation of rapidly progressive glomerulonephritis or familial nephritis, and persisting azotemia (9). Data were collected using hospital records on admission, hospital progression notes and outpatient follow up. Results were analyzed using SPSS-13 software. *P* value<0.05 was considered statistically significant.

Results

In this retrospective descriptive analytic study, 94 patients less than 15 years old with documented diagnosis of AGN were enrolled. Among these children 52 patients (55.3%) were male and 42 patients (44.6%) were female (male to female ratio was 1.23). Patients' age range was between 1-15 years old (mean age: 8.2±2.7 years old), of which 30 patients (31.9%) were 1-5 years old, 35 patients (37.2%) were 5-10 years old and 29 patients (30.8%) were greater than 10 years old.

APSGN was reported in 87 patients (92.5%), membranoproliferative glomerulonephritis (MPGN) in 4 patients (4.2%), hemolytic uremic syndrome (HUS) in 2 patients (2.1%) and IgA nephropathy in 1 patient (1.06%). There was no significant differences between GN types and gender (*P*=0.54).

Past history of upper respiratory tract infection (URI), sore throat or pharyngitis was reported in 92 patients (97.8%) and past history of impetigo was reported in 2 patients (2.1%). The onset of symptoms in 81 patients (86.1%) was in cold months of year (from November to April).

Clinical manifestation included edema in 64 patients (68.8%), oliguria in 34 patients (36.3%), gross hematuria in 65 patients (69.1%), HTN in 58 patients (61.7%) and anuria in 1 patient (1.07%). One patient

was present with hypertensive encephalopathy (1.06%) which has been resolved after lowering of blood pressure. No mortality was reported in these 7 years period.

In laboratory findings, microscopic hematuria was reported in all patients, proteinuria in 64 patients (68.08%), of which 15.9% was in nephrotic range, azotemia (blood urea nitrogen more than 20 mg/dL) in 68 patients (72.3%), hyponatremia (blood sodium less than 135 mEq/L) in 31 patients (32.9%), hyperkalemia (blood potassium more than 5.0 mEq/L) in 18 patients (19.1%).

Decreased C3 level was detected in 79 patients (84.04%). Elevated antistreptolysin (ASO) titer was found in 81 patients (86.1%).

In the time of follow up (mean 39±18 months) none of patients had hypertension, 3 patients (3.1%) had proteinuria and 6 patients (6.3%) had microscopic hematuria. Kidney biopsy was done in patients with proteinuria, of which two patients had MPGN and the other one had lupus nephritis. The results of kidney biopsy in hematuric patients showed APSGN in 5 patients and GN as the result of Henoch-Schönlein purpura in 1 patient.

Discussion

This retrospective descriptive study was performed to evaluate patients with acute glomerulonephritis who were admitted in Qom and Yazd's hospitals between 2000 and 2006.

APSGN is more frequent in children from 4-14 years old and is twice more frequent in males than females (10). Derakhshan *et al.*, in a study in southern Iran, reported that mean age of patients was 8.5±3.2 years old and male to female ratio was 2.93, he mentioned that this ratio is higher than other studies (11). In a study by Kasahara *et al.*, patients age range was 3-14 years old and the most common age of involvement was 6-10 years old (4).

According to the results of present study, patients' age range was between 1 and 15 years old with mean age of 8.2±2.7 years old. Also mild male predominance (male to female ratio: 1.23) was observed.

Madani and his colleagues, in a study in 2003 reported that APSGN was the most common cause of glomerulonephritis in their patients (9). Also Ataei *et al.*, reported the same results in 2006 (12). In a study by Bodaghi *et al.*, the most common cause of glomerulonephritis was APSGN, mesangiocapillary GN and lupus nephritis, respectively, and the less common

causes were IgA nephropathy and HUS (8). In the present study, APSGN was the most common renal pathology and HUS and IgA nephropathy were the less common one which in agreement with the results of these studies.

Hypertension was present in 60-80% of children with APSGN, of which antihypertensive therapy usually required in about half of patients (10).

In a study by Kasahara, hypertension was reported in 64.5% (4) which is in agreement with the results of present study; which hypertension was detected in 61.7% of patients. Hypertensive encephalopathy was reported in 1.06% of patient which has been resolved after lowering of blood pressure.

Other clinical and laboratory findings in our study are in agreement with the results of the other studies (9, 10, 12). In the present study the majority of patients had a past history of URI or sore throat (97.8%) and only 2.1% of patients had a past history of skin infection, also APSGN was occurred in cold months in 86.1% of patients which resembles the results of the other studies (10, 11).

Roy *et al.*, reported that between 1961 and 1970, 31 ± 6.3 patients/year and between 1979 and 1988, 10 patients/year were hospitalized in the United States with the diagnosis of APSGN. Also they reported a decline in urban and an increase in rural patients with APSGN ($P = 0.0483$) (13). In our study, 71.2% were lived in urban areas. This incongruity may be related to the differences in socioeconomic conditions between study populations.

The results of this study showed that APSGN is the most common cause of AGN in Qom and Yazd's children and the prognosis of disease is fine on the condition of prompt diagnosis and treatment. According to the complications of this disease in un-treated children such as hypertensive encephalopathy, heart failure, hypertension and progressive renal failure which affect quality of life and lead to morbidity and mortality, early diagnosis and treatment of APSGN is of great value, thus supplemental epidemiological studies are advised.

As stated by the literature, in epidemic conditions, subclinical APSGN occurs 1.5 times more frequently than clinical APSGN and in non-epidemic conditions it occurs 4-5 times more frequently than clinical types. However in the present study we evaluate only symptomatic cases of APSGN who were hospitalized. Recently several molecular studies has focused in two antigenic fractions [nephritis associated plasmin receptor (NAPlr) and streptococcal pyrogenic exotoxin B (SPEB)] (10) which maybe beneficial in the diagnosis of

both clinical and subclinical cases of APSGN in children. In conclusion, APSGN is the most common causes of AGN in Qom and Yazd's children. Early diagnosis and treatment of APSGN may protect children from long term morbidity and mortality and improve quality of life.

References

1. Davis ID, Avner ED. Introduction to glomerular diseases. In: Kliegman RM, Behrman RE, Jenson HB, Stanton BF, editors. *Nelson Textbook of Pediatrics*. 18th ed. Philadelphia, PA: Saunders Elsevier; 2007. p. 2163-219.
2. Vehaskari VM, Aviles DH. Acute glomerulonephritis and rapidly progressive glomerulonephritis. In: Kher KK, Schnaper HW, Makker SP, editors. *Clinical Pediatric Nephrology*. 2nd ed. London, England: Informa Healthcare; 2007. p. 145-54.
3. Marcdante KJ, Kleigman RM. Nephrology and urology. In: Kleigman RM, Marcdante KJ, Jenson HB, Behrman RE, editors. *Nelson Essentials of Pediatrics*. 5th ed. Philadelphia, PA: Saunders Elsevier; 2006. p. 751-70.
4. Kasahara T, Hayakawa H, Okubo S, Okugawa T, Kabuki N, Tomizawa S, Uchiyama M. Prognosis of acute poststreptococcal glomerulonephritis (APSGN) is excellent in children, when adequately diagnosed. *Pediatr Int* 2001;43(4):364-7.
5. Pahari A, Walters S, Levin M. Infectious disease and the kidney. In: Avner ED, Harmon WE, Niaudet P, editors. *Pediatric Nephrology*. 5th ed. Philadelphia, PA: Lippincott, Williams and Wilkins; 2004. p. 956-86.
6. Orth SR, Ritz E. The nephrotic syndrome. *N Engl J Med* 1998;338(17):1202-11.
7. Yap HK, Chia KS, Murugasu B, Saw AH, Tay JS, Ikshuvanam M, Tan KW, Cheng HK, Tan CL, Lim CH. Acute glomerulonephritis: changing patterns in Singapore children. *Pediatr Nephrol* 1990;4(5):482-4.
8. Bodaghi E, Vazirian S, Abtahi M, Honarmand MT, Madani A, Zia Shamsa AM. Glomerular diseases in children. "The Iranian experience". *Pediatr Nephrol* 1989;3(2):213-7.
9. Madani A, Fahimi D, Esfehane ST, Mohsseni P, Atayee N, Ahmadi M, Elmi F, Haddadi M. Glomerular diseases in Iranian children: clinico-pathological correlations. *Pediatr Nephrol* 2003;18(9):925-8.
10. Rodriguez-Iturbe B, Mezzano S. Acute postinfectious glomerulonephritis. In: Avner ED, Harmon WE, Niaudet P, Yoshikawa N, editors. *Pediatric Nephrology*. 6th ed. Berlin, Heidelberg: Springer-Verlag; 2009. p. 744-55.
11. Derakhshan A, Hekmat V. Acute glomerulonephritis in southern Iran. *Iran J Pediatr* 2008;18(2):143-48.

12. Ataei N, Tajeddini A, Honarmand M, Madani A, Esfahani ST, Nikkhah A, Mohseni P, Soltani M. Clinical outcome of acute poststreptococcal glomerulonephritis (APSGN) in Iranian children. *Iran J Pediatr* 2006;16(2):195-200.
13. Roy S 3rd, Stapleton FB. Changing perspectives in children hospitalized with poststreptococcal acute glomerulonephritis. *Pediatr Nephrol* 1990;4(6):585-8.
14. Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson JL, editors. *Harrison's Principles of Internal Medicine*. 16th ed. New York, NY: McGraw-Hill; 2005.