

Complications of Acute Glomerulonephritis in Children in Port Harcourt

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Abstract

Anochie IC, Eke FU, Okpere AN, Bellgam HU. Complications of Acute Glomerulonephritis in Children in Port Harcourt. *Nigerian Journal of Paediatrics* 2008; 35: 7.

Background: The incidence of acute glomerulonephritis (AGN) is in decline in developed countries and usually runs an uncomplicated course. In this study, we aimed to determine the common complications and outcome of childhood AGN in Port Harcourt, Nigeria.

Patients and Methods: A prospective study of 31 children with acute glomerulonephritis (AGN) admitted into the children's ward or emergency ward of the department of Paediatrics, University of Port Harcourt Teaching Hospital (UPTH) from June 2006 to June 2008, was carried out. The complications, investigations, treatment (conservative with or without dialysis) and outcome were documented and analyzed.

Results: The 31 patients with AGN represented 38.3 percent of the 81 renal cases (excluding urinary tract infection) seen during the study period. They consisted of 16 (51.6 percent) males and 15 (48.4 percent) females, and were aged 3-16 years with a mean age of 8.3 ± 4.2 years. Twenty (64.5 percent) patients had at least one complication, and six (19.4 percent) had more than one complication. There were more males (11; 55.2 percent) with complications than females (nine; 45.0 percent), although the difference was not significant ($p > 0.80$). There was also no significant age difference between patients with and without complications ($p > 0.90$). Acute renal failure (ARF) was the commonest complication seen in 12 (38.7 percent) patients. Hypertensive encephalopathy with seizure occurred in five patients. Others included pulmonary oedema in five, nephrotic syndrome in four, anaemia in four, while congestive cardiac failure and chronic renal failure occurred in two patients each. Five patients with ARF underwent dialysis due to failure of conservative measures with intractable hypertension (2) and uraemia (3). The mean duration of admission was 12.3 ± 9.6 days (range 7-46 days). Three patients, comprising two with intractable hypertension and one with uraemia died in the hospital.

Conclusion: Most cases of acute glomerulonephritis in this study had complications, with mortality mainly from hypertensive encephalopathy and uraemia.

Key words: Acute glomerulonephritis, complications, children, Port Harcourt.

Introduction

CHILDHOOD acute glomerulonephritis (AGN) runs a relatively benign course with complete recovery in over 90 percent of cases.^{1,2} Complications

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such as hypertensive encephalopathy, pulmonary oedema, renal failure and nephrotic syndrome sometimes occur to alter the course of the disease.¹

¹⁶ The incidence of these complications varies in different countries, being higher in developing countries.^{4,5} In Nigeria, Olowu¹ reported an incidence of 41.38 percent, Okafor *et al.*³ 28.7 percent and Bello *et al.*⁴ 10.1 percent among AGN patients from the Western, Eastern and Northern parts, respectively. Mortality arising from these complications is reported to be between 1.2-3.2 percent.^{1,3,4,5} This is influenced by the time of presentation of the patients to health facilities, poverty, and availability of emergency measures including facilities for dialysis. Early recognition and prompt treatment of complications

of AGN have been shown to reduce mortality in children.^{4,7}

In this study, the various complications of AGN seen in children in Port Harcourt and their outcome are highlighted. The findings were compared with studies carried out in other parts of Nigeria and internationally.

Patients and Methods

A prospective study of all children admitted into the children's ward or emergency ward of the department of Paediatrics, University of Port Harcourt Teaching Hospital (UPTH) with the diagnosis of acute glomerulonephritis (AGN) from June 2006 to May 2008, was carried out. The diagnosis of AGN was based on the acute onset of oedema, macroscopic or microscopic haematuria and proteinuria of less than two weeks' duration. The complications noted as well as the investigations, treatment and outcome were documented. Hypertension was defined as systolic and/or diastolic blood pressure values greater than the 95th centile for age and sex.¹⁷ Urinalysis for protein and blood, and 24-hour urinary protein estimation was done for the diagnosis of nephrotic syndrome. Abdominal ultrasonography and chest radiograph were done for all the patients, while computerized tomography was done only in the unconscious patients. Renal biopsy, processed under light microscopy (LM), electron microscopy (EM) and immunofluorescence microscopy (IF) was carried out in two patients. The treatments given which were conservative with or without dialysis, were reviewed.

Data analysis was carried out using the statistical package Epidemiological Information Software (EPI-INFO version 6). Chi-square (χ^2) was used to test proportions while normally distributed data were analyzed using the student's *t* (unpaired) test. In all cases, a *p* value of <0.05 was considered statistically significant.

Results

Thirty one patients had acute glomerulonephritis (AGN), representing 38.3 percent of the 81 renal

cases (excluding those with urinary tract infection) seen during the study period. They comprised 16 (51.6 percent) males and 15 (48.4 percent) females with a M: F ratio of 1.1:1. The age distribution showed that eight (25.8 percent) patients were < 5 years, 14 (45.2 percent) between five and 10 years and nine (29.0 percent) > 10 years.

Complications of AGN occurred in 20 (64.5 percent) patients. They were aged 3-16 years with a mean age of 8.3 ± 4.2 years. Table I shows the age and sex distribution of the patients. There were more males (55.0 percent) with complications compared to females (45.0 percent) but the difference was not statistically significant (*p* > 0.80). Complications of AGN occurred more often in patients between the ages of five and 10 years; however, the difference was not significant (*p* value > 0.90). The complications seen in the patients are shown in Table II; six patients had more than one complication.

Acute renal failure (ARF) was the commonest complication recorded in 12 (38.7 percent) patients. The mean serum creatinine was 412.2 $\mu\text{mol/L}$ (range 119-1060 $\mu\text{mol/L}$), urea was 31.1 mmol/L (range 22.0-46.0 mmol/L), sodium was 131.5 mmol/L (range 121.0-150.0 mmol/L), potassium was 5.1 mmol/L (range 4.8-5.7 mmol/L), and bicarbonate 19.4 mmol/L (range 13.0-22.0 mmol/L). Three patients had both ARF and pulmonary oedema. Two patients progressed to chronic renal failure after six months; renal biopsy reports in these two patients suggested focal segmental glomerulosclerosis.

Hypertensive encephalopathy with seizures occurred in five out of 20 patients with hypertension while nine patients had severe hypertension (systolic/diastolic pressure $\geq 150/110$ mmHg). Hypertensive encephalopathy usually occurred in patients with very high blood pressure; mean systolic blood pressure (SBP) of 172 ± 19.2 mmHg (range 150-200 mmHg) and mean diastolic blood pressure (DBP) of 118.5 ± 13.0 mmHg (range 110-130 mmHg). The difference in the BP of patients with and without encephalopathy was statistically significant (*p* value = 0.001). Computerized tomography done in two

Table I
Age and Sex Distribution of Patients with Complications of Acute Glomerulonephritis

Age (yrs)	Males (%)	Females (%)	Total (%)
<5	2 (18.2)	3 (33.3)	5 (25.0)
5-10	5 (45.4)	4 (44.4)	9 (45.0)
>10	4 (36.4)	2 (22.2)	6 (30.0)
Total	11 (100)	9 (100)	20 (100)

Table II
Complications of Acute Glomerulonephritis in 31 Patients

Complications	No of Cases	% of 31 Patients
Acute renal failure	12	38.7
Hypertensive encephalopathy	5	16.1
Pulmonary oedema	5	16.1
Nephrotic syndrome	4	12.9
Anaemia	4	12.9
Congestive cardiac failure	2	6.5
Chronic renal failure	2	6.5

unconscious patients with hypertensive encephalopathy showed cerebral oedema.

Acute pulmonary oedema occurred in five patients. Their chest radiographs showed diffuse perihilar infiltrates (butterfly distribution) with engorged lymphatics in the interlobular septa (Kerley B lines). Four patients had nephrotic syndrome with massive proteinuria (greater than 40mg/m²/day), hypoalbuminaemia (serum protein: 20-33gm/dl) and hypercholesterolaemia (serum cholesterol: 7.3 - 8.8 mmol/l).

The packed cell volume (PCV) of patients with anaemia ranged from 10-28 percent (mean 22.3 ± 8.0 percent). Two patients had severe anaemia with PCV of 10 percent and 18 percent, respectively. Congestive cardiac failure was recorded in two patients, one with severe hypertension and in another with normal blood pressure. Chest radiography showed cardiomegaly in both patients.

The treatment given consisted of conservative management and/or dialysis. All the patients received antibiotics namely, oral or intravenous amoxicillin 100mg/kg/day in three divided doses given for 10 days to two weeks. Patients with severe hypertension received intravenous hydralazine 0.1-0.5mg/kg repeated every 4-6 hours as necessary. They were maintained on oral hydralazine 0.25-0.5mg/kg given 8 hourly; intravenous and oral frusemide 2mg/kg/day and oral captopril 0.1mg/kg (maximum 6.25mg) first dose, and increased gradually depending on the blood pressure, to 0.1-0.3mg/kg (12.5-25mg) 2-3 times a day. Intravenous mannitol 1g/kg/dose over 30 minutes 8 hourly for 24 hours was given to two patients with cerebral oedema. Humidified oxygen was also given to those with pulmonary oedema and congestive cardiac failure. The two patients with severe anaemia received blood transfusion. Five (41.7 percent) of the 12 patients with ARF had dialysis

due to failure of conservative measures to control intractable hypertension in two cases, and uraemia in three. One eight-year-old girl had peritoneal dialysis (PD), while four (>10 years; two females and two males) had haemodialysis (HD). The mean duration of admission was 12.3 ± 9.6 days (range 7-46 days).

Outcome

Three patients died in hospital, giving a mortality rate of 9.7 percent. Two patients died from intractable hypertension and one patient from uraemia principally because of inability to afford dialysis.

Discussion

Acute glomerulonephritis (AGN) was associated with complications in our environment. These complications were found in 64.5 percent of the AGN patients. The prevalence of complications noted in this study was high compared to the 41.38 percent reported by Okun², 28.7 percent by Okafor *et al*³ and 10.1 percent by Bello *et al*¹¹ in other parts of Nigeria. Blyth *et al*¹² in Australia, reported complications in 18.9 percent of their patients. The reason for the higher prevalence of complications in this study is not clear but the environmental pollution common in this part of the country and late presentation to the hospital might have contributed to a higher incidence of renal complications in our centre.

Acute renal failure (ARF) was the commonest complication seen in 37.8 percent of the patients. It was higher than the incidence reported in studies carried out in other parts of Nigeria^{1,2,3}. However, in Iraq a 50.0 percent prevalence of ARF was reported by Al-Mosawi¹⁰. Failure of conservative management resulted in the dialysis of five (16.1 percent) patients. The choice of dialysis modality

used varied depending on the age of the patient and affordability. Haemodialysis (HD) was used in older patients with better vascular access, while one patient received peritoneal dialysis (PD).

The 16.1 percent prevalence of hypertensive encephalopathy is quite high compared to the 2.0-4.8 percent prevalence recorded in some centres in Nigeria^{12,13} and the 5.0 percent each, recorded by Singh *et al*²⁰ in Afghanistan and Shiva *et al*²¹ in Iraq. The higher prevalence of hypertensive encephalopathy may be attributed to the high prevalence of hypertension in this study. Five of the nine patients with severe hypertension in our series developed hypertensive encephalopathy. The rate of increase as well as the preservation of the dynamics of cerebral auto-regulation²² in hypertensive states may explain the absence of encephalopathy in the other four patients.

The study found a lower prevalence of acute pulmonary oedema than the 20.4 percent recorded in an earlier study in this centre¹⁴ and much lower than the 39.7 percent prevalence reported by Ihadin *et al*²³ in Benin. It is however higher than the prevalence reported by Shiva *et al*²¹ in Iran.

Studies in Africa have shown that children with AGN tend to present with features of nephrotic syndrome.^{15,16,23} The 12.9 percent prevalence reported in this study was similar to the 12.7 percent prevalence reported by Ihadin *et al*²³ in Southern Nigeria but lower than the 16.7 percent reported by Hurt *et al*⁷ in East Africa. Anaemia of varying degrees was recorded in 12.9 percent of the patients. This is much lower than the 44.8 percent reported by Olowu.⁴ Anaemia in AGN has been reported to be due to haemodilution from fluid retention and bone marrow suppression.²⁴

The prevalence of congestive cardiac failure (CCF) which is a recognized feature of AGN⁷ recorded in this study was much lower than the 58.3 percent prevalence reported by Olowu⁴ but comparable with that reported by Singh *et al*²⁰ in Afghanistan. It was however, much higher than the prevalence reported by Shiva *et al*²¹ in Iran. The fact that CCF occurred in one non-motile patient might suggest that apart from hypertension, sodium and water retention may be responsible for CCF in AGN patients. Left ventricular dysfunction has been reported to occur in some AGN patients.²⁵ Previous studies on ACN patients using echocardiography have demonstrated that myocardial dysfunction do occur in some ACN patients.^{26,27}

The long term outcome of childhood AGN is generally very good with recovery rate of over 95 percent compared to adults.²⁸ However, AGN is a documented risk factor for chronic renal disease in

late life.²⁹ The fact that AGN can cause chronic renal failure (CRF)³⁰ is supported by this study. The high mortality rate obtained in this study when compared with 1.2 - 3.2 percent rate in other parts of the country^{11,12} may be attributed to a very high cost of dialysis limiting the number of dialysis sessions, or precluding any session as was the case in respect of one of our patients who died from uraemia. Late presentation of our patients may also be contributory.

In conclusion, there is a high incidence of complications of acute glomerulonephritis in our environment and mortality which is also high, results mainly from hypertensive encephalopathy and uraemia.

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