

THE PATTERN OF ACUTE RENAL FAILURE IN KELANTAN

D Zainal, C S Loo

ABSTRACT

Acute renal failure (ARF) has undergone many changes with advances both in diagnosis and therapy. A retrospective study covering three and a half years from June 1986 to December 1989 of adults admitted to Hospital of the University of Science Malaysia examined the various aspects of presentation of the syndrome, management and areas where improvement can be made.

A total of 164 patients were included in the study. 61.6% were male and 38.4% were female. The mean age was 49.8 ± 17.2 years with 70% of patients being more than 40 years old. The aetiologies of acute renal failure were analysed and discussed.

The majority of the patients (80%) had non-oliguric acute renal failure. Oliguric acute renal failure patients have higher mortality and more frequently need dialysis.

Early recognition of acute renal failure and discerning use of nephrotoxic drugs could result in decrease in incidence and severity of renal failure.

Keywords: acute renal failure, inpatients, Kelantan.

SINGAPORE MED J 1996; Vol 37: 44-47

INTRODUCTION

Acute renal failure (ARF) remains a serious disorder despite advances in medical treatment. Case mortality remained in the region of 40% - 60%^(1,2) over the last 20 years. It occurred quite frequently in the setting of large general hospitals⁽³⁻⁵⁾. The 3 studies of Malaysian patients treated in Kuala Lumpur General Hospital were done from 1976 to 1981 and 1987⁽⁶⁻⁷⁾. The population served by Hospital University Science Malaysia (HUSM) is predominantly Malay which is different from the other 3 studies. There is also a need to study this clinical syndrome which changes continually with advances in medical practice.

The aims of this study were: 1) to elucidate the clinical characteristics, aetiology, treatment and mortality of the disease, and 2) to suggest methods of prevention.

MATERIALS AND METHODS

This was a retrospective study over a three and half year period from June 1986 to December 1989 on adult inpatients at the Hospital University Science Malaysia.

Definition

Acute renal failure (ARF) was defined as an acute rise of serum creatinine to more than 177 $\mu\text{mol/L}$ and

- (i) an increase in serum creatinine of at least 44 $\mu\text{mol/L}$ from the baseline value of less than 168 $\mu\text{mol/L}$, or
- (ii) an increase in serum creatinine greater than 88 $\mu\text{mol/L}$ for patients with a baseline value of 177 to 433 $\mu\text{mol/L}$ or
- (iii) an increase of greater than 133 $\mu\text{mol/L}$ for patients with baseline value of 442 $\mu\text{mol/L}$ or greater.

Baseline serum creatinine was defined as the most recent value obtained within the previous 6 months.

For patients who did not have a creatinine determination in the prior 6 months, but had serum creatinine greater than 177 $\mu\text{mol/L}$ while in hospital, the presence of ARF was retrospectively defined by a decrease in serum creatinine of 50% within one month of admission.

Oliguria was defined as a daily urine output of less than 400 ml. ARF was considered to be community-acquired if the renal function was abnormal on admission. It was considered to be hospital-acquired if the renal function that was normal on admission deteriorated during hospital stay.

Laboratory records of renal function from June 1986 to December 1989 were scrutinised to generate a list of patients with serum creatinine level of more than 177 $\mu\text{mol/L}$. Case records of these patients were studied retrospectively. The serum creatinine was measured by an autoanalyser.

All data were expressed as ± 1 SEM (Standard error of the mean) and statistical analyses were performed using Student's t-test and chi-squared analysis.

RESULTS

A total of 164 patients admitted from June 1986 to December 1989 fulfilled the criteria and were included in the study. During this period there were 79,196 adult admissions to Hospital University Science Malaysia. This gave an incidence of acute renal failure of 2 per 1,000 admissions. Table I shows the age distribution. The mean age of these patients was 49.8 ± 17.2 years. Seventy percent of the patients were over 40 years old.

The majority of our patients were Malays (86.6%), followed by Chinese (12.2%), and Indians (1.2%). 61.6% were males and 38.4% were females. The mean period of hospital stay was 29 ± 28 days.

The primary events leading to renal failure were shown in Table II. Infection and pre-renal azotaemia were the leading causes of acute renal failure.

Oliguric renal failure occurred in 32 patients (20%) with mean urine output of 203 ± 134 ml. The other 132 patients with non-oliguric renal failure had mean urine flow of 1290 ± 970 ml/day.

Table III compares both groups; the oliguric patients required dialysis more frequently [43.8% versus 12.1%, $p <$

Department of Medicine
University Science Malaysia Hospital
16150 Kubang Kerian, Kelantan
Malaysia

D Zainal D, MRCP (UK)
Lecturer

C S Loo, MRCP (UK)
Registrar

Correspondence to: Dr D Zainal

Table I – Age distribution of patients with acute renal failure

Age range (years)	No. of patients (%)
< 20	7 (4.3%)
21 – 40	42 (25.6%)
41 – 60	65 (39.6%)
> 60	50 (30.5%)
Total	164 (100.0%)

Table II – Primary events leading to acute renal failure (ARF)

Events or causes leading to ARF	No of patients	%
Obstructive uropathy	45	27.4
a. renal calculi	27	
b. cervical/ovarian carcinoma	8	
c. bladder calculi/carcinoma	6	
d. prostatic carcinoma/hypertrophy	4	
Pre-renal azotaemia	40	24.4
a. decrease in cardiac output	10	
b. diminished intravascular volume	19	
c. haemorrhage (postoperatively)	11	
Infective	38	23.2
a. septicaemia	24	
b. pyelonephritis/urinary tract infections	8	
c. malaria	2	
d. leptospirosis	3	
e. renal tuberculosis	1	
Obstetric	11	6.7
a. pre-eclampsia	5	
b. abruption placenta	3	
c. septic abortion	3	
Toxin-induced	8	4.9
a. aminoglycoside	7	
b. others	1	
Miscellaneous	22	13.4
a. multifactorial	15	
b. incompatible blood transfusion	3	
c. multiple myeloma	2	
d. glomerulonephritis	2	
Total	164	100.0

Table III - Characteristics of patients with oliguric and non-oliguric acute renal failure (ARF).

Clinical data	oliguric n = 32	non-oliguric n = 132	p value
Mean age (years)	48.1±16.5	50.2±17.5	ns
Mean period of hospitalisation (days)	22.7±16.5	30.7±30.3	ns
Mean peak S. urea (mmol/L)	36.0±13.9	32.4±14.0	ns
Mean peak S. creatinine (µmol/L)	737±481	561±414	ns
Requiring :			
a. Dialysis	43.8%	12.1%	p < 0.001
b. Intensive care	40.6%	13.6%	p < 0.005
c. Mechanical ventilations	23.8%	10.8%	p < 0.02
Death	56.3%	18.9%	p < 0.001

ns: not significant.

0.001]. They were found more frequently in intensive care and were ventilated [40.6% vs 13.6%, p < 0.01 and 31.3% vs 12.1%, p < 0.02]. They also had higher mortality [56.3% vs 18.9%, p < 0.001].

One hundred and thirteen patients (68.9%) had ARF on admission and the other 51 patients (31.1%) who had normal renal function on admission acquired renal failure during the hospital stay. Table IV compares these two groups of patients. Obstructive uropathy, obstetric and toxin-induced cases occurred more frequently in hospital-acquired ARF. Mortality of the two groups were not significantly different. However, more patients with hospital acquired ARF required mechanical ventilation compared with community-acquired ARF [37% vs 11%, p < 0.005 and 38.6% vs 8%, p < 0.001].

Treatment by haemodialysis or peritoneal dialysis was required in 30 of 164 patients (18.3%). Thirty-one patients (18.9%) stayed in the intensive care and 26 patients (15.9%) were ventilated. Forty-three patients died over this period, giving a mortality rate of 26.2%. Table V shows the causes of ARF in patients who died. The largest group consisted of patients with septicaemia.

Table IV – Characteristics of patients with community and hospital acquired acute renal failure (ARF)

Clinical data	Hospital acquired ARF n = 51	Community acquired ARF n = 113	p value
Mean age (years)	46.8±18.9	51.1±16.4	p < 0.05
Mean period of hospitalisation (days)	30.5±23.6	28.5±30.2	ns
Aetiology of ARF			
a. obstructive uropathy	48%	36%	p < 0.01
b. pre-renal azotaemia	16%	22%	ns
c. infective	16%	21%	ns
d. obstetric	18%	2%	p < 0.005
e. toxin induced	16%	0%	p < 0.001
f. miscellaneous	28%	19%	ns
Mean urine volume (ml/day)	990±740	1117±1062	ns
Dialysis	20%	18%	ns
Mortality	39%	20%	ns
No. of patients requiring intensive care	37%	11%	p < 0.005
No. of patients requiring mechanical ventilation	38.6%	8%	p < 0.001

ns = not significant

Table V – Causes of acute renal failure in patients who died.

Diagnostic groups	No. of patients
Septicaemia	14
Post operative	7
Polytrauma	4
Advanced carcinoma	4
Chronic liver disease	3
Cardiogenic shock	4
Obstructive uropathy	2
Diabetic ketoacidosis	2
Septic abortion	2
Pre eclampsia	1
Total	43

DISCUSSION

From this study, the incidence of ARF patients managed in our hospital was 2 per 1,000 admissions. The mean age at presentation was $49.8\% \pm 17.2$ years; 70% of them were over 40 years old. The racial distribution noted in this study was proportionate to the ethnic distribution in the state of Kelantan⁽⁸⁾.

Medical patients comprised the largest group of patients with ARF, involving 65.9% of all patients. Other studies gave almost similar figures ranging from 41% to 54%^(6,9,10). This differed from earlier studies before 1975 which gave figures of approximately 60% surgical patients, 30% medical patients and 10% obstetric patients respectively⁽¹¹⁾. This is not surprising with the patients now having long standing medical problems. Better surgical, anaesthetic techniques and better general supportive care contributed to a smaller proportion of surgical causes.

The majority of our patients have non-oliguric ARF, accounting for 80% of cases. The present result is consistent with those of other studies which reported incidences of 60% - 78%^(3,7).

Routine screening of renal function in hospitalised patients may have brought more cases of non-oliguric failure to light. In addition, the use of nephrotoxic drugs causes mainly non-oliguric renal failure. Increased use of nephrotoxic drugs probably contributed to the increased number of cases.

It is quite obvious that spontaneous non-oliguric ARF has better prognosis. As seen in this study, creatinine levels were lower, affected patients needed dialysis less frequently and mortality was lower.

It would seem advantageous to "convert" oliguric into non-oliguric ARF by using loop diuretics. Unfortunately there were no conclusive studies that confirmed the beneficial effect of diuretics in improving renal function and hence lowering the mortality rate of patients with oliguric ARF.

Obstructive uropathy was the major single cause of acute renal failure, accounting for 27.4% of all cases with two-thirds of the cases secondary to renal stones. In patients studied at the nephrology unit at Kuala Lumpur General Hospital, 15% of 152 patients with acute renal failure had obstructive uropathy⁽⁶⁾. This is a potentially reversible cause of ARF if the obstruction was relieved early. All patients with ARF should have an ultrasound scan done to exclude obstructive uropathy. If present, relief of obstruction should be performed. Percutaneous nephrostomy is a procedure available in most hospitals.

Pre-renal factors, the next most common cause of ARF comprising haemorrhage following postoperative procedures, decreased cardiac output and diminished intravascular volume are potentially reversible causes. Careful maintenance of adequate intravascular volume with monitoring of central venous pressure would be helpful in prevention as well as treatment of these cases.

Septicaemia giving rise to ARF had very poor prognosis. As seen in this study, 32.5% of patients who died had septicaemia. Many of these patients had multiorgan failure. Recently, monoclonal antibodies towards endotoxin have been used and its effect on ARF remains to be evaluated.

Obstetric causes of ARF, prevalent in the past, have both decreased in incidence and mortality. This could be attributed to better prenatal care, control of hypertension and better anaesthetic and surgical techniques.

The incidence of drug-induced ARF is expected to fall as more new drugs with lower nephrotoxic potential come into the market. In this study aminoglycoside remained the single most important culprit. Of the 8 cases, 7 were due to

gentamicin and one to amikacin. Serum drug levels were done in all cases and 2 were found to have toxic levels. All had non-oliguric renal failure. This finding would suggest that only carefully selected patients should be given aminoglycoside and the drug level should be carefully monitored.

Radiocontrast-induced nephropathy may play a major role in the aetiology of ARF. However, in this study it does not seem to feature at all. This condition can be easily missed as it is transient, self-limiting and causes non-oliguric ARF. Renal function should be monitored more closely following all imaging procedures in susceptible patients such as the elderly, diabetic and those with pre-existing renal failure.

Only 18.29% of 164 patients with ARF required dialysis. This indicates that early recognition of ARF and prompt treatment of the reversible cause reduces the severity of ARF and the need for dialysis.

The main mode of dialysis treatment performed were peritoneal dialysis and conventional haemodialysis. In hypotensive patients, CVVHD (continuous veno-veno haemodialysis) is safe and effective in controlling electrolyte abnormalities. Unfortunately, facilities for continuous haemodialysis were not available at the time.

The overall mortality of 26% was comparable with other studies with rates of 18% to 35%^(6,7,12). The strategies to lower this rate would include prevention, earlier diagnosis and treatment both of ARF and the underlying diseases and improvement in general supportive care.

In conclusion, ARF managed at the Hospital University Science Malaysia did not differ in incidence, aetiology and mortality from other hospitals in Malaysia. There is a need to stress the preventive aspects of management of this disease with efforts directed especially towards early recognition of obstruction.

REFERENCES

1. Mc Murray SD, Luft FC, Maxwell DR, Hamburger RJ, Dennis Fatty, Szwed JJ, et al. Prevailing pattern and predictive variables in patients with acute tubular necrosis. *Arch Intern Med* 1978; 138: 950-5.
2. Butkus DE. Persistent high mortality in acute renal failure: are we asking the right questions? *Arch Intern Med* 1983; 143: 209-12.
3. Anderson RJ, Linas SL, Bems AS, Henrich WL, Miller TR, Gabow PA, et al. Nonoliguric acute renal failure. *N Engl J Med* 1977; 296: 1134-8.
4. Hou SH, Buchrisky DA, Wish JB, Cohen JJ, Harrington JT. Hospital acquired renal insufficiency: a prospective study. *Am J Med* 1983; 74: 243-8.
5. Suleiman AB. Clinical review of acute renal failure, a 5 year experience at Kuala Lumpur. *Ann Acad Med Singapore* 1982; 11: 32-5.
6. Suleiman AB, Yahya S. Acute renal failure in Kuala Lumpur. *Med J Malaysia* 1981; 36(i): 11-3.
7. Suleiman AB, Morad Z, Prasad S. Prospective study of acute renal failure in a general hospital. *Med J Malaysia* 1987; 42: 4: 230-7.
8. Department of Statistic, Malaysia. Breakdown of population in Malaysia by ethnic groups as on 30 June 1983. *Year Book of Statistic* 1984.
9. Turney MBJH, Rodger RSC, McGonigle RJS, Adu D, Michael J. Changing pattern of acute renal failure. *Q J Med* 1987; 62 (237): 15-23.
10. Maher ER, Robinson KN, Scoble JE, Farrimond JG, Browne DRG, Sweny P, et al. Prognosis of critically-ill patients with acute renal failure: APACHE II score and other predictive factors. *Q J Med* 1989; 72 (269): 857-66.

19th ILAR Congress on Rheumatology

8 – 13 June 1997

**Venue: Singapore International Convention &
Exhibition Centre**

Scientific Programme

- * Masterclasses
- * Plenary Lectures
- * Symposia/Workshops/Debates
- * Poster Sessions and Discussions

Scientific Highlights include

- * Immunopathogenic Mechanisms of Rheumatic Disease
- * Genetics in Autoimmune Diseases
- * Bone and Cartilage Metabolism in Health and Disease
- * Environmental Agents in Rheumatic Disease
- * Epidemiology of Rheumatic Disease
- * Evaluation of Rheumatic Disease
- * Management of Specific Rheumatic Diseases

For further information, please contact:

**ILAR '97 SECRETARIAT
Communication Consultants
336 Smith Street
#06-302 New Bridge Centre
Singapore 0105
Tel: (65) 227-9811
Fax: (65) 227-0257**