

Prognostic Indicators in Acute Renal Failure

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ABSTRACT

BACKGROUND

Acute renal failure complicates 45% of cases in the general setup and up to 70% cases in the intensive care unit setup. Knowing the possibility of death is essential to determine the line of treatment and explaining prognosis to the patient and relatives. Multiple organ failure is a grave prognostic indicator in acute renal failure. We wanted to study the relation of indices to outcome in patients with acute renal failure.

METHODS

All patients above 18 years of age with acute renal failure who were admitted to hospital for a period of 1 year were included in the study. Those patients with pre-existing chronic renal failure were excluded from the study. Statistical package for Social Sciences Version 14 was used for statistical analysis.

RESULTS

Need for respiratory support, comatose state, thrombocytopenia, and increasing number of complications are significant prognostic indicators according to this study. The mortality rate of patients in acute renal failure in this study was 26%.

CONCLUSIONS

Acute renal failure continues to be a leading cause of mortality in a hospital setup. Prognostic scoring will help not only to explain prognosis but also in triaging patients in case of natural or manmade catastrophes causing massive influx of patients to hospitals.

KEYWORDS

Acute Renal Failure, Complications, Prognostic Indicator, Multiple Organ Failure

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BACKGROUND

Acute renal failure is a syndrome characterized by a rapid (hours to weeks) decline in glomerular filtration rate.¹ It is a condition in which a patient with no known previous renal impairment develops rapidly failing renal function with an acute increase in serum levels of substances excreted by the kidney.² An increase in creatinine more than 3 times of normal range or a decrease in glomerular filtration rate greater than 75% or urine output less than 400 ml for 24 hours or anuria for 12 hours is evidence of acute renal failure.³ Acute renal failure (also called Acute Kidney Injury) complicates approximately 5% of hospital admissions and 30% of admissions to intensive care units.⁴ While acute renal failure complicates around 45% cases in general series and close to 70% cases in intensive care unit series, functional outcome is usually good among the surviving patients. As is true for any severe clinical condition, a prognostic estimation of acute renal failure is of great utility for both the patients and their families and the medical specialists for analysis of therapeutic manoeuvres and options.⁵ A $\geq 101\%$ increment of creatinine with respect to its baseline before nephrology consultation is associated with significant increase of in-hospital mortality.⁶ Multiple organ failure is a poor prognostic factor in patients with acute renal failure in the setting of the intensive care unit.⁷ Aminoglycosides are the single biggest cause for drug induced acute renal failure.⁸

We wanted to study the relation of indices to outcome in patients with acute renal failure.

METHODS

50 patients aged 18 years and above who were admitted to a Medical College Hospital in South India for a period of one year with acute renal failure or developing the same during their stay in the hospital as evidenced by an increase in creatinine of more than 3 times of normal or a decrease in glomerular filtration rate greater than 75% or urine output less than 400 ml for 24 hours or anuria for 12 hours. Eligible participants were approached, and Informed consent was obtained before enrolling in the study. Subjects underwent detailed history taking and physical examination. The prognostic indicators to be correlated with outcome-recovery or death are- age, gender, hypotension, coma, jaundice, oliguria, nephrotoxic medication, respiratory support, and thrombocytopenia. Patients with chronic renal failure were excluded from the study.

Statistical Methods

The data collected has been analysed with SPSS Ver. 14 using chi square test and Pearson's test. p value less than 0.05 was considered to be significant.

RESULTS

Out of patients in the 18-49 years age group, 6 out of 24 people expired and 7 out of 26 people expired in the 50-80 years age group. There was no significant difference in mortality between younger and older age groups. There

were more males (31) than females (19) who suffered from acute renal failure. However the difference in mortality was not significant as compared between the two gender groups. P value showed that there was no statistically significant difference between normotensives and hypotensives as 7 out of 35 normotensives and 6 out of 15 hypotensive patients expired.

Variable		Survived	Expired	Total	Mortality %	p Value	Chi Square Test Value
Age (decades)	3rd - 5th	18	6	24	25%	0.877	0.024
	6th- 9th	19	7	26	26.9%		
Gender	female	14	5	19	26.32	0.968	0.002
	male	23	8	31	25.81		
Hypotension	normotensive	28	7	35	20	0.140	0.002
	hypotensive	9	6	15	40		
comatose	conscious	36	6	42	14.29	0.001	18.722
	comatose	1	7	8	87.5		
Respiratory Support	Normal respiration	32	5	37	13.51	0.001	11.532
	Respiratory support	5	8	13	61.54		
Oliguria	Normal output	3	0	3	0	0.290	1.121
	oliguria	34	13	47	27.66		
Jaundice	No jaundice	29	9	38	23.68	0.506	0.441
	jaundice	8	4	12	33.33		
Thrombocytopenia	Normal platelet count	26	5	31	16.13	0.042	4.131
	thrombocytopenia	11	8	19	42.11		
No. of Complications	1	15	0	15	0	0.001	28.826
	2	13	3	16	18.75		
	3	9	2	11	18.18		
	4	0	6	6	100		
	5	0	2	2	100		

Table 1. Mortality Rate, Its p Value and Chi Square Value among Different Variables

The consciousness level of the patient was a significant predictor of mortality in this study with 7 out of 8 comatose patients expiring. More than half (61.54%) of the patients requiring some kind of respiratory support expired showing that the need for respiratory support was another statistically significant independent predictor of mortality. While none of the patients with normal urine output expired, 13 out of 47 oliguric renal failure patients expired. However statistical significance could not be attributed since almost all (47/50) the cases were in oliguria. 9 out of 38 patients with normal and 4 out of 12 patients elevated bilirubin levels respectively expired. 5 out of 31 patients with normal platelet count and 8 out of 19 patients with thrombocytopenia expired making thrombocytopenia an important predictor for mortality in acute renal failure. The mortality rate of patients increased as the number of complications increased. Patients with only one complication had no mortality. Patients with 2 or 3 complications had just under 20% of mortality. However, patients with 4 or 5 complications had 100% mortality. 66% of the patients diagnosed to be acute renal failure underwent dialysis. Total mortality rate: 13 out of 50 patients expired. Mortality rate in this study was 26%.

DISCUSSION

Patients were divided into 2 groups - those from 18-49 years and those from 50-80 years. There was no significant

difference in mortality between younger and older age groups in this study. This finding does not correlate with that of Stott et al⁹ in London, UK and Chertow et al¹⁰ in Massachusetts wherein increased age corresponded with higher mortality. This study finding however does correlate with the findings of Oliveira et al¹¹ in London and Obialo et al¹² in Georgia, USA where in both instances the elderly did not have a poor prognosis compared to the younger age groups. This is significant as it means that aggressive treatment need not be withheld in the elderly.

Obialo et al¹² had also significantly higher men affected with acute renal failure as compared to women, but they found that mortality was higher in females than males. While this study agrees with Obialo et al that more men than women are affected, it does not find any statistically significant difference in mortality between men and women. Hypotension was defined as any patient with blood pressure lower than or equal to 90 mmHg systolic or those requiring inotropic support. While Vincent et al¹³ showed that hypotension can itself cause acute renal failure, this study finds that mortality rate between hypotensives and normotensives is not statistically significant.

Patients were divided into 2 groups - those with Glasgow coma scale equal to or less than 8 and those with a score 9 or above. Samimagham et al¹⁴ found that low Glasgow coma score was an important predictor of mortality in acute renal failure and our study also came to the same conclusion that consciousness level is an independent predictor of mortality. Respiratory support was recognized as any patient requiring support to maintain oxygen saturation whether it be by venturi mask or ventilator support. There was a significant correlation between the need for respiratory support and mortality which was in agreement with Kuiper et al¹⁵ where they found that mechanical ventilation may aggravate or even initiate acute renal failure.

Oliguria was defined as urine output less than 400 ml/day. While oliguria was found to be an early predictor of mortality in critically ill patients by Macedo et al,¹⁶ a statistical significance could not be made out in this study as almost all (94%) cases of acute renal failure were oliguric and there were not sufficient non oliguric patients to compare the findings with. Jaundice was defined as total bilirubin greater than 1.5 mg/dl. While Amerio et al¹⁷ found that rise in total bilirubin was directly proportional to rise in mortality, this study did not find any such difference in mortality.

Thrombocytopenia was defined as total platelet count less than 1.5 lakhs/cumm. While little over 16% of the patients with normal platelet count expired due to acute renal failure, as many as 42% of patients with acute renal failure in thrombocytopenia expired. These findings correlate with Chertow et al¹⁸ where thrombocytopenia was associated with increased mortality. Complications included hypotension (cardiovascular system), comatose (central nervous system), decreased urine output (nephrology), need for respiratory support (respiratory system), thrombocytopenia (haematology) and jaundice (hepatology). Each complication represents a different organ system in the body. No patient had all 6 complications. Brivet et al¹⁹ found that mortality increased with increase in number of organ systems involved. This study agrees with

the findings of Brivet et al as there was a significant correlation between increase in number of complications and increase in mortality. While patients with only 1 organ system involvement had no mortality, those with 2 or 3 organ systems involved had a mortality rate of just under 20% and those with 4 or 5 organ systems involvement had a 100% mortality.

66% of the patients diagnosed to be acute renal failure required haemodialysis. This finding correlates with the Robertson et al²⁰ study in which 63.9% of patients in acute renal failure required dialysis. The mortality rate in this study was 26% as compared to 34% by Levy et al.²¹ The lower rate of mortality was probably due to increased awareness by hospital staff, early detection of renal failure, inter-departmental coordination and early intervention in the management of acute renal failure.

CONCLUSIONS

Need for respiratory support, comatose state, thrombocytopenia and increasing number of systems involved are reliable predictors of mortality. This study is useful as it reveals a prognosticating system in which 'number of complications' may be utilized to predict the possibility of mortality in a patient with acute renal failure. It consists of only 6 variables and its simplicity makes it practical to employ it in the wards and may be used to explain prognosis to the patient and his/her relatives.

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