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Original Research Article

Sequential Organ Failure Assessment (SOFA) score in predicting morbidity and mortality in community and hospital acquired acute renal failure patient requiring dialysis

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ABSTRACT

Background: The Sequential Organ Failure Assessment (SOFA) score is an excellent tool for assessing the extent of organ dysfunction in critically ill patients. This study was planned to compare outcome and organ failure status of community (CAARF) and hospital acquired acute renal failure (HAARF) patients requiring dialysis using SOFA score.
Methods: The present prospective observational study was conducted on fifty consecutive acute renal failure patients age more than 18 years of either sex requiring dialysis. Patients who developed ARF after 24 hours of admission were referred as HAARF and patients who had acute renal failure on admission were considered as CAARF. The Sequential Organ Failure Assessment (SOFA) score was used to track a patient's status during the stay in an intensive care unit in both HAARF and CAARF patients.
Results: Out of 50 patients, 31(62%) patients had community acquired renal failure and 19 (38%) patients had hospital acquired renal failure. Mean SOFA in HAARF patients was high (8.84±3.13) compare to CAARF patients (6.16± 2.80). The p value calculated was 0.003 which was significant. High SOFA Score (>11) were seen predominantly in HAARF (83.3%) patients compare to CAARF (16.7%), followed by 57.1% of patients in HAARF and 42.9% of patients in CAARF had SOFA score between 9 to11.
Conclusions: High SOFA Score were seen predominantly in HAARF patients compare to CAARF and so poor outcome compare to CAARF. So, SOFA score may be used in explaining prognosis and outcome of ARF patients.

Keywords: Community acquired ARF, Hospital acquired ARF, Mortality, Critically ill, Sequential organ failure assessment

INTRODUCTION

Acute kidney injury (AKI) is now a days synonymously used with the term acute renal failure (ARF). The alternative proposed AKI better captures the diverse nature of this syndrome.[1] ARF is responsible for major morbidity and mortality of hospitalized patients because of serious nature of underlying illness and high incidence of complications. ARF is usually asymptomatic and diagnosed when biochemical investigations of hospitalized patients reveal a recent increase in blood urea nitrogen and serum creatinine concentration.[2]

Acute kidney injury is no longer considered to be an innocent by merely reflecting coexistent pathologies. It has been demonstrated to be an independent risk factor for mortality.[3] Over recent years there has been increasing recognition that relatively small rises in serum creatinine in a variety of clinical settings are associated with worse outcomes.[4] Morbidity and Mortality of hospital acquired renal failure is high and varies from 19% to 59%.[5,6]

In India, Acute Kidney Injury constitutes 1.5% of all general hospital admissions, of which 60% are due to medical causes. The most common causes of AKI are acute diarrheal diseases, sepsis, infections, snake bite, cardiac failure, diabetes mellitus, nephrotoxic drug use, malignancy, systemic lupus erythematous, hypertension etc. major surgery like exploratory laparotomy, whipple's procedure etc., are also an important cause of AKI. Advanced age, liver diseases, underlying comorbid illness (diabetes mellitus, hypertension, chronic obstructive pulmonary disease, cirrhosis) have been implicated as risk factor for the development of AKI.[7]

Regardless of cause, the management of AKI is mainly supportive, with dialysis being indicated when medical management fails to treat the complications like pulmonary edema, hyperkalemia, metabolic acidosis, signs and symptoms of uremia, pericarditis, gastritis, hypothermia, fits, encephalopathy, hypernatremia, drug toxicity.[8] There is no evidence that dialysis shortens the course in acute renal failure. Dialysis may be hazardous because of the episode of hypotension and arrhythmias. The available modes for renal replacement therapy in AKI require either access to the peritoneal cavity (for peritoneal dialysis) or the large blood vessels (for haemodialysis, hemofiltration and other hybrid procedures). Delay in diagnosis of ARF may lead to increased morbidity and mortality.[9] Early identification, referral and treatment of pre-renal failure with proper therapeutic decisions can substantially improve the incidence and outcome of ARF. Different aspects regarding outcome of ARF, in relation to severity scores, ICU setting, age, dialysis, and underlying illness have been studied in various parts of the world.[10] Community acquired ARF (CAARF) was defined as ARF developing outside the hospital while hospital acquired ARF (HAARF) was defined as ARF developing during hospitalization.[11,12] The Sequential Organ Failure Assessment (SOFA) score is an excellent tool for assessing the extent of organ dysfunction in critically ill patients with AKI.[13,14] Very few studies have compared the CAARF and HAARF patients. This study was planned to compare outcome and organ failure status of community and hospital acquired acute renal failure patients requiring dialysis using SOFA score.

METHODS

The present prospective observational study was conducted on fifty consecutive acute renal failure patients age more than 18 years of either sex requiring dialysis at a tertiary care teaching hospital of Udaipur, Rajasthan. Ethical clearance was taken from the institutional ethical committee and detailed informed consent and explanation about the purpose and confidentiality being maintained in the study. Detailed history, general physical examination, systemic examination and investigates were carried out in all patients of age above 18 with AKI and have been dialyzed at least once during hospitalization. Patients with chronic kidney disease, discharged against medical advice, patients who lost to follow up were excluded from the study.

The presence of AKI is usually inferred by an elevation in the serum creatinine concentration. AKI is currently defined by a rise from baseline of at least 0.3 mg/dl within 48 hr or at least 50% higher than baseline within 1 week or a reduction in urine output to less than 0.5 ml/kg per hour for longer than 6 hr.[15] Oliguria less than 200 ml in 12 hours or anuria (0-50ml in 12 hours) is an indication for dialysis. Dialyses requiring in severe AKI patients according to UK Renal association (2011) guidelines are

- Presence of clinical features of uremia (e.g., pericarditis, gastritis, hypothermia, fits or - encephalopathy).
- Fluid retention leading to pulmonary edema: inability to reduce excess volume with-diuretics with urine volume under 200 ml in twelve hours.
- Severe hyperkalemia (potassium above 6.5 mmol/L) unresponsive to medical management
- Serum sodium above 155 mmol/L or below 120 mmol/L.
- Severe acid-base disturbance (pH under 7.0) that cannot be controlled by sodium bicarbonate.
- Severe renal failure (urea greater than 30 mmol/L, creatinine greater than 500 µmol/L.)
- Toxicity with drugs that can be dialyzed.

Patients who developed ARF after 24 hours of admission were referred as HAARF and patients who had acute renal failure on admission were considered as CAARF. The Sequential Organ Failure Assessment score (SOFA score) was used to track a patient's status during the stay in an intensive care unit (ICU).[16] It was used to predict the outcome and organ failure status in patient of acute renal failure requiring dialysis. The score is based on six different scores, one each for the respiratory, cardiovascular, hepatic, coagulation, renal and neurological systems.

The data collected was recorded in an excel sheet and analyzed using suitable statistical tests like chi square and student t tests. P value <0.05 was considered significant.

RESULTS

Out of 50 patients, 31(62%) patients had community acquired renal failure and 19 (38%) patients had hospital acquired renal failure. The mean age of patients with CAARF and HAARF were 51.97±16.73 and 55.05±17.35 years respectively. In our study 51.61% of patients were male and 48.39% were female in CAARF and in HAARF, 63.16% were male and 36.84 were female. In CAARF maximum incidence (35.5%) was seen in age group range between 45 to 60 years and in HAARF maximum incidence (36.8%) was seen in two age groups range between 45 to 60 and 60 to 75 years respectively (Table 1).

Table 1: Age distribution of CAARF and HAARF dialysis requiring patients.

Age groups (years)	15-30	30-45	45-60	60-75	75-90
CAARF (31) n (%)	3 (9.70%)	4 (12.9%)	11(35.5%)	10 (32.3%)	3 (9.70%)
HAARF (19) n (%)	3 (15.80%)	1 (5.30%)	7 (36.80%)	7 (36.80%)	1(5.30%)
Total (50) N (%)	6 (12%)	5 (10%)	18(36%)	17(34%)	4(8%)

Table 2: Etiology of CAARF and HAARF dialysis requiring patients.

	CAARF (31) n (%)	HAARF (19) n (%)
Sepsis	3 (9.67%)	9 (47.37%)
Malaria	6 (19.35%)	2 (10.52%)
Acute glomerulonephritis	5 (16.12%)	0
Drug induced	4 (12.90%)	1 (5.26%)
Congestive cardiac failure	0	4 (21.05%)
Scrub typhus	3 (9.67%)	1 (5.26%)
Pancreatitis	3 (9.67%)	0
Chronic liver disease	1 (3.22%)	1 (5.26%)
Rhabdomyolysis	1 (3.22%)	0
Snake bite	1 (3.22%)	0
Obstructive uropathy	3 (9.67%)	0
Bladder outlet obstruction	1 (3.22%)	0
Post-partum hemorrhage	0	1 (5.26%)

Out of 19 (38%) patients of HAARF, sepsis was found major etiological factor in our study causing acute renal failure in 47.37% of patients followed by congestive heart failure (21.05%), malaria (10.52%). Out of 31(62%) patients of CAARF, 19.35% of patients had malaria causing acute renal failure, followed by acute gastroenteritis (16.12%), drugs (12.90%), sepsis (9.67%), scrub typhus (9.67%), pancreatitis (9.67%) and obstructive uropathy (9.67%) causing acute renal failure. The p value calculated was 0.013 which was significant (Table 2).

Out of 19 (38%) patients of HAARF, oliguria was seen in 18 (94.7%) patients and in CAARF, out of 31 patients 25 (80.6%) patients had oliguria. Average duration of hospital stay was more in HAARF (11.15 days), compare to CAARF (9.35 days).

Table 3: Outcome of dialysis requiring CAARF and HAARF patients.

	Outcome	
	Survived	**Expired**
CAARF (31) n (%)	29 (93.55%)	2 (6.45%)
HAARF (19) n (%)	14 (73.68%)	5(26.32%)

Mortality rate among the hospital acquired acute renal failure (HAARF) patients was 26.32% compare to 6.45% in community acquired acute renal failure (CAARF) patients. The p value calculated was 0.049 which was significant (Table 3).

Mean age of expired patients was 65.43±21.17 years and 51.14±15.33 years of survived patients. The p value calculated was 0.035 which was significant.

Table 4: Mean SOFA score in dialysis requiring CAARF and HAARF patients.

		N	Mean	Std. deviation	P value
SOFA score	CAARF	31	6.16	2.806	0.003
	HAARF	19	8.84	3.132	

Mean SOFA in HAARF patients was high (8.84±3.13) compare to CAARF patients (6.16±2.80). The p value calculated was 0.003 which was significant. (Table 4) High SOFA Score (>11) were seen predominantly in HAARF (83.3%) patients compare to CAARF (16.7%), followed by 57.1% of patients in HAARF and 42.9% of patients in CAARF had SOFA score between 9 to11. The p value calculated was 0.016 which was significant (Table 5).

Table 5: SOFA score in dialysis requiring CAARF and HAARF patients.

	SOFA score		
	<9	**9 to 11**	**>11**
CAARF (31) n (%)	27 (87.09%)	3 (9.67%)	1 (3.22%)
HAARF (19) n (%)	10 (52.63%)	4 (21.05%)	5 (26.31%)
Total (50)	37	7	6

DISCUSSION

Severity score systems from various measurable clinical variables are used to predict the course of the patient in the critical conditions and they also help in the assessment of various interventions and quality of care.[17] The APACHE system developed in 1980s was the first illness severity model had a good correlation with mortality.[18] SOFA score uses simple variables of major organ function, derived from routine investigations to calculate a severity score and for faster evaluation.[16] In present study we used SOFA score in ARF patients requiring dialysis.

In present study 62% patients had CAARF and 38% patients had HAARF. The mean age of patients with CAARF and HAARF were 61.5±16.3 and 51.1±20.3

years respectively. This suggests that CAARF is more common than HAARF. Obialo et al also found in hospitalized African Americans, the incidence of CAARF was 3.5 times greater than that of HAARF.[6] Above study witnessed that CAARF was predominant cause of acute renal failure, which is similar to present study.

In HAARF patients of our study, sepsis was the major etiological factor in our study causing acute renal failure in 47.37% of patients followed by congestive heart failure (21.05%) and others. This is consistent with Goswami et al study as in this study leading cause of ARF was sepsis (35%) in HAARF, second leading cause was drugs (23.36%), and acute gastroenteritis was seen in 9.81% of HAARF patients.[19] However, Biradar et al study showed that drugs (38%) were the commonest factor responsible for HAARF followed by sepsis (35%).[20] It explains that the sepsis is very common etiological factor causing acute renal failure during hospitalization.

Out of 19 (38%) patients of HAARF in our study, oliguria was seen in 18 (94.7%) patients and in CAARF; out of 31 patients 25(80.6%) had oliguria. This is consistent with Wang et al study which observed that oliguria was more commonly seen in HAARF patients.[21]

Average duration of hospital stay was more in HAARF (11.15 days), compare to CAARF (9.35 days). However, Goswami et al observed that duration of hospital stay was 14.74 days in HAARF and 13.23 in CAARF patients.[19] The maximum mortality was seen in our study belonged to age group range from 60 to 75 years. It explains that mortality rate is high in older age.

In our study, mortality rate among the hospital acquired acute renal failure (HAARF) patients was 26.32% compare to 6.45% community acquired acute renal failure (CAARF) patients. This explains that HAARF patients are associated with high risk of mortality. This is consistent with Wang et al study which has showed that HAARF was increasing with more complicated cause and higher mortality.[21] In contrary to our study, Kumar et al found that community acquired AKI was associated with increased mortality as compared to hospital acquired AKI (22.5% Vs 6.7%).[22]

74% patients had sequential organ failure assessment score (SOFA score) less than nine in present study. Both the mean and highest SOFA scores are the predictors of outcome. An increase in SOFA score during the first 24 to 48 hours in the ICU predicts a mortality rate of at least 50% up to 95%. Scores less than 9 give predictive mortality at 33% while above 11 can be close to or above 95%. Mean SOFA in HAARF patients was significantly high (8.84±3.13) compare to CAARF patients (6.16±2.80). It explains that HAARF patients have poor outcome compare to CAARF as high SOFA associated with high risk for mortality. High SOFA Score (>11) was predominantly seen in HAARF (83.3%) patients compare to CAARF (16.7%). This explains that HAARF patients have a high SOFA score and so poor outcome compare to CAARF.

In present study 14% patients were expired and oliguria was seen in all patients. It explains that oliguria is important predictor of mortality. These findings were in consistent with other studies who observed that oliguria was associated with mortality.[13,19,23]

CONCLUSION

Mortality rate was found high among the hospital acquired acute renal failure (HAARF) patients compare to community acquired acute renal failure (CAARF) patients. High SOFA Score (>11) were seen predominantly in HAARF patients compare to CAARF, this explains that HAARF patients have a high SOFA score and so poor outcome compare to CAARF. So, SOFA score may be used in explaining prognosis and outcome of ARF patients.

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