

STUDY OF ACUTE KIDNEY INJURY IN PATIENTS ADMITTED IN INTENSIVE CARE UNIT IN TERTIARY CARE HOSPITAL

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ABSTRACT

The Acute kidney injury (AKI) in particular occurring in ICU and is recognised as a major public health problem worldwide affecting millions of patients leading to decreased survival. AKI complicates 5–7% of acute care hospital admissions and up to 30% of admissions to the intensive care unit. AKI is a common complication of ICU and also associated with a markedly increased risk of death in hospitalized individuals, particularly in those admitted to the ICU where in-hospital mortality rates may exceed 50% when Compared to western literature, reports from our country are limited and hence there is a need to understand the clinical profile of these patients here. A thorough understanding of clinical spectrum of disease is needed in order to devise methods to improve final outcome due to AKI in ICU admitted cases. The present study aims to know the clinical spectrum of AKI in patients admitted in intensive care unit and to determine the risk, prognostic factors and final outcome of AKI patients who are admitted in intensive care unit tertiary care hospitals in Bangalore city. A total 100 patients of AKI patients admitted in ICU were considered for the study. The data was collected through a pretested proforma, which included various like patients history, Clinical examination, Diagnosis, Laboratory parameters, Urine output, Comorbid conditions, dialysis, MSOF etc., The Patients were followed up till the event of discharge or death in hospital. The main outcome evaluated was mortality. As per the analysis present study demonstrates majority of patients were in 51 to 60 years age group (24%) with highest mortality in 51 to 60 age group (32.1%). Fever was the most common presentation of patients (46%); Sepsis was the most common diagnosis (59%). Oliguric renal failure was seen in 49% cases. Comorbidity was seen in 51% of the patients; hypertension (30 cases), diabetes mellitus (23 cases), COPD (11 cases) and IHD (7 cases). A high overall mortality of 56% was seen which is consistent with other studies done in various parts of the world. Intrinsic type of renal failure was the most common type (68%). MSOF was noted in 63% of the patients. 37% of the patients required ventilator support and 45 % patients required dialysis. Mortality increased in older age group, comorbid conditions, oliguric renal failure. Sepsis was the most common cause. Intrinsic type of renal failure was the most common type of AKI seen. There was an increased mortality seen in patients who required dialysis, and mechanical ventilation. Presence of MSOF was associated with poor prognosis.

KEYWORDS: Acute Kidney Injury, Sepsis, Liguria, Multiple Systems Organ Failure

INTRODUCTION

Acute kidney injury (AKI) in particular occurring in ICU is recognised as a major public health problem worldwide affecting millions of patients leading to decreased survival. AKI complicates 5–7% of acute care hospital admissions and up to 30% of admissions to the intensive care unit. The incidence of AKI has grown by more than fourfold in the United States since 1988 and is estimated to have a yearly incidence of 500 per 100,000 populations. AKI is associated with a markedly increased risk of death in hospitalized individuals, particularly in those admitted to the ICU where in hospital mortality rates may exceed 50% 1. The incidence of in hospital AKI is difficult to estimate because no

registry of its occurrence exists and because up until recently there was no standardized definition. From a variety of predominantly single centre studies it is estimated that 3% to 7% of hospitalized patients develop AKI. 2,3,4 More detailed information is available regarding its development in the intensive care unit (ICU) environment, where approximately 25% to 30% of unselected patients develop some degree of AKI, although again estimates vary considerably depending on the definition used and the population case mix. Renal replacement therapy is typically required in 5% to 6% of the general ICU population or 8.8 to 13.4 cases per 100,000 population/year. 5,6,7,8,9,10 However, with the increasing prevalence of older subjects, higher degrees of co- morbidity and pre-existing chronic kidney disease in some centres, the proportion of patients requiring dialysis is substantially higher, two thirds of patients with AKI in one large multicentre study. 11 The occurrence of AKI and the need for renal replacement therapy may also be much higher in specific high-risk populations, such as those with hematologic malignancies, in whom in one study the requirement for renal replacement therapy was 22.5% as compared with 5.8% in those without haematological malignancies.12A recent analysis of a random 5% sample of Medicare beneficiaries based on

Inpatient claims data from between 1992 and 2001 found an overall AKI incidence of 23.8 cases per 1000 hospital discharges. The rate per 1000 discharges progressively increased—by approximately 11% per year—over the decade from 14.6 in 1992 to 36.4 in 2001 and was consistently higher in older subjects, men, and blacks¹³. A similar incidence rate—9.2 cases per 1000 hospitalizations, equivalent to 1.9% of all hospital discharges—and similar demographic associations were observed using the 2001 National Hospital Discharge Survey, a national collected database based on a representative sample of non federal acute care hospitals¹⁴. Indian data available regarding the incidence of ARF in ICU is meagre, it was estimated to be around 3.79% by Prakash J et al¹⁵ (they defined ARF as an acute increase in serum creatinine of ≥ 0.5 mg/dl if baseline creatinine is < 1.5 mg/dl or an increase of at least 1.0mg/dl if baseline serum creatinine is > 1.5 mg/dl but < 5.0 mg/dl). AKI in ICU is associated with high mortality despite significant improvement in the care of these patients. This indicates that AKI is not just a matter of loss of organ function, but is a condition additionally accompanied by systemic consequences which significantly impacts on prognosis. Acute epidemiological assessment of AKI is still a problem, as there is frequent change in accepted definition for AKI and definition for the end points to measure, results will remain heterogeneous and hard to compare. The Acute Dialysis Quality Initiative Group has published a consensus definition/classification system for acute kidney injury (AKI) termed the RIFLE criteria. 16 The Acute Kidney Injury Network (AKIN) group has recently proposed modifications to this system. 17 There is a need to evaluate whether there are advantages between these criteria's. Compared to western literature, reports from our country are limited and hence there is a need to understand the clinical profile of these patients here. A thorough understanding of clinical spectrum of disease is needed in order to devise methods to improve final outcome due to AKI in ICU and to analyse the clinical spectrum of AKI in patients admitted in intensive care unit. Determine the risk, prognostic factors and final outcome of AKI in patients admitted in intensive care unit.

MATERIALS AND METHODS

The prospective study conducted at Government tertiary care hospitals in Bangalore city during 2011-2013. Patients with Acute kidney injury because of various causes admitted in ICU and also who are admitted to both the hospitals of Victoria & Bowring & Lady Curzon hospital attached to BMCRI during the study period and meet inclusion and exclusion criteria. Total 100 patients prospectively recruited with written consent. pretested questionnaires were used to collect the secondary data of patients. Data was collected through a prepared proforma which included various

parameters like Age, Gender, Duration of hospital stay, Duration of ICU stay, Symptoms at presentation, Clinical examination (MAP, heart rate, respiratory rate, GCS, temperature), Diagnosis, Laboratory parameters (ABG, blood urea, serum creatinine, serum sodium and potassium, LFT, PT-INR, haematocrit, WBC count, platelet count, blood culture) Urine output, Comorbid conditions, need for dialysis, presence of Multiple systems organ failure (MSOF) and need for mechanical ventilation were evaluated. Jaffe's method was used for estimation of serum creatinine. Patients were followed up till discharge or death in hospital. The main outcome evaluated was mortality. Various other organ system failures (MSOF) were defined according to the recommendations of Knaus W A and Wagner D P. Correlation of various organ system failures with mortality were evaluated.

Inclusion Criteria

Patients with AKI admitted to ICUs with variety of medical and surgical disorders necessitating ICU care during the study period. Acute increase of serum creatinine of 0.5mg/dl if the baseline serum creatinine is <1.5mg/dl or an increase of at least 1mg/dl if the baseline serum creatinine > 1.5mg/dl but <5mg/dl. Oliguria urine output <200 ml over 12 hrs Need of renal replacement therapy.

Exclusion Criteria

Patients with chronic kidney disease were excluded from the study

RESULTS

Majority of patients were in 51 to 60 years age group (24%), followed by 31 to 40(20%), 61 to 70(18%) and 21 to 30 (17%) years of age group. Mean age in our study was 45.74 years. Total number of males was 62, and females comprise 38. 71%, duration of hospital stay was 1-10 days, 23 patients duration was 11-20 days, 3 patients duration was 21-30 days and 3 patients duration was >30 days. 65 patients duration of ICU stay was 1-5 days, 28 patients duration was 6-10 days, 1 patients duration was 11-15 days and 6 patients duration was >15 days. Present study, Fever was the most commonest presentation of patients (46%), followed by decreased urine output (38%), altered sensorium (35%) and vomiting (31%). Other symptoms were seen in relatively less number of patients. Many patients presented with more than one symptoms. Comorbidity seen with highest frequency was Hypertension (30%), followed by Type 2 DM (23%), COPD (11%) and IHD (7%). Other co morbidities were seen in relatively less number of patients. Many patients had one or more comorbidities. A total 49% of patients had oliguric renal failure, and remaining 51% of patients had non-oliguric. The descriptive statistics of laboratory parameters showed that 40 patients of haemoglobin <10gm/dl, 32 patients haemoglobin 10-12gm/dl and 28 patients >12gm/dl. 22 patients total leucocyte count of <10000 cells/cumm, 36 patients TLC of 10000-15000 cells/cumm and 42 patients TLC of >15000 cells/cumm. 53 patients platelet count of < 1.5 lakh/cumm, 31 patients platelet count of 1.5-2.5 lakh/cumm and 16 patients platelet count of >2.5 lakh/cumm. Laboratory parameters showed that total 8 patients blood urea <50 mg/dl, followed by 23 patients of 50-80 mg/dl and 69 patients of > 80mg/dl. Ten patients serum creatinine of < 1.5 mg/dl and 90 patients of > 1.5mg/dl. 60 patients of serum sodium < 135meq/dl, 35 patients of 135-145 meq/dl and 5 patients of >145meq/dl. 16 patients of serum potassium <3.5meq/dl, 66 patients of 3.5 – 5.5 meq/dl and 18 patients > 5.5 meq/dl. 37 patients needed ventilator support, 7 cases has needed ventilator support for 1-2 days, 18 patients for 3-5 days, 11 patients for 6-10 days and 1 patient for > 10 days. Patients needed 1-2 dialysis (3); 3-5 dialysis (23); 6-10 dialysis (12) and 2 patients needed > 10 dialysis. The majority of patients had respiratory failure (53%), followed by cardiovascular system failure (43%), hepatic failure (28%), hematologic failure

(17%) and neurologic failure (8%). Many patients had multiple organ failures. AKI most commonly found to be renal (68%) followed by prerenal (30%) and post renal (2%). Present study mortality was more common in patients who presented with vomiting ($p < 0.05$) followed by loose stools ($p < 0.05$), altered sensorium ($p < 0.05$) and Cough ($p < 0.05$). Patients presenting with other symptoms had less mortality, however most of the patients had more than one symptom. Mortality was more with patients with combination of symptoms than a single symptom. Mortality in patients with hypertension was very significant of 42.9% ($p < 0.05$), mortality with patients with COPD was 17.9% ($p < 0.05$). Mortality among patients with other co morbidities was less. However patient with more co morbidities had more mortality compared to patient with single co morbid.

The mean age of the patients was 45.74 when compared to non survivors was 50.09 years compared to survivors 40.20 years ($p < 0.05$). Mean duration of hospital stay was 9.55 days when compared to on survivors was 7.89 days compared to survivors 11.66 years ($p = 0.015$). It was found to be statistically significant ($p < 0.05$). The incumbent changes of average duration of ICU stay was 5.49 days ($p < 0.05$) as compared with prognosis. Many patients were required to make dialysis treatment and the results documented the mean requirement of dialysis was 4.78 days it was found to not statistically significant with survivor ($p > 0.05$). As per the result of mortality among non survivors and survivors with organ failure is positively correlate with Cardiovascular failure; 57.1% v/s 25% ($p = 0.001$). Respiratory failure; 71.4% v/s 29.5% ($p < 0.001$), Hepatic failure; 32.1% v/s 22.7% ($p = 0.298$). Haematological failure; 23.25% v/s 9.1 ($p = 0.062$) Neurological failure; 12.5% v/s 2.3% ($p = 0.061+$) MSOF: 89.3 v/s 29.5% ($p < 0.001$).

DISCUSSIONS

The study population consisted of one hundred patients of acute kidney injury because of various presentation were admitted in intensive care units during the study period from November 2011 to May 2013. The parameter like age, Gender, Duration of hospital stay, Duration of ICU stay, Symptoms at presentation, Diagnosis, Laboratory parameters, Blood/urine culture, Urine output, Co morbid conditions, need for dialysis, presence of Multiple systems organ failure (MSOF) and need for mechanical ventilation were evaluated. The main outcome evaluated was mortality various other organ system failures (MSOF) were defined according to the recommendations of Knaus W A and Wagner D P. The correlation of various organ system failures with mortality were evaluated. Increasing age is associated with increased morbidity and mortality due to homeostenosis. The concept of *Homeostenosis* refers to the fact that from maturity to senescence, diminishing physiologic reserves are available to meet challenges to homeostasis. All the organ systems in the body are affected by ageing. This leads to the increased vulnerability to disease as there is decrease in the tissue repair and immunity with increasing age. Mean age of the present study was 45.74 years. In an Indian context study reported by Prakash J et. al., mean age was 44.9 years and this study utilized a same criteria as our study for diagnosing AKI. The mean age among non survivors was 50.09 years compared to survivors 40.20 years ($p = 0.004$). 18 patients expired among the age group of 51 to 60 years followed by 14 patients of 61 to 70 years, 8 patients of 30 to 40 years. Hence mortality was more in older age groups. Total number of males in present study was 62, and females were 38. In study by Bagshaw S M et al 83 males were 59.5% and males were 70.1% in study by Chang C et al. Mortality in males in present study was 64.3% and in females was 35.7%. In study by Chang C et al mortality in males was 60.29% whereas in females it was 62.07%. There was no significant correlation between gender and mortality in present study ($P = 0.595$). The mean duration of hospital stay was more in patients who got discharged (11.66 days) when compared with the patients who died (7.89 days), this correlation was statistically significant ($P = 0.015$). This may suggest that patients with AKI in ICU who

are likely to worsen do not survive for longer duration because of high mortality associated AKI in ICU. The mean duration if ICU stay in our study in survivors was 5.95 days, whereas as it was 5.13 days among non-survivors. This relation was not statistically significant ($P=0.270$). In study by Chang C et al., the mean duration of ICU stay was 12.1 days among survivors and 10.9 days among non-survivors. In our study, Fever was the most commonest presentation of patients (46%), suggesting that infections were the most common etiology. Most common diagnosis was sepsis (59%), followed by gastrointestinal system (23%), respiratory system (12%) and genitourinary (9%). Other diagnosis was made in relatively less number of patients. Present study 51% patients had one or more co morbidities. Co morbidity seen with highest frequency was Hypertension (30%), followed by Type 2 DM (23%), COPD (11%), IHD (7%) and CVA (1%). Other co morbidities were seen in relatively less number of patients. Similar study have been reported by Prakash J et al., Hypertension was seen in 34.7% patients, followed by Type 2 DM (28.3%), IHD (30.4%), CKD (13%), CVA (4.3%) and COPD (4.3%). Mortality among patients with IHD was 10.7% ($P=0.131$). In study by Lopes J A et al 84 53.2% of patients had history of cardiovascular diseases. Mean number of dialysis required was 4.78 ± 2.91 . Mortality was 51.98% in patients who were dialysed, whereas it was 48.21% in patients who were not dialysed ($P=0.124$). Percentage of deaths was 64.44% in patients who required dialysis. Need for dialysis indicates increased severity of disease. In study by Gjyzariet al 88 32.8% of patients with AKI received dialysis. In study by Prakash J et al 15 54.35% patients received haemodialysis, mortality was 80% in patients who were dialysed and it was 42.86% in patients who were not dialysed. Mortality was high in patients with MSOF (89.3%) ($p < 0.001$). as per the earlier study reported by Prakash J et al., 15 73.91% patients had MSOF. Majority of patients had respiratory failure (53%), followed by CVS failure (43%), Hepatic failure (28%), Hematologic failure (17%) and Neurological failure (8%). Many patients had multiple organ failures.

CONCLUSIONS

AKI in ICU is usually multifactorial rather than the result of a primary renal disease. Intrinsic renal failure is the most common type of AKI in ICU. AKI in ICU is characterised by increasing morbidity, higher incidence of sepsis, MOSF and mortality. Higher mortality is seen in patients with oligo-anuria, MOSF, elderly, association of co morbid condition and who required ventilator and dialysis. These findings creeping for early detection and aggressive management of sepsis and its associate complication, so as to bring down the mortality in patients admitted to intensive care unit.

LIMITATIONS OF STUDY

- This study was conducted in single centre, multicentre studies will be needed for better generalisation of results.
- A higher stratified sample size could be required for drawing more conclusive results.
- No follow up event has not been done after the discharge of patients from the hospital.

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