An Observational Study to Identify Etiology and Prognostic Markers of Acute Kidney Injury in Critically Ill Patients During COVID Era In a Tertiary Care Center

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Abstract:

Objective: Acute kidney injury affects 10-15% of all hospitalized patients with a much higher incidence in the critically ill. The Acute Kidney Injury Network proposed a definition in which serum creatinine rises (>0.3mg/dl) and/or oliguria (<0.5/ml/kg/h) for a period of 6 hours are used to detect AKI. Accurate urine output measurements as well as serum creatinine values from our database were used to detect patients with AKI, their clinical profile and to identify prognostic markers.

Design: Prospective observational study

Setting :4 intensive care units at, a large, academic, tertiary medical center

Methodology: All patients admitted in INTENSVE CARE UNIT in Sapthagiri Institute of Medical Sciences and Research Centre with diagnosis of acute kidney injury, was included.Data was collected through a prepared performa.Patients were followed up till death or discharge.The main outcome evaluated was mortality.

Results: The study shows majority of patients were in 50-60 years age group(24%).Covid 19 pneumonia (52%)was the most common diagnosis followed by sepsis(19%).Overall mortality rate was 56%.In this study out of 100 patients,45 patients required dialysis among them 29 patients (66%)expired.There was more mortality in patients who needed dialysis;Comorbidities and mods contributed to mortality.In our study ,Comorbidity seen with highest frequency was Diabetes mellitus(48%),followed by Hypertension(17%),COPD(5%) and CLD(4%).The current research found a mortality rate of 64.3% among men and 35.7% among females.

Interpretation and conclusion: The study demonstrates high overall mortality of 56%.Mortality increased with advancing age.Other contributing factors were comorbidities and oliguric renal failure.Covid 19 pneumonia was most common diagnosis.There was increased mortality among the

ventilated patients and those requiring dialysis.

Keywords: Acute kidney injury,sepsis,oliguria,Multiorgan dysfunction

Introduction

Acute Kidney Injury (AKI) affects 5–7% of all hospitalized patients [1], with a much higher incidence in the critically ill.An increase in blood urea nitrogen (BUN) level and/or an increase in plasma or serum creatinine (S.Cr) concentration, frequently accompanied by a reduction in urine volume, are the most notable diagnostic features of acute kidney injury. However, the term acute kidney injury does not refer to a single medical condition. Rather, it refers to a group of diseases with similar diagnostic features. Acute kidney injury (AKI) may vary in severity from asymptomatic, transient aberrations in glomerular filtration rate (GFR) laboratory measurements to serious, deadly deviations in effective circulating blood volume, electrolyte balance, and acid-base compositionof the plasma.

Materials And Methods:

Source of data:

 All patients diagnosed with acute renal damage who are hospitalised to the intensive care unit at the Sapthagiri Institute of Medical Sciences and Research Centre will be included.

A. Study design: Prospective Observational study

B. B. Study period: 18 months February 2021 to August 2022

C. Place of study: Research Facility of the Sapthagiri Institute ofMedical Sciences.

D. Sample Size : 100

A. Inclusion Criteria :

- Those with Acute Kidney Injury who are admitted to the IntensiveCare Unit.
- At least 18 years old
- People who are willing to provide informed consent

### B. Exclusion Criteria:

- Patient with underlying CKD

C. Methodology:

- Participants that meet the research's inclusion criteria will beincluded to the study.
- In 100 eligible subjects etiology of AKI,risk factors including,age,gender,comorbidities and relevant investigationsdone will be noted .
- In order to analyse the relationship between risk factors, prognostic variables, and patient outcome, researchers will gather data from the moment of admission to the time of recovery or death.

Definition of Acute kidney injury

We classified our patients into 3 classes according to AKIN criteria[2]

AKIN classification of acute kidney injury
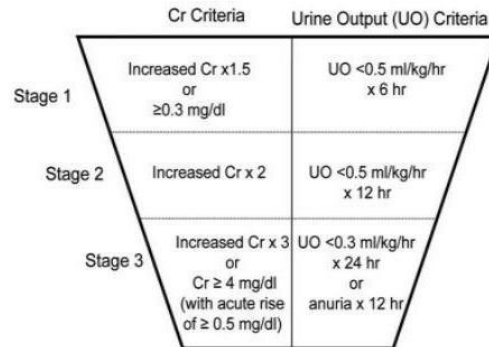
STATISTICAL ANALYSIS:

Using SPSS V.20 for analysis, the obtained data will be entered into Microsoft Excel. The result will be expressed in the form of descriptiveand inherently statistics.

If p< 0.05, it is said to be statistically significant

Results:

In our study out of 100 patients, 24 patients were between the ages of 51 and 60, 20 between the ages of 31 and 40, 18 between the ages of 61 and 70, and 21 to 30.Our sample had a mean age of 45 years.

Age distribution	N(100)	%
16-20	7	7%
21-30	17	17%
31-40	20	20%
41-50	10	10%
51-60	24	24%
61-70	18	18%
71-80	4	4%

Fig 1.Age distribution

Out of 100 patients 62 were males and 38 were females

Gender	No of Patients N=100
Male	62(62%)

Female	38(38%)

Fig 2.Gender distribution

Most common etiology of AKI in this study was Covid 19 pneumonia followed by sepsis.Out of 52 patients ,42 patients had severe covid 19 pneumonia.The total mortality rate was 56% in our study.There were a total of 62 males in this study, and 36 of them died (for a 48% mortality rate); of the 38 females, 20 deceased (52%).

In this study out of 100 patients,45 patients required dialysis among them 29 patients expired.There was more mortality in patients who needed dialysis.The mean tenure of hospitalization was 9 days.

Non-survivors had a median life expectancy of 7 days, whereas survivors averaged 11 days. (p=0.015*).In this study mean creatinine in discharged patients was 5.04 and in expired patients was 3.30 as there was associated multiorgan dysfunction.In this study ,out of 100 patients 20 had hyponatremia out of which 8 expired.In this study out of 100 ,31 patients had hypernatremia out of which 14 expired
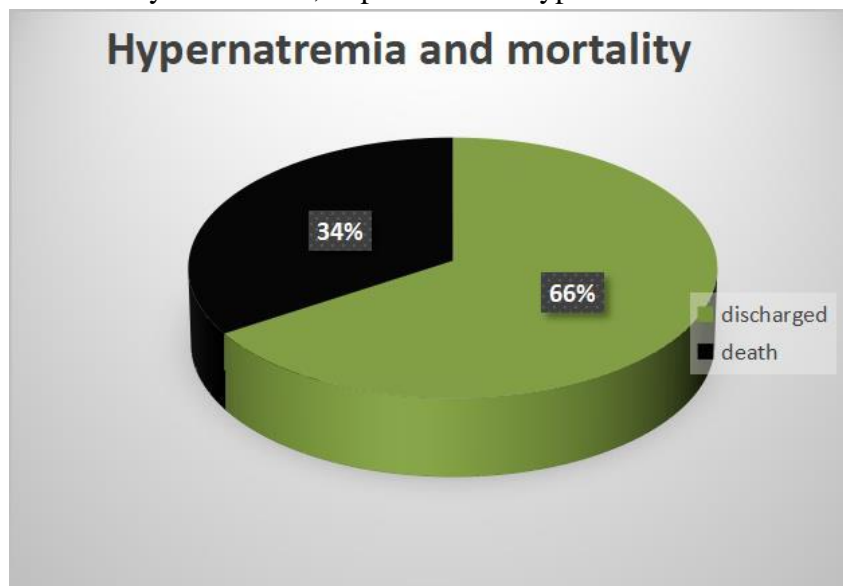

Fig 3:Hypernatremia and mortality

In this study out of 100 ,17 patients had hyperkalemia out of which 7 expired.Diabetes mellitus was the comorbidity that was most often seen in our research (48%) and was followed by hypertension (17%), COPD (5%), and CLD (4%). A smaller proportion of individuals also had othercomorbidities.
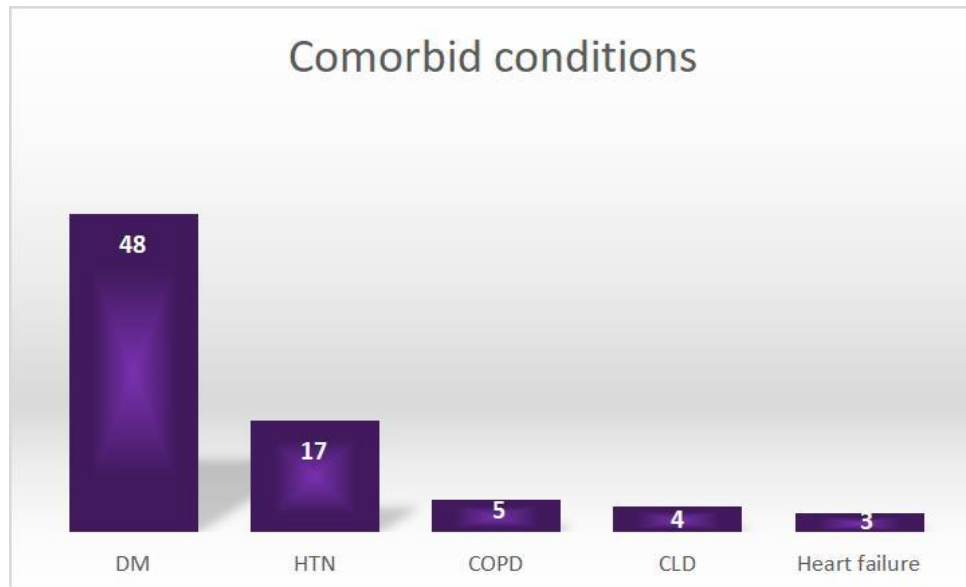
Fig 4 :Comorbidities and mortality

In this study patients with 2 or more comorbidities had more mortality In our study out of 100 ,37 patients required ventilator ,among them 26 patients expired.There was more mortality among patients who required

ventilator.(p=0.028*)In the present study out 100 ,26 patients has MODS out of which 23 expired and 3 got discharged

No of Patients	Death	Discharge
26	23	3

Fig 5: MODS and outcome

Discussion:

Our research included 100 patients with Acute Kidney Injury from a variety of sources who were hospitalized to critical care units betweenFebruary 2021 and August 2022.

Multiple systems organ failure (MODS), the existence of comorbid conditions, the requirement for dialysis, the presence of comorbid conditions, the necessity for mechanical ventilation, and the age and gender of the patient were all taken into account.Mortality was the primary outcome.

The oldest patients in the current research were 70 years old, followed by those aged 61–70 years old (18%), those aged 31–40 years old (20%), and those aged 21–30 years old (17%). Overall, the average age of our sample was 45.74 years. Based on research conducted by Lumlertgul N[3],the average age was found to be 54. Prakash j et al[4] found that the average age was 44.9 years.

Non-survivors had a significantly higher mean age (50.09 vs. 40.20; p=0.004). Of the total number of deaths, 18 occurred in patients aged 51– 60, 14 occurred in those aged 61–70, and 8 occurred in those aged 30–40.Therefore, death rates increased with age.

62 men and 38 women participated in the current research. Males accounted for 59.5% of the sample in the research by Bagshaw S M et al[4],and 70.1% of the sample in the study by Chang C et al[5].

The current research found a mortality rate of 64.3% among men and 35.7% among females. In the same

research, Chang C et al[6] found that male mortality was 60.29 percent and female mortality was 62.07 percent.In the current investigation, gender did not have a role in mortality (P=0.595).

There was a significant (P=0.015) difference between the median length of hospital stay for patients who survived (11.66 days) and those who died (7.89 days).

High mortality linked with AKI in the ICU may explain why patients who develop AKI in the ICU are less likely to survive for an extended period of time.

In our analysis, the median length of ICU stay for those who made it through was 5.95 days, whereas it was 5.13 days for those who did not. Chang C et al[7] found that the median length of ICU stay was 12.1 days among survivors and 10.9 days among non-survivors, but that this association was not statistically significant (P = 0.270).

Patients most often presented with fever (46%) in our research, pointing to infections being the most prevalent cause.

In our study most commom diagnosis among the patients were Covid 19pneumonia(52%).

In present study, mortality of 56% was seen. It was consistent with mortality seen in study done by Lili chan.et al[8].

In present study mean Haemoglobin, Total leucocyte count and Platelet count were 10.80 gm/dl, 15,040/cumm and 1.54 lakh/cumm respectively. A urea value of 118.85 mg/dl was discovered, along with a serum creatinine level of 4.06 mg/dl, a sodium level of 118.85 mg/dl, and a potassium level of 4.06 mg/dl. The values are 133.75 and 4.57 meq/dl.

Sang Heon Suh found that high white blood cell and low platelet counts, in in addition to advanced age, were linked with the greatest mortality inAKI.

The current research found that 49% of patients had oliguric renal failure, whereas 51% had non-oliguric renal failure.

A higher mortality of 60.7% was seen in oliguric patients, when compared to non-oliguric patients (39.2%) (P<0.001**).

Among the 24 patients studied by Shi H et al, the death rate was 82.35% in those with oliguric renal failure and 21.88% in those without (P=0.000). Patients with oliguric renal failure had a 73.33% death rate, while those with non-oliguric renal failure had a 43.75% mortality rate, according to a study by Prakash J et al[9].

Diabetes mellitus was the most common comorbidity (48%), followed by high blood pressure (17%), chronic obstructive pulmonary disease (5%), and non-alcoholic fatty liver disease (4%).A smaller proportion of individuals also had other comorbidities.

Sampathkumar26 found in his research The most common comorbidities were diabetes (73%), hypertension (59%) and coronary heart disease (32%), respectively.

45 participants in the current study needed dialysis. The average number of times a patient needed dialysis was 4,78+2.91. Dialyzed patients had a mortality rate of 51.98 percent, whereas non-dialyzed patients had a mortality rate of 48.21 percent (P-0.124). Dialysis patients had a mortality rate of 64.44 percent. An increasing disease severity is reflectedin the need for dialysis.

Lumlertgul N[10] found that 31.9% of AKI patients were treated with dialysis. Patients who were dialyzed had an 80% lower risk of death than those who weren't in a research by Prakash J et al., where the total number of patients who had hemodialysis was 554.35%..

In study done by Marlies Ostermann et al[11] patients with AKI who received dialysis had more mortality than patient who did not receivedialysis

In present study, 37 patients with AKI required ventilator support. Mean days on ventilator was 4.84+2.83 days. Among 37 patients who needed ventilator 26 patients expired. There was more mortality among patientswho required ventilator (p=0.028*)

In study by Rahimzadeh H[12] there was more mortality among patients who required dialysis when compared with the patients who did not needthe ventilation

Conclusion:

AKI in ICU is usually multifactorial ;pandemic-related COV19 pneumonia was the leading cause of death, followed closely by sepsis.Patients with oligoanuria, MODS, the elderly, concomitant conditions, and those who needed ventilation and dialysis had a greaterdeath rate in this research

From these results, it is imperative that sepsis and its associated complications be identified quickly and treated aggressively in order toreduce mortality in ICU patients.

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