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CLINICAL PROFILE OF ACUTE KIDNEY INJURY (AKI) PATIENTS ADMITTED IN INTENSIVE CARE UNITS (ICU) IN A TERTIARY CARE REFERRAL HOSPITAL.

Internal Medicine

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ABSTRACT

Introduction: Acute kidney damage, which is frequently recognized by an accumulation of the waste products of nitrogen metabolism (urea and creatinine), a decrease in urine production, or both, is the fast loss of the kidney's excretory function. One of many clinical signs of major kidney disorders, it is. Acute kidney injury (AKI), which is frequently seen in patients in intensive care units (ICUs), is a sign of poor prognosis on its own. Therefore, this study was designed to study the clinical profile of acute kidney injury (AKI) patients admitted in intensive care units (ICU) in a tertiary care referral hospital and analyze the diagnostic and prognostic role of RIFLE and AKIN criteria in acute kidney injury patients. **Material And Methods:** This prospective observational cohort study was conducted on 240 patients of Acute Kidney Injury admitted in the Medical Intensive Care Unit in Department of Medicine at GMC Jammu and SSH, Jammu. The study was done over a period of one year after approval from the Institutional Ethics Committee. The patients were followed up during ICU stay and till discharge from hospital. The incidence of AKI in ICU was determined. A detailed history was collected and clinical examination was done. Statistical Analysis The data collected was compiled on excel sheet and was analysed statistically by using SPSS software version 21.0. **Result:** In our study, male to female ratio was 1.8:1 and mean age of 48 years. 68.3% were medical patients, 86.3% required mechanical ventilation and mean length of stay in ICU was 7.9 days. The reported overall AKI prevalence of 82.1% by RIFLE and 86.7% by AKIN criteria. **Conclusion:** It was concluded that AKI is particularly common in the ICU. The AKIN criterion assists in an earlier and more complete diagnosis of AKI when compared to RIFLE criteria. There was a statistically significant link between hypotension, AKI, and the requirement for RRT.

KEYWORDS

Acute kidney injury, Clinical profile, Illness and RIFLE.

INTRODUCTION

The rapid loss of the kidney's excretory function is known as acute kidney injury, which is often identified by an accumulation of the waste products of nitrogen metabolism (urea and creatinine) or a decrease in urine production, or both. It is one of several clinical manifestations of serious kidney diseases. Patients in intensive care units (ICUs) frequently experience acute kidney damage (AKI), which independently indicates a bad prognosis.[1]

Up to 30% of patients to intensive care units (ICU) and 5% of hospital admissions are complicated by AKI. AKI significantly raises the risk of death in patients in hospitals, especially those admitted to the intensive care unit (ICU), where in-hospital mortality rates can reach 50%.[2]

Because of variations in location, co-morbid disease burden, demographics, and economics, the epidemiology of AKI varies greatly across industrialised and poor nations.[3] The etiology of AKI is multifactorial, and among all causal factors, septic shock is the one most commonly associated with the onset of AKI.[4]

Old age, past renal illness, sepsis, obesity, hypovolemia, surgery, history of hypertension, and cardiovascular disease are risk factors for AKI in ICU patients.[5]

Therefore, this study was designed to study the clinical profile of acute kidney injury (AKI) patients admitted in intensive care units (ICU) in a tertiary care referral hospital and analyze the diagnostic and prognostic role of RIFLE and AKIN criteria in acute kidney injury patients.

MATERIAL AND METHODS

This prospective observational cohort study was conducted on 240 patients of Acute Kidney Injury admitted in the Medical Intensive Care Unit in Department of Medicine at GMC Jammu and SSH, Jammu. The study was done over a period of one year after approval from the Institutional Ethics Committee.

Inclusion Criteria

All patients of age more than 18 years admitted in ICU with wide variety of medical & surgical disorders necessitating ICU care during the one-year period after obtaining due consent.

Exclusion Criteria

- Age less than 18 years
- Chronic kidney disease (CKD).
- Patients with ICU stay less than 48h.
- Patients unwilling to participate in the study or to give informed consent.

The patients were followed up during ICU stay and till discharge from hospital. Accrued data was reviewed after discharge to establish an etiology and analyze their presentation, management as well as complications, intervention with hemodialysis and outcome.

The incidence of AKI in ICU was determined. AKI after ICU admission was diagnosed by using the RIFLE and AKIN criteria.

After verification of the patients for fulfilling the inclusion and exclusion criteria, each patient was subjected to detailed history, clinical examination and laboratory investigations during their hospital stay. A detailed history of all the selected patients was recorded. Presence of chronic co-morbid conditions (Diabetes, Hypertension, Chronic Liver Disease etc.) and history of nephrotoxic drugs/toxins, if any was recorded. Complete physical examination including vital signs was performed. Demographic details including age, gender, residence (rural/urban) was recorded. All patients were subjected to laboratory investigations including Hemogram, Peripheral Blood Smear, Random Blood Sugar, Liver Function Tests, Renal Function Tests. Glomerular Filtration Rate (GFR) was measured according to estimated Creatinine Clearance based on Cockcroft Gault Equation.

Statistical Analysis The data collected was compiled on excel sheet and was analyzed statistically by using SPSS software version 21.0. Chi Square test and Fisher Exact test were used for qualitative variables. Mean and Standard Deviation were calculated for quantitative variables. p value < 0.05 was taken as significant.

RESULTS AND OBSERVATIONS:

Table 1: Baseline Characteristics Of Subjects

Variables	Unit	Value
Age (years)	Mean±SD	48.78±12.73
Sex: Male	No. (%)	154 (64.2)
Female	No. (%)	86 (35.8)
Causes of Hospitalization		
Surgical	No. (%)	76 (31.7)
Medical	No. (%)	164 (68.3)
Length of Hospital Stay (days)	Mean±SD	14.3±4.38
Length of ICU Stay (Days)	Mean±SD	7.9±3.25
Mechanical Ventilation	Percent	207 (86.3)

Inotropic Support	Percent	22 (13.8)
Acute Kidney Injury		
AKIN	No. (%)	208 (86.7)
RIFLE	No. (%)	197 (82.1)
Treatment		
Conservative	No. (%)	138 (57.5)
Renal Replacement Therapy	No. (%)	59 (24.6)
Actual Death	No. (%)	62 (25.8)
Left Against Medical Advice (LAMA)	No. (%)	70 (29.2)
Total Assumed Mortality*	No. (%)	128 (53.3)

*Patients went LAMA were sick and they were assumed to have expired at home or at another center

Out of 240 subjects; 64.2 were male; 68.3% were medical vs 31.7% surgical patients. Mean length of ICU and hospital stay was 7.9 3.25 and 14.3 4.38 days respectively. 86.3% subjects required ventilatory support during ICU care and 13.8 required inotropic support. Out of the 240 cases, there were 86.7% subjects by AKIN and 82.1% by RIFLE criteria who were diagnosed to have AKI. Actual death was 25.8% and 29.2% of subjects left against medical advice in sick condition. The total assumed mortality was calculated in our study taking actual death and subjects which left against medical advised (as these were assumed to have expired at home or at another center) and it was 53.3% as depicted in table 1.

Table 2: Comorbidities And Risk Factors

		No.	% age
Co-Morbidities	Coronary Artery Disease	35	14.6
	Diabetic Mellitus Type 2	42	17.5
	Hypertension	51	21.3
	Lungs (COPD)	26	10.8
	Liver (Cirrhosis)	5	2.1
Risk Factors	Trauma	24	10.0
	Poison	7	2.9
	Nephrotoxic Drug Exposure	58	24.2
	Hypotension	125	52.1
	Sepsis	123	51.3
	Dehydration	20	8.3

Type 2 diabetes, hypertension, coronary artery disease and lung diseases were the common preexisting co-morbidities seen. Preexisting liver and neurological diseases were less common. Among subjects, hypotension and sepsis were the most common risk factors seen as shown in table 2.

Prevalence Of AKI in ICU

Table 3: Distribution of subjects according to the RIFLE criterion

RIFLE Criterion	No.	%age
No AKI	43	17.9
Risk	46	19.2
Injury	62	25.8
Failure	89	37.1
All Categories AKI	197	82.1

AKI occurred in 82.1% of patients as per the RIFLE criteria-risk in 19.2%, injury in 25.8% and failure in 37.1% as presented in table 3.

Table 4: Distribution Of Subjects According To AKIN Criterion

AKIN Criterion	No.	% age
No AKI	32	13.3
Stage 1	65	27.1
Stage 2	54	22.5
Stage 3	89	37.1
All Stages	208	86.7

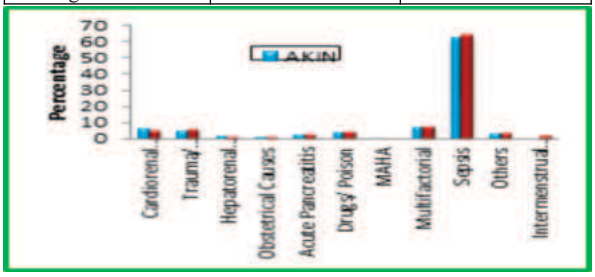

Fig. 1: Causes of AKI among subjects.

AKIN criteria allowed the identification of more patients as having AKI and classified more patients with Stage 1 (risk in RIFLE). According to AKIN criteria, AKI occurred in 86.7% of patients – 27.1% with Stage 1, 22.5% with Stage 2 and 37.1% with Stage 3 as depicted in table 4.

Figure 1, presented the causes of AKI. It was found that the sepsis was the most common cause of AKI (62.5 % in AKIN group and 63.5% in RIFLE group). followed by cardiorenel syndrome (6.7% in AKIN group and 5.6% in RIFLE), trauma/rhabdomyolysis surgicalhepatic (5.8% in AKIN group and 6.1% in RIFLE). Obstetrical diseases were reported in 1.9% as cause of AKI. Dengue, Scrub typhus, leptospirosis, snake bite, HINI influenza, multiple myeloma, MAHA were the other causes of AKI, although less common.

Table 7: Renal Outcome Of The Subjects: RIFLE

Stage	No Recovery		Improving		Death	
	No.	%age	No.	%age	No.	%age
Risk	9	19.57	30	65.22	7	15.22
Injury	18	29.03	35	56.45	9	14.52
Failure	29	32.58	31	34.83	29	32.58
Total	56	28.43	96	48.73	45	22.84

28.43% of subjects had no renal recovery, 48.73% had improvement and 22.84% expired as shown in table 7.

Table 8: Renal Outcome Of The Subjects: AKIN

Stage	No Recovery		Improving		Death	
	No.	%age	No.	%age	No.	%age
Stage 1	18	27.69	38	58.46	9	13.85
Stage 2	11	20.37	36	66.67	7	12.96
Stage 3	30	33.71	27	30.34	32	35.96
Total	59	28.37	101	48.56	48	23.08

Table 8, showed the renal outcome of the subjects. It was observed that 28.37% of AKI patients had no renal recovery, 48.56% had improvement in renal functions while 23.08% expired.

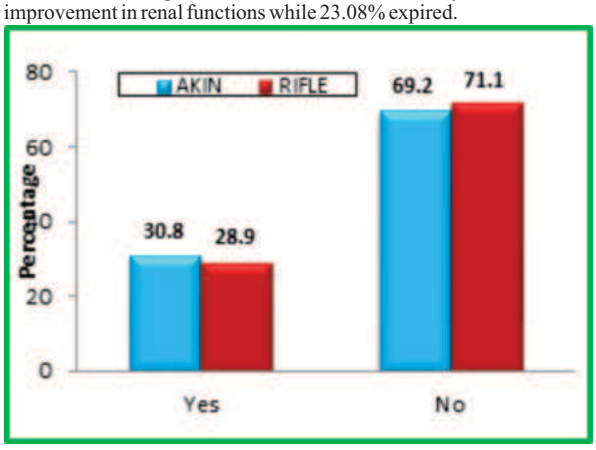

Fig. 2: Requirement of RRT among subjects with AKI.

By AKIN criterion, 208 subjects were diagnosed to have AKI, out of which 64(30.8%) required RRT. By RIFLE criterion out of 197 diagnosed AKI patients about 57 (28.9%) required RRT. In AKIN criterion slightly more percentage of AKI patients required RRT but this was not statistically significant as presented in figure 2.

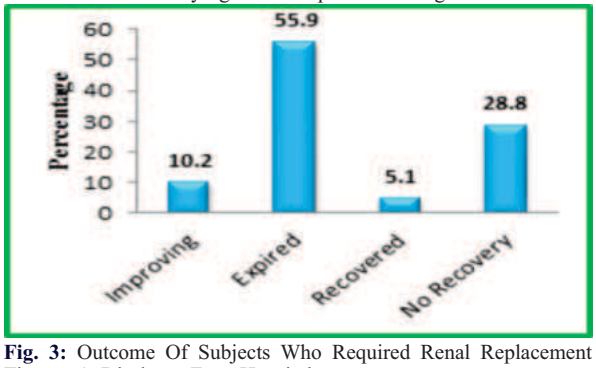

Fig. 3: Outcome Of Subjects Who Required Renal Replacement Therapy At Discharge From Hospital

55.9% of patient expired and 28.8% showed no recovery among subjects who required RRT and was statistically significant as depicted in figure 3.

DISCUSSION

In this study patients admitted to ICU are being described for baseline characteristics, risk factors and etiology of AKI. Secondly, comparison of RIFLE and AKIN criteria was done for assessing early diagnosis and prevalence of AKI. A total of 240 patients were studied.

In our study, male to female ratio was 1.8:1 and mean age of 48 years. Two large studies had shown the median age of AKI in critically ill patients to be 63 and 67 years respectively (Uchino et al, 2005; Joannidis et al, 2009).[6,7]

In our study, 68.3% were medical patients, 86.3% required mechanical ventilation and mean length of stay in ICU was 7.9 days. our study agrees with the study of (Bagshaw et al, 2007) in which 60% were medical patients, 85% patients required mechanical ventilation and mean length of stay in ICU was 16 days.[8]

In our study we had majority of medical patients (68.3%) but incidence of AKI was comparable among surgical and medical patients. Patients with AKI had a longer ICU length of stay (8.2 6.8 days) compared to patients without AKI (5.3 2.8 days), no matter which criteria were used. Patients with Failure/Stage3 AKI had an even a shorter length of stay than patients with risk/stage 1AKI when defined by both the RIFLE and AKIN. Probably this can be explained by the higher mortality associated with Failure/Stage 3.

In our study diabetes mellitus type 2, hypertension, coronary artery disease and lung diseases were the common pre-existing co-morbid illnesses. The common risk factors observed in our study were hypotension (52.1%), sepsis (51.3%) and nephrotoxic drug exposure (24.2%). Our findings were in agreement with a review study by Rodrigo et al (2012) which demonstrated a significantly increased risk of AKI in critically ill patients with older age, diabetes, hypertension, heart failure, sepsis/systemic inflammatory response syndrome, use of nephrotoxic drugs, diseases scores, use of vasopressors/inotropes, high risk surgery.[9]

Various studies shows that there is a wide variation in the reported prevalence of AKI in ICU patients. The prevalence of AKI worldwide varies widely across different studies. Among critically ill patients, the prevalence of AKI varies between 30 and 70% (Uchino et al, 2005). In our study we found an overall AKI prevalence of 82.1% by RIFLE and 86.7% by AKIN criteria. The AKIN criteria identified 4.6% (n = 11) more patients with AKI than the RIFLE criteria. The prevalence of AKI in our study was 86.7%, which was high compared to the older studies. Several reasons could be found to explain this difference. Firstly this was a different patient cohort. Secondly the urine output criteria were not included in the some previous studies. Thirdly there was a different method of estimating baseline creatinine. In our study, baseline creatinine value was used when available the lowest creatinine value among the hospital admission creatinine, the ICU admission creatinine or the MDRD creatinine value was used as the baseline value. This could result in an over estimation of the prevalence of AKI.[10]

In our study the mean age, serum creatinine levels and urine output at admission were comparable in RIFLE and AKIN criterion population. RIFLE criterion showed that 28.43% of subjects had no renal recovery, 48.73% had improvement in renal functions and 22.84% expired. AKIN criterion showed that 28.37% of AKI patients had no renal recovery, 48.56% had improvement in renal functions while 23.08% expired. It was similar to the results of a study conducted by Bastin et al concluded that incidence and outcome of AKI according to the RIFLE and AKIN classification were similar.[11]

In our study, AKIN diagnosed about 4.6% more AKI patients than RIFLE criteria, the majority of patients were Stage 1. Analysis of these patients showed that majority were identified by a small increase in serum creatinine level. In some patients there was a decrease in creatinine after admission to the ICU, followed by a relative increase, these patients could not be identified by AKIN because a rolling in-hospital baseline was used for the 48-hour rise, but not by RIFLE. Secondly patients who received RRT would be classified as Stage 3 by AKIN, irrespectively of SCR but not by RIFLE. According to AKIN Criteria, AKI was diagnosed by two creatinine measurements within 48 hours. However, most patients did not have creatinine measured every day prior to the ICU admission, thus, when creatinine as ICU admission was used, some community acquired AKI cases may have been missed (Siew et al, 2010).[12]

Patients missed by RIFLE but identified by AKIN were mostly classified as Stage 1. the patients diagnosed by AKIN criteria as Stage 1 but missed by RIFLE had slightly higher mortality than patients without AKI based on AKIN criteria. Thus, a small increase in creatinine might be accompanied by increased mortality. Similar results were observed in other studies (Chertow et al, 2005; Lassnigg et al, 2008).[13,14]

Sepsis (62.5%) was the most common cause of AKI in our study accounting for more than one half of the cases. The role of sepsis in AKI has been well documented in western literature, causing nearly 50% of the AKI cases in few studies (Ali et al, 2007).[15]

In our study, RRT was required in 30.8% (n =64) of subjects diagnosed by AKIN and in 28.9% (n =57) diagnosed by RIFLE criterion. Previous Indian studies by Prakash et al (1996) and Singh et al (2013) reported that 34% and 20.58% of the cases respectively required RRT. However, these studies did not specificially evaluate AKI patients in ICU but studied them irrespective of the hospital setting.[16,17]

In our study, mortality rate was higher among patients receiving RRT (55.9%) and abuot 28.8% of these subjects showed no recovery. The mortality and requirement of RRT showed statistically significant correlation. Chertow et al (1995) previously demonstrated that among critically ill patients, acute renal failure requiring dialysis is an ominous condition with a high risk of in-hospital mortality.[18]

CONCLUSION

In the ICU, AKI is very common. Compared to RIFLE criteria, the AKIN criteria aids in an earlier and more thorough diagnosis of AKI. A statistically significant correlation was found between hypotension, AKI, and the need for RRT. In our analysis, sepsis was the most typical reason for AKI. Mortality was increased in patients with AKI compared to those without AKI, and it gets worse as AKI gets worse.

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