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RESEARCH ARTICLE

STUDY OF CLINICAL PROFILE OF PATIENT WITH ACUTE KIDNEY DISEASE

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Abstract

Introduction: An acute and potentially reversible decline in renal function, which impairs the kidney's ability to eliminate nitrogenous waste products and maintain fluid and electrolyte balance, is the hallmark of acute kidney injury. Depending on the definitions employed, the population being investigated, and the clinical settings, there is a significant difference in the epidemiological statistics of acute kidney injury.

Methods: The Institutional Ethics Committee approved this cross-sectional observational study in a semi-urban tertiary-care teaching hospital. All patients with RIFLE-defined acute renal failure were included. Patients under 18 were excluded. The investigation included a detailed history, physical exam, and systemic assessment. Throughout hospitalisation, we categorised patients by RIFLE class (R, I, or F). GFR or urine output determined RIFLE class. Using serum creatinine and urine output, we categorised patients.

Results: Amongst the 100 cases of AKI, 46 cases (46%) were females while 54 cases (54%) were males.. The mean age at presentation was 55.22 ± 14.91 years. Sepsis was found to be the major cause of AKI. Out of 100 patients in our study, 64 (64%) cases were attributed to sepsis. Mortality rate seen in this study was 40% (n=40).

Conclusion: Acute Kidney Injury is a common complication in ICU patients. Early detection and care reduce AKI-related and all-cause death in critically sick patients.

Introduction:-

Acute kidney injury (AKI) can be brought on by a variety of aetiologies, is largely preventable, and may even be treatable if caught early enough. Usually, there are serious negative effects as a result of failing to recognise and treat in a timely and/or adequate manner. It is linked to a high mortality rate and irreversible kidney function loss. [1] AKI is associated with noticeably increased short- and long-term mortality at all stages. The renal damage brought on by AKI can, however, be partially or completely reversed with early detection and treatment [2]. Due to the frequent shift in the definition of AKI's criteria, the precise incidence of AKI has been a key point of contention. Depending on the term employed, the incidence ranges from 1% to 31%, according to the literature that is currently available. [3]

In a variety of clinical contexts, relatively minor increases in serum creatinine are now more widely acknowledged to be related with inferior outcomes [4]. As a result, the entire range of the syndrome—from slight alterations in

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indicators of renal function to the need for renal replacement therapy—is now thought to comprise AKI (RRT). As a result, attempts have been made to develop uniform standards for classifying and characterising acute kidney injury. The Acute Dialysis Quality Initiative (ADQI) group developed the RIFLE criteria in 2004, which was the beginning of the process [5]. With this system, two outcome classes—Loss and End-Stage Renal Disease—and three severity grades—Risk, Injury, and Failure—are identified (ESRD). The Acute Kidney Injury Network (AKIN) group proposed a modified version of the RIFLE criteria in 2007 with the intention of increasing the sensitivity of the AKI diagnostic criteria [6]. This was further modified by the KDIGO (Kidney Disease: Improving Global Outcomes) Acute Kidney Injury Working Group, which defines AKI as an absolute increase in serum creatinine of at least 0.3 mg/dL within 48 hours or by a 50% increase from baseline within 7 days, or by a urine volume of less than 0.5 mL/kg/h for at least 6 hours [7].

Depending on the definitions used, the population being investigated, and the clinical settings, there is a noticeable heterogeneity in the epidemiological statistics of acute kidney injury [8,9]. AKI incidence ranges from 20% to 50% in critically sick patients treated in various ICU settings, with fatality rates exceeding 50%[10,11]. The epidemiological and clinical profiles of AKI differ significantly between industrialised and developing countries. AKI primarily affects older hospitalised patients in industrialised countries, but it more frequently affects children and younger adults in poorer nations. AKI is more frequently caused by infections and volume depletion in underdeveloped nations [12,13].

Analysis of epidemiological and clinical data at the regional level is crucial for comprehending the scope of the issue and ensuring that healthcare resources are allocated in an effective manner in light of the introduction of newer standards for the definition and categorization of AKI. Additionally, there are large regional variations in the epidemiology of acute kidney injury. In developing nations like India, there is a dearth of information about the clinical and epidemiological characteristics of patients with AKI using these more recent defining criteria. It has also been demonstrated that the presence of acute kidney injury in critically sick patients is a significant predictor of increased long-term morbidity and mortality. In order to better understand the clinical and epidemiological characteristics of adult patients with acute kidney injury (AKI) who were admitted to the medical ICU of a rural tertiary care facility in Central India, this study was created.

Methods:-

This cross-sectional observational study was conducted in a semi-urban tertiary-care teaching hospital in this a prospective study of 100 patients of acute renal failure admitted to SAIMS Hospital from April 2021 to October 2022 after approval from the Institutional Ethics Committee. All patients with clinical and biochemical evidence of acute renal failure according to RIFLE criteria were included in the study. Patients with chronic renal disease and aged below 18 years were excluded. Detailed history was recorded, general physical examination, systemic examination was done and necessary investigations were done. We classified patients according to the maximum RIFLE class (class R, class I or class F) reached during their hospital stay. The RIFLE class was determined based on the worst of either glomerular filtration rate criteria or urine output criteria. We used the change in serum creatinine level and urine output to classify patients according to the RIFLE criteria.

Results:-

The study was conducted at in a semi-urban tertiary-care teaching hospital SAIMS Hospital from April 2021 to October 2022 patients admitted in the Medical intensive care unit who developed acute kidney Injury with an aim to profile the overall presentation, clinical course and outcome.

Table 1 shows the demographic and clinical characteristics of the study population. Amongst the 100 cases of AKI documented, 46 cases (46%) were females while 54 cases (54%) were males. The mean age at presentation was 55.22 ± 14.91 years. Total duration of hospital stay was 7.91 ± 3.89 days. Mean stay in the Medical Intensive Care Unit was 4.98 ± 2.56 days. Mean GFR at presentation was 49.04 ± 19.09. As per RIFFLE staging, 40% patients were in Stage R of Acute Kidney Injury. The common co-morbid conditions seen were Diabetes Mellitus (27%), COPD (16%), Chronic Liver Disease (6%) and Hypertension (11%). RRT was initiated in 40% patients in the form of haemodialysis (HD), while 60% patients did not receive RRT.

Table 1:- Showing The Demographic And Clinical Characteristics Of The Study Population.

Parameter	Patient Characteristics
Age (yrs), Mean ± S.D.	55.22 ± 14.91
Gender (n, %) Males Females	 54 (54%) 46 (46%)
Co-Morbid Conditions (n, %) Diabetes Mellitus COPD Chronic Liver Disease Hypertension	 27(27%) 16(16%) 6(6%) 11(11%)
Length of ICU Stay (days), Mean ± S.D.	4.98 ± 2.56
Total Hospital Stay (days), Mean ± S.D.	7.91 ± 3.89
GFR	49.04 ± 19.09
SBP (mm Hg), Mean ± S.D.	121.43 ± 12.57
DBP(mm Hg), Mean ± S.D.	78.84 ± 11.63
Peak S Creatinine (mg/dl), Mean ± S.D.	5.25 ± 2.10
AKI Stage(RIFFLE) Stage R (n, %) Stage I (n, %) Stage F (n, %)	 40(40%) 19(19%) 41(41%)
APACHE II Score, Mean ± S.D.	13.00 ± 5.41
RRT (Hemodialysis) Initiated (n, %)	40 (40%)
Need for Mechanical Ventilation (n, %)	23 (23%)
No of Deaths (n, %)	40 (40%)

Table 2 shows the major clinical manifestations at presentation in patients with Acute Kidney Injury. The most common presenting symptoms were fever in 71 patients (71%), oliguria (66%), loose stools (37%), nausea and vomiting (31%), dyspnea (30%), edema (24%) and altered sensorium (23%).

Table 2:- Showing The Major Clinical Manifestations At Presentation In Patients With Acute Kidney Injury.

Clinical features	Number	Percentage of Cases
Fever	71	71%
Nausea/Vomiting	31	31%
Loose stools	37	37%
Oliguria	66	66%
Polyuria	13	13%
Odema	24	24%
Dyspnea	30	30%

Encephalopathy	30	30%

The etiological causes leading to Acute Kidney Injury in the medical ICU are shown in **Table 3**. Sepsis was found to be the major cause of AKI. Out of 100 patients in our study, 64 (64%) cases were attributed to sepsis. Major sources of sepsis in our patients were complicated Urinary Tract Infections and Respiratory Tract Infections. The other etiological factors responsible for AKI were Hypovolumic Shock (24%), Nephrotoxic Drug Intake (4%), Renal Stone Disease (3%) and Poisoning (1%).

Table 3:- Showing Etiological Causes Leading To Acute Kidney Injury In The Medical ICU.

Etiology	**Number**	**% of Cases**
AGE/Hypovolumic Shock	24	24%
Sepsis	64	64%
- Urinary Tract Infections	11	11%
Respiratory TractInfections	20	20%
- Ac Pancreatitis	5	6%
- Diabetic Foot with sepsis	3	3%
- Septicemia	11	11%
- Malaria	4	4%
- Others	9	9%
Drug intake	4	4%
Poisoning	1	1%
Renal Stone Disease/Obstructive Uropathy	3	3%
Multifactorial	3	3%

Table 4 shows the complications occurring in patients with Acute Kidney Injury. The most common complications recorded were Hyperkalemia (26%), Metabolic AcidosiS (44%), Encephalopathy (47%) and Oliguria (66%). Mechanical ventilation in view of respiratory compromise was needed in 23% patients.

Table 4:- Showing Complications Seen In Patients With Acute Kidney Injury.

Complication	**Number**	**Percentage of Cases**
Oliguria	66	66%
Hyperkalemia	26	26%
Metabolic Acidosis	44	44%
Encephalopathy	47	47%
Arrhythmia	3	3%
Respiratory Distress	23	23%

Table 5 shows the comparison of clinical profile, laboratory investigations and complications between Survivors and Non-survivors. Longer total duration of stay in the hospital (> 7 days) and longer ICU stay (> 4 days) was significantly associated with increased mortality. Presence of complications including Oliguria and Encephalopathy were also associated with significantly higher mortality. GFR< 60 and **AKI Stage (RIFFLE)** Stage R were also associated with significantly higher mortality. No significant association was found between mortality and factors like age, gender, type of AKI and renal replacement therapy.

Table 5:- Showing The Comparison Of Clinical Profile, Laboratory Investigations And Complications Between Survivors And Non-Survivors.

Parameters	**Survivors (n=60)**	**Non – survivors (n=40)**	**P-value**
AGE			
21-40	9 (15%)	8 (20%)	0.334^{NS}
41-60	31 (52%)	24 (60%)	

>60	20 (33%)	7 (18%)	
SEX			
Male	34(57%)	20 (50%)	0.557 NS
Female	26(43%)	20(50%)	
HOSPITAL STAY			
≤7 days	47 (78%)	4 (10%)	
>7 days	13 (22%)	36 (90%)	< 0.01 *
ICU STAY			
< 4 DAYS	42 (70%)	3 (7%)	<0.01 *
4-7 DAYS	11 (18%)	20 (50%)	
>7 DAYS	7(12%)	17 (43%)	
APACHE II SCORE			
Score ≤10 Score >10	24 (40%)	11 (28%)	0.308 NS
	36 (60%)	29 (71%)	
ENCEPHALOPATHY			
Present Absent	16 (26%)	32 (78%)	< 0.01 *
	44 (74%)	9 (22%)	
OLIGURIA			
Present	29(48%)	37 (93%)	< 0.05 *
Absent	31(52%)	3 (7%)	
SEPSIS			
Present	37 (62%)	27 (68%)	0.611 NS
Absent	23 (38%)	13 (32%)	
TYPE OF AKI			
Pre Renal	10(17%)	6 (15%)	0.377 NS
Renal	47(78%)	33 (83%)	
Post Renal	3 (5%)	6 (15%)	
AKI Stage(RIFFLE)			
Stage R (n, %)	38(62%)	3 (7%)	
Stage I (n, %)	11(19.0%)	7 (18%)	<0.01 *
Stage F (n, %)	11 (19.0%)	30 (75%)	
GFR			
≤60	20(33%)	34 (85%)	<0.01 *
>60	40 (67%)	6 (15%)	

Discussion:-

In hospitalised patients, especially those who are admitted to the ICU with critical disease, acute kidney injury is a common presentation. Studying the prevalence and clinical characteristics of patients with AKI in various communities is crucial given recent revisions to the criteria and improvements in diagnostic and therapeutic approaches. Epidemiological data that is current and adequate is essential for making the best use of regional healthcare resources. Recent research on AKI in ICU patients has revealed that the incidence of the condition varies greatly amongst demographics and patient subgroups[8,10,14]. The bulk of the patients in our study (55%) were between the ages of 41 and 60. This is in line with earlier evidence from developing nations, which demonstrates that AKI is typically diagnosed at a younger age in these countries than it is in developed ones, where it is more prevalent in the older population[15,16]. The range and pattern of AKI's aetiology are very diverse. The most frequent cause of AKI in the current study (69.8%) was intrinsic renal disorders, which were followed by pre-renal (24%) and post-renal causes (5%). Sepsis (64% of instances of AKI) was the primary cause. Respiratory tract infections, urinary tract infections, septicemia, severe malaria, and other diseases were among the causes of sepsis. Acute gastroenteritis, drug use, renal stone disease, and poisoning were additional significant aetiologies for AKI. Septic shock was the primary diagnosis for 47.5% of the patients in a multicentric research (54 hospitals in 23 countries) of acute renal failure in critically unwell patients15. Eswarappa et alretrospective .'s examination of 500 critically ill Indian patients with acute kidney injury[17] revealed that sepsis accounted for 38.6% of cases, making it the most common cause of AKI. Sepsis is still a significant factor leading to AKI in developing nations, despite recent evidence showing a decline in incidence of sepsis as a cause of AKI in the industrialised world.

There is a significant range in the reported fatality rates for AKI patients in ICU settings, with some studies indicating more than 50% mortality8. The research population, socioeconomic level, underlying causes of AKI, and the hospital's management resources all play a role in this. Uchino et al.[16] reported an overall hospital mortality of 60.5% in a worldwide multicenteric research of 29269 severely unwell patients with acute kidney injury. A 28 days mortality of 49.5% was reported by Korula et al[18] in a recent observational research on incidence, prognostic variables, and fate of acute kidney injury in ICU patients conducted in South India. Similar to this, the death rate reported in a retrospective analysis of patients in intensive care units with acute kidney injuries who needed renal replacement treatment was 49% [19]. 37 AKI patients died in our study; the mortality rate was 37%. Patients with Sepsis Related AKI had a higher mortality rate (27 out of 64, 42.18%) compared to patients without Sepsis (13 out of 36, 36.11%). In our investigation, RIFFLE stage F AKI, accounting for 41% of the total patients, was found to be the most common, with a fatality rate of 30 patients (73.17%). The factors that significantly affected mortality when comparing various clinical parameters between survivors and non-survivors included the length of hospital stay, the length of stay in the intensive care unit, the presence of oliguria and encephalopathy, baseline GFR, and RIFFLE Stage. Oliguria was considered to be a significant predictor of death. Oligouria affected 66 of the 70 patients, of whom 37 passed away (56.06%) and 29 survived (43.94%). Only 3 patients (8.8%) out of the non-oliguric patients (n=34) died.

Acute kidney injury is a disease that frequently affects critically sick patients and adds to the financial strain on health care resources, which is especially important in settings with limited resources found in developing nations like India. The secret to preventing mortality and long-term illness is early diagnosis and timely treatment.

The current study had a few drawbacks. We did not compare ICU patients with AKI to those who did not acquire AKI because this study was just an observational one about the clinical characteristics of AKI. Second, the clinical profile of AKI patients admitted to the hospital was the only subject of our investigation. The necessity for maintenance RRT or long-term patient follow-up to evaluate the emergence of any chronic problems was excluded from the study. The study's smaller sample size could be another drawback. To determine the evolving epidemiological and clinical profile of patients with acute kidney injury at a regional level, additional research with long-term follow-up may be required.

Conclusion:-

Acute Kidney Injury is a significant clinical issue that frequently affects critically ill patients, particularly in the medical ICU. As of now, sepsis and volume depletion are the most frequent causes of AKI. It is currently regarded as a standalone mortality predictor. To lower AKI-related as well as all-cause mortality in critically ill patients, early detection and appropriate management, including renal replacement therapy (where needed), are crucial.

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