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Study of Prevalence of Acute Kidney Injury in Critically Ill Patient Admitted in ICU

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Abstract **Original Research Article**

Introduction: Acute Kidney Injury (AKI) (previously referred as acute renal failure) reflects a broad spectrum of clinical presentations ranging from mild to severe acute insult that may result in reversible loss of renal function. The lack of consensus has resulted in a broad range of estimated prevalence of AKI in the intensive care unit (ICU) ranging from 1% to 70% depending on the criteria used. Acute Kidney Injury (AKI) is a complex disorder that occurs in a variety of settings, with clinical manifestations ranging from a minimal elevation in serum creatinine to anuric renal failure. ***Objectives:*** To study prevelance of AKI in critically ill patients admitted in Medical ICU with special refrence to various etiological and co-morbid condition. ***Material and Method:*** This Cross sectional analytical study was carried out in our institution for duration of 15 month .Total of 200 subjects were enrolled in the study. Detailed clinical profile and demographic profile including various etiological and pre-existing conditions were noted. Data were analyzed using SPSS Version 16. ***Results:*** Sepsis was the most common cause of the AKI followed by the hypovolemia due to diarrhea, and Patients with some associated co-morbidities were more prone to have AKI. ***Conclusion:*** AKI (ARF) is of very common occurrence among patients attending various ICUs. Early detection of AKI and its predisposing factors is the need of time so that we can prevent short term mortality and also long term morbidity due to progression of these patients into chronic renal dysfunction i.e. ESRD.

Keywords: Acute Kidney Injury, ICU, complex disorder, hypovolemia.

INTRODUCTION

Acute Kidney Injury (AKI) (previously referred as acute renal failure) reflects a broad spectrum of clinical presentations ranging from mild to severe acute insult that may result in reversible loss of renal function. The range of severity and variety of causes of AKI has resulted in multiple classification systems complicating diagnosis and subsequent management. Estimated prevalence of AKI in the intensive care unit (ICU) ranges from 1% to 70% depending on the criteria used. AKI is a common complication in patients admitted to the intensive care unit (ICU) and numerous causes are responsible for its development [2].

The relative importance of factors contributing to AKI varies according to the underlying pathology and patients' characteristics. Several risk factors involved in the genesis of AKI have been analyzed in the Medical literature, including Obstetric bleeding and GI hemorrhage, sepsis, shock, infections, use of contrast, and drug toxicity [3, 4]. The underlying mechanisms of AKI include a decrease in the kidney's ability to excrete nitrogenous waste, manage electrolytes, regulate intravascular volume, and assist with maintenance of the acid-base status. The clinical effects of AKI depend on the clinical situation but almost invariably increase mortality and morbidity [5, 6]. Acute kidney injury (AKI) has emerged as a major public health problem that affects millions of patients worldwide and leads to decreased survival and increased progression of underlying chronic kidney disease (CKD). Recent consensus criteria for definition and classification of AKI have provided more consistent estimates of AKI epidemiology and have now led to the first clinical practice guideline for AKI [7]. Even small changes in serum creatinine concentrations are associated with a substantial increase in the risk of death. AKI is not a single disease but rather a syndrome comprising multiple clinical conditions. Outcomes from AKI depend on the underlying disease, the severity and duration of renal

impairment, and the patient's baseline renal profile. The development of AKI is the consequence of complex interactions between the actual insult and subsequent activation of inflammation and coagulation [7]. The development of AKI has also been shown to be associated with higher patient mortality and increased hospital length of stay and cause a rise in health care expenditure [6].

MATERIAL AND METHOD

This cross sectional analytical study was carried out in Department of Medicine SS Medical college and SGM Hospital Rewa (MP) for duration of 15 months. Total of 200 subjects was enrolled in the study. Informed patients consent was obtained before clinical examination. Thorough history taking and clinical examination were done. Patient`s proforma was maintained which include all demographic particulars past medical, surgical, personal and family,drug history and clinical examination was done. According to their severity AKI was categorized into three 3 stages as per following KDIGO STAGING based on serum creatinine and urine output and effect observed on AKI by various etiological factors and pre-existing conditions.

KDIGO STAGING SYSTEM:

Stage	Serum Creatinine	Urine output
1	1.5–1.9 times baseline or ≥ 0.3 mg dl^{-1} (≥26.5 µmol $litre^{-1}$) increase within 48 h	≤0.5 ml kg^{-1} h^{-1} for 6–12 h
2	2.0–2.9 times baseline	≤0.5 ml kg^{-1} h^{-1} for 12 h
3	3.0 times baseline or Increase in serum creatinine to ≥4.0 mg dl^{-1} (≥353.6 µmol $litre^{-1}$) or Initiation of renal replacement therapy or In patients <18 yr, decrease in eGFR to <35 ml min^{-1} per 1.73 m^2	≤0.3 ml kg^{-1} h^{-1} for 24 h or Anuria for × 12 h

Inclusion Criteria

- All patients aged >18 years
- All patients admitted to ICU with AKI at the time of admission and those who developed AKI after admission to ICU.

Exclusion Criteria

- Patients <18 years age
- Patients with preexisting renal disease,
- Patients with liver disease,
- Patients with myocardial infarction and those who received renal transplantation were excluded from the study

STATISTICAL ANALYSIS

Statistical evaluation was performed by statistical package for social sciences (SPSS) version 16 for window statistics program using the unpaired t test/single factor ANOVA and categorical variables were analysed with chi squared test and Fisher Exact Test. Correlation of AKI with various etiological factors and co-morbid condition were obtained using Pearson`s formula. Arithmetic mean calculated by our data. A P value <0.05 was considered statistically significant.

OBSERVATIONS

Our study of etiology of AKI patients was carried out at S.G.M. Hospital Rewa MICU, 200 patients who had fulfilled inclusion criteria of AKI were enrolled. Patients were divided into 3 categories according to KIDGO staging., in stage1- 46%, patients were present ,in stage2- 22% patients and in stage3- 33% patients were present.

Mean age of AKI in our study was 53.30yrs. Nearly half (48%/ n=96) of the patients admitted in MICU were more than 55 year of the age and out of them 48 were in stage1 and 29 in stage3, higher incidence of AKI in older age was not statistically significant (P=.124). Out of 200 patients, male were 124 (62%) and female were 76 (38%). no statistically significant difference seen in different gender group.

Table-1: Distribution of Cases According to KIDGO Staging

Staging	No. of cases	Percentage
Stage1	92	46.0%
Stage2	44	22.0%
Stage3	64	32.0%
Total	**200**	**100.0%**

Table-2: Distribution of Cases According To Age and Gender

Variables		Stage1(92)	Stage2(44)	Stage3(64)	P value
Age	Mean age(53.3)	51.30	53.1	55.5	.124
	18-40yrs42(21%)	12(6%)	11(5.5%)	19(9.5%)	
	41-55yrs62(31%)	32(16%)	14(7%)	16(8%)	
	>55yrs96(48%)	48(21%)	19(9.5%)	29(14.5%)	
Gender	Male124(62%)	60(30%)	19(9.5%)	45(22.5%)	.789
	Female76(38%)	32(16%)	25(12.5%)	19(9.5%)	

There were different causes of AKI but sepsis was statistically significant , most important and most common cause of AKI ,Hypovolemia was also statistically significant cause of AKI, patients with sepsis were more associated with stage3 AKI wherase hypovolemia was more associated with stage1 AKI. Although febrile illness/hypovolemia /respiratory causes/CNS causes /poisoning and drugs were also important but not statistically significant.

In 200 patients enrolled in our study, community acquired injury(CAAKI) is more common than hospital acquired injury (HAAKI),among them stage1 AKI was more common in CAAKI and stage 3 AKI was more common in HAAKI and this correlation was statistically significant (<.00001).Out of 200 patients 125 with co-morbid condition had AKI and among them diabetic (p-.000052) and hypertensive (p-.009842) patients were statistically significant, but history of CAD and pulmonary disease were not statistically significant.

Table-3: Distributing AKI Cases According To Etiological Factor

Causes	Stage 1	Stage2	Stage3	P value
Sepsis (67)	17	13	37	.00001
Febrile illness(21)	11	3	7	.661897
Hypovolumia (diarrhoeal disease)(30)	22	6	2	.0016
Respiratory causes(16)	11	2	3	.163299
CNS causes (26)	10	10	6	.090998
Poisoning(24)	14	6	4	.221219
Drugs and Toxin(16)	7	4	5	.954401
Total-200	92	44	64	

Table-4: Distribution of AKI Cases According To Type of Injury-

Type of AKI n=200	Stage 1 (46%)92	Stage2 (22%)44	Stage3 (32%)64	P value
CAAKI(123)	63	31	21	<.00001
HAAKI(77)	29	13	43	
Total (200)	92	44	64	

Table-5: Distribution of AKI Cases according to Associated Comorbid Condition

Co-morbid condition	Stage1	Stage2	Stage3	P value
Diabetes mellitus(49)	12	9	28	.000052
Hypertension(29)	7	6	16	.009842
Previous history of CAD(21)	6	4	11	.095938
Pulmonary cause(COPD,PTB)(26)	12	4	10	.611231
Total(125)	37	23	65	

DISCUSSION

We obsereved various etiological factors of AKI in present study.We devided 200 patients into three stages of AKI by KDIGO staging. Sanjay Vikrant et al., [8] reported that mean age of presentation was 49 yrs which is lesser than present study, that was 53.3yrs. In the study done by M. Eswarappa *et al.*, [9], AKI was more commonly associated with male sex, 63.6% (n = 318) out of 600 patients were males similar to our study. Sepsis and septic shock were contributing to 32% cases of AKI in Rakesh Bhadade *et al.*, [10] study similar to present study in which 67(33.5%) patients with sepsis presented with AKI.This study was done in endemic zone of malaria with 21(11.5%) cases with febrile illness had AKI and out of 200 cases, 30(15%) cases with hypovolemia (diarrhoeal disease) causing AKI. In K Mehta *et al.*, [11] study most common etiology of AKI was Febrile illness/ malaria (28.3%) followed by acute gastroenteritis (23%).In present study 20 cases with poisoning had AKI ,that was greater than previous study of P. S. Priyamvada *et al.*, [12]. As in developing countries CAAKI is more common than HAAKI, in present study also CAAKI was more than

HAAKI similar to previous study of P. S. Priyamvada *et al*., [12]. In present study 125 (65%) patients in AKI had some co-morbid condition lesser than previous study of Tariq Ali *et al*., [13] who found that >80% of patients had at least one comorbid illness and that the majority, approximately 70% of patients with AKI.

CONCLUSION

AKI (ARF) is of very common occurrence among patients attending various ICUs. Early detection of AKI and its predisposing factors in the need of time so that we can prevent short term mortality and also long term morbidity due to progression of these patients into chronic renal dysfunction i.e. ESRD.

It is necessary to evaluate every patient admitted in ICU for AKI. By this we can prevent various morbidities and mortality associated with AKI.

LIMITATION

Because this study was carried out at tertiary care hospital, it does not truly reflects the etiological spectrum of AKI prevalent throughout the country. Pediatrics and surgical patients were excluded because we studied in medical ICU and Finally long term outcome could not be studied due to lack of such follow up in those patients that could be changed into CKD.

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