

## FREQUENCY OF ACUTE KIDNEY INJURY IN PATIENTS WITH TRAUMATIC INJURY ADMITTED IN INTENSIVE CARE UNIT AND RELATIONSHIP OF SOCIO-DEMOGRAPHIC FACTORS

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### ABSTRACT

**Objective:** To determine the frequency of acute kidney injury (AKI) and impact of socio-demographic factors to it, among the patients of trauma at an intensive care unit (ICU) of a tertiary care hospital of Pakistan

**Study Design:** Perspective comparative study.

**Place and Duration of Study:** Combined Military Hospital (CMH) Peshawar, from Mar 2018 to Aug 2018.

**Methodology:** This study was conducted on patient admitted after a traumatic event in the intensive care unit of CMH Peshawar. On the basis of Global Outcome Clinical Practice Guidelines (KDIGO) patients admitted in intensive care unit were recruited. Demographic profile included age, gender, co-morbidity, use of mechanical ventilation and length of stay in the intensive care unit.

**Results:** A total of 102 patients were admitted in the intensive care unit with traumatic injuries during the study period. Out of them 33 (31.4%) were diagnosed with the acute kidney injury during the intensive care unit stay. Extremities were the commonest site of trauma among the target population followed by head and neck. Mean age of patients included in the study was  $38.13 \pm 4.925$ .

**Conclusion:** Long duration of intensive care unit stay was associated with the presence of acute kidney injury in our sample population.

**Keywords:** Acute kidney injury, Intensive care unit, Pakistan, Socio-demographic factors.

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### INTRODUCTION

Incidence of kidney diseases is increasing all over the world despite all the efforts of prevention and early recognition<sup>1</sup>. Our country is facing a similar challenge and renal illness are on a rise posing a great burden on overall health care budget<sup>2</sup>. Critical care medicine specialized for trauma patients is an emerging specialty with very limited scope in the developing countries<sup>3</sup>.

Trauma is the commonest cause of AKI in the critical care setting<sup>4</sup>. A study conducted in UK concluded that around 20% of patients admitted in the ICU developed acute kidney injury. Data from an ICU of our neighboring country India revealed that sepsis and trauma were common culprits of acute kidney injury in an ICU<sup>5</sup>. A very large meta-analysis involving multiple studies

concluded that around 20-50% patients may suffer from acute kidney injury in an intensive care unit<sup>7</sup>. Various studies in the past have also demonstrated that around 20-40% of the patients require renal replacement therapy inside the intensive care unit<sup>8</sup>. Renal replacement therapy may be the only life saving option among the patients suffering from acute kidney injury.

Many factors have been correlated with the presence of AKI in patients of trauma in the ICU. Some of them include age, type of underlying illness, co-morbid illnesses, biomarkers, hemodynamic instability, RIFLE class at time of presentation and type of trauma<sup>4-7</sup>. These factors may provide a physical, physiological or immunological basis for the development of a renal injury among the patients in the ICU setting.

Being from a developing country with few resources, this topic is of utmost relevance in good clinical practice for the trauma patients. This study was planned with the objective to look

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for the frequency of acute kidney injury and socio-demographic factors related to it among the patients of trauma at an intensive care setting of a teaching military hospital of Pakistan.

## METHODOLOGY

This descriptive prospective study was planned and conducted at the ICU of CMH Peshawar from 1<sup>st</sup> March 2018 to 31<sup>st</sup> August 2018. Sample size was calculated by WHO sample size calculator. Non probability consecutive sampling technique was used to gather the sample. All patients between the age of 12 and 60 years admitted in critical care unit after any kind of traumatic injury were part of the inclusion criteria. Patients who were referred from other military, public sector and private hospitals who required renal replacement therapy were also included in the analysis. Exclusion criteria was the patients with already established chronic kidney disease and pregnant women. Patients who themselves or their care-givers did not give written informed consent were also excluded from the study.

After ethical approval from the ethical review board committee and written informed consent from the potential participants or their care-givers, patients who were admitted after traumatic injuries in the intensive care unit of CMH Peshawar fulfilling the above mentioned inclusion and exclusion criteria were included in the study. Intensive care unit is a fifteen bedded facility with around 450 admissions per year and around 130 patients requiring the renal replacement therapy. The diagnosis of acute kidney injury was made by a consultant nephrologist on The Kidney Disease: Improving Global Outcomes (KDIGO) Clinical Practice Guidelines as any of the following: Increase in serum creatinine by more than or equal to 0.3 mg/dL within 48 hours; or increase in serum creatinine to more than or equal to 1.5 times baseline, which is known or presumed to have occurred within the prior seven days; or urine volume less than 0.5 mL/kg/hour for 6 hours<sup>10</sup>. Relationship of factors like age, gender, co-morbidity, use of mechanical

ventilation and length of stay in the ICU were correlated with the recovery of patients.

Characteristics of participants and the distribution of the acute kidney injury were described by using the descriptive statistics. Chi-square was used to determine between-group variances in categorical correlates. Binary logistic regression analysis was done to evaluate the relationship of age, gender, co-morbidity, use of mechanical ventilation and length of stay in the ICU with the presence of acute kidney injury. All statistical analysis was performed using SPSS-24.

## RESULTS

Initially 111 patients were approached to get them included in the analysis. Six were out of the age bracket of inclusion criteria, one had chronic kidney disease prior to admission in ICU and

**Table-I: Characteristics of the study group and presence of acute kidney injury.**

Socio demographic factors	No acute kidney injury n (%)	acute kidney injury n (%)	p-value
<b>Total</b>	<b>69 (65.9)</b>	<b>33 (34.1)</b>	
<b>Age</b>			
≤35 year	28 (41.5)	12 (39.6)	0.683
35-60 year	41 (58.5)	21 (60.4)	
<b>Gender</b>			
Male	62 (89.8)	26 (78.8)	0.139
Female	07 (10.2)	07 (21.2)	
<b>Duration of intensive care unit stay</b>			
<1 week	62 (75.4)	20 (71.7)	0.001
≥1 week	07 (24.6)	13 (28.3)	
<b>Use of mechanical ventilation</b>			
No	52 (53.9)	25 (26.4)	0.965
Yes	17 (46.1)	8 (73.6)	
<b>Co-morbidities</b>			
No	55 (79.7)	24 (72.7)	0.435
Yes	14 (20.3)	9 (27.3)	

care-givers of two patients did not give consent to include them in the study. Out of 102 patients included in the final analysis 89 (87.2%) were male and 13 (12.8%) were female. Mean age of patients put on renal replacement therapy was 38.13 ± 4.93 years. Other characteristics of study population have been summarized (table-I).

Extremities was the commonest site of trauma among the target population followed by head and neck (table-II). Table-I showed that out of 102 patients, 33 (34.1%) developed the acute renal injury. Longer duration of ICU stay was related to the presence of acute kidney injury when

**Table-II: Underlying trauma types among the patients admitted in the intensive care unit (n=102).**

Sites of Trauma	Frequency (%)
Extremities	33 (32.3)
Head and neck	31 (30.6)
Polytrauma	18 (17.3)
Chest	9 (8.8)
Abdomen	9 (8.8)
Others	2 (1.9)

**Table-III: The correlated factors relating with presence of acute kidney injury among the study participants: the binary logistic regression.**

	$\beta$	<i>p</i> -value	OR (95% CI)
Age (ref: >5 years)	-0.003	0.996	0.997 (0.381-2.612)
Gender (ref: male)	0.486	0.321	1.626 (0.622-4.246)
Duration of intensive care unit stay (ref: <1 week)	1.795	0.001	6.017 (2.045-17.697)
Co-morbidity (ref: no Co-morbidity)	0.616	0.200	1.851 (0.722-4.746)
Use of mechanical ventilation (ref: no use)	0.179	0.744	1.196 (0.408-3.512)

binary logistic regression was applied (table-III).

## DISCUSSION

Organ support is the primary aim of an intensive care admission of a patient. Critical care medicine is an emerging specialty in our country. Renal support after acute renal injury is a common clinical scenario in a critical care setting<sup>4,6</sup>. Therefore our study provides a basic data and highlights the importance of work required for critically ill patients after the traumatic events, who have suffered from the acute kidney injury.

Most of the patients in our study were male with male female ratio of 6.3:1. Similar results were reported in a similar study done in past in

our country and our neighboring country India which showed clear male dominance among the study population<sup>9-11</sup>. Reason might be that males are more exposed to trauma than females. Another possibility is that the chances of critically ill females with kidney injury reaching the tertiary care facility are less as compared to males. More research is required to look into this parameter.

Extremities were the commonest site of trauma closely followed by head injuries in patients that landed in the ICU in our study. Variable results were reported in other studies done in the recent past<sup>10,11</sup>. Head and neck and facial injuries were more common in other studies done in the west. As a huge chunk of our sample size was drawn from the soldiers with mine blast injuries and road traffic accidents so that might be the reasons for our findings.

Age, gender and presence of co-morbid illnesses were not found to be related to the development of acute kidney injury. Similar results regarding gender has been reported in studies reported in other countries with post traumatic acute kidney injury in critical care settings<sup>12</sup>. But in contrast to our study advancing age and presence of co-morbid illnesses have been associated with the presence of acute kidney injury after the trauma in a critical care setting<sup>13,14</sup>.

High mortality rate has been a problem in intensive care units all over the world. This holds true for both adult and pediatric intensive care units<sup>15,16</sup>. Longer duration of stay has been linked with various problems among the critical patients of ICU. Development of renal injury in our study participants was strongly linked with the longer stay in the critical care unit. Reason might be that the original intensity of trauma which contributed both in the longer ICU stay and the development of the acute renal injury, further more infections or other ICU hazards may have contributed. More studies with the control of confounding factors may be required to clear this association<sup>16-18</sup>.

The major limitation of our study was the lack of generalizability as patients from one critical care unit of a teaching hospital of Pakistan were studied instead of all hospitals of the country. The sample size, and design of study pose methodological issues as well. Patients were not followed up for long term after the discharge so final outcome could not be determined. We suggest further studies on a broader based and a more representative sample size involving the hospitals of both public and private sector.

## CONCLUSION

This study gave an insight into the prevalence of AKI among the patients of trauma admitted in ICU. Level of suspicion for this kind of injury among the traumatic patients should be high among the critical care specialists. Special attention should be given to the patients with a long stay in the critical care facility.

## CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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