



IMPACT OF ACUTE KIDNEY INJURY IN ELDERLY (≥ 80 YEARS) PATIENTS UNDERGOING PERCUTANEOUS CORONARY INTERVENTION

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Abstract

Background and Aim: Chronic renal disease is commonly found in individuals hospitalized for acute coronary syndrome, and its frequency rises drastically with advancement of age. The increasing rate of mortality in chronic kidney disease is primarily caused by cardiovascular disease. Acute kidney injury has been associated with adverse outcomes in patients undergoing percutaneous coronary intervention. There is a scarcity of data on AKI after PCI in older individuals. Therefore, the aim of the study was to determine the impact of AKI in elderly patients (≥ 80 years) undergoing PCI.

Patients and Methods: This study retrospectively investigated 350 patients undergoing PCI at Cardiology Department of Lady Reading Hospital, MTI Peshawar from February 2022 to February 2023. All the ACS diagnosed patients aged ≥ 80 years undergoing PCI were enrolled. Patient's clinical and procedural details were recorded comprised of different variables and outcomes. Non-fatal myocardial infarction, disabling stroke, cardiovascular mortality, re-hospitalization for cardiovascular causes, and bleeding types were recorded. For renal assessment, Serum creatinine levels were carefully evaluated during the index hospitalization. Patients were distributed into mild, moderate, and severe renal dysfunction based on estimated glomerular filtration rate (e-GFR). The increase of 0.3 mg/dl in serum creatinine from baseline was considered as AKI.

Results: Out of 350 ACS patients, there were 156 (44.6%) female and 194 (55.4%) male. Based on estimated glomerular filtration rate (e-GFR), the incidence of mild, moderate, and severe renal dysfunction was 85 (24.3%), 54.3% (n=190), and 21.4% (n=75) respectively. The composite ischemia endpoint rate increased with reduction in e-GFR and renal dysfunction from 8.6% to 14.5% and 25.8% in mild, moderate, and severe AKI, respectively. Furthermore, individuals with renal impairment had a significantly higher risk of hospitalization owing to cardiovascular reasons (6.3%, 9.4%, and 15.9%, respectively). On the other hand, no substantial association and variation

between groups in terms of recurrent non-fatal MI (5.8%, 6.2%, and 9.2), debilitating stroke (0.3%, 0.8%, and 1.6%), and hospital bleeding (1.2%, 0.9%, 2.1%) in mild, moderate, and severe renal impairment.

Conclusion: The present study found that Elderly patients (≥ 80 years) undergoing percutaneous coronary intervention (PCI) for acute coronary syndrome (ACS) exhibit a higher mortality rate, primarily attributable to baseline renal dysfunction. Renal impairment is a prevalent condition in older ACS patients who undergo PCI during their initial hospitalization, and it serves as a standalone predictor of both all-cause and cardiovascular mortality within one year.

Keywords: Acute coronary syndrome, Elderly patients, percutaneous coronary intervention, acute kidney injury.

INTRODUCTION

Acute kidney injury (AKI) is a common consequence associated with increased morbidity, hospital duration, mortality, and healthcare costs in patient's undergone percutaneous coronary intervention [1-3]. Although AKI is often treatable, patients who acquire this complication after PCI may be prone to 20-fold increase in higher risk of in-hospital mortality [4]. The interpretation of previous research' findings on the relationship between AKI and mortality after PCI is complicated by the fact that both outcomes share risk variables such as underlying chronic kidney disease, heart failure, hemodynamic instability, and diabetes mellitus. In majority of cases, AKI with percutaneous coronary artery (PCI) has been associated with adverse outcomes [5, 6]. AKI pathogenesis is complex, encompassing both ischemia and nephrotoxic injury [7]. Patients with congestive heart failure, diabetes, and chronic renal disease are at higher risk of AKI (50%) whereas incidence is 2% in general population [8].

It has been found that coronary artery disease contribute to the higher risk of morbidity and mortality in elderly individuals [9]. Though, numerous studies focused on the coronary revascularization among elderly patients for acute coronary syndrome and stable coronary artery disease [10, 11]. Renal function declines with age and vascular illness, hence CKD is a serious clinical concern in senior ACS patients. Considerate the elements of unfavorable outcomes in this highly high-risk group might help with the specific treatment technique's development and preventive plans. In the present investigation, the increasing level of renal dysfunction caused by percutaneous coronary intervention were investigated with patient's demographics, variation in treatment, and outcomes. Furthermore, because acute kidney damage (AKI) can complicate PCI and have a detrimental influence on outcome, we evaluated the frequency and impact of AKI based on clinical presentation as well as baseline renal function.

METHODOLOGY

This study retrospectively investigated 350 patients undergoing PCI at Cardiology Department of Lady Reading Hospital, MTI Peshawar from February 2022 to February 2023. All the ACS diagnosed patients aged ≥ 80 years undergoing PCI were enrolled. Patient's clinical and procedural details were recorded comprised of different variables and outcomes. Non-fatal myocardial infarction, disabling stroke, cardiovascular mortality, re-hospitalization for cardiovascular causes, and bleeding types were recorded. For renal assessment, Serum creatinine levels were carefully evaluated during the index hospitalization. Patients were distributed into mild, moderate, and severe renal dysfunction based on estimated glomerular filtration rate (e-GFR). The increase of 0.3 mg/dl in serum creatinine from baseline was considered as AKI.

Descriptive statistics were done using SPSS version 27. Mean \pm SD was used to express the continuous variables whereas frequency and percentages represented the categorical variables. Gender, age, body mass index, diabetes mellitus, blood hemoglobin, peripheral artery disease, atrial fibrillation, ejection fraction, and multi-vessel coronary artery disease were all included in the analysis. Comparison of various groups were done using Chi-square test. Finally, in moderate or

severe AKI patients, univariate and multivariable regression analyses were done to find independent determinants of outcome.

RESULTS

Out of 350 ACS patients, there were 156 (44.6%) female and 194 (55.4%) male. Based on estimated glomerular filtration rate (e-GFR), the incidence of mild, moderate, and severe renal dysfunction was 85 (24.3%), 54.3% (n=190), and 21.4% (n=75) respectively. The composite ischemia endpoint rate increased with reduction in e-GFR and renal dysfunction from 8.6% to 14.5% and 25.8% in mild, moderate, and severe AKI, respectively. Furthermore, individuals with renal impairment had a significantly higher risk of hospitalization owing to cardiovascular reasons (6.3%, 9.4%, and 15.9%, respectively). On the other hand, no substantial association and variation between groups in terms of recurrent non-fatal MI (5.8%, 6.2%, and 9.2), debilitating stroke (0.3%, 0.8%, and 1.6%), and hospital bleeding (1.2%, 0.9%, 2.1%) in mild, moderate, and severe renal impairment. Incidence of mild, moderate, and severe based on estimated glomerular filtration rate is illustrated in Figure-1. Demographic details and baseline characteristics is shown in Table-I. In-hospital outcome are shown in Table-II.

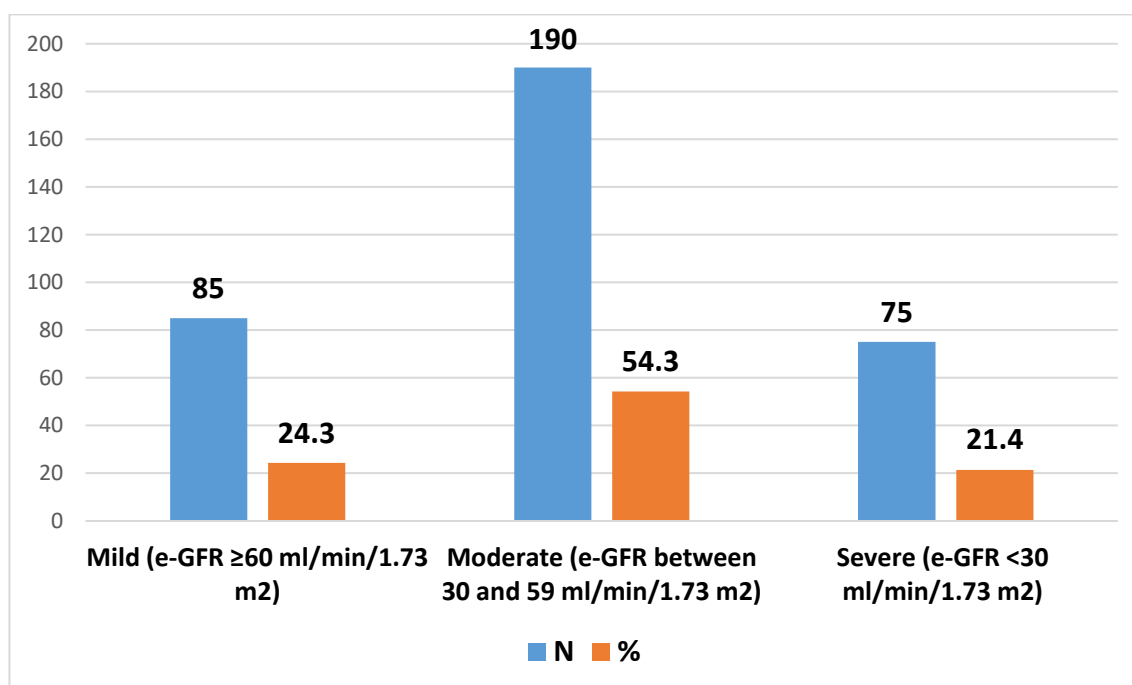


Figure-1 Severity of renal dysfunction among acute coronary syndrome patients

Table-I Demographic details and baseline characteristics

Variables	Acute Kidney Injury (N=75)	No/Mild acute kidney injury (N=85)	P-value
Age (years)	81.92 \pm 4.98	83.0 \pm 6.62	0.10
Gender N (%)			0.12
Male	50 (66.7)	42 (49.4)	
Female	25 (33.3)	43 (50.6)	
BMI (Kg/m ²)	25.8 (22.5-27.8)	25.2 (23.2-27.9)	0.78
Comorbidities			
Diabetes	25 (33.3)	27 (31.8)	0.72
Hypertension	60 (80.0)	69 (81.2)	0.49
Dyslipidemia	35 (46.7)	42 (49.4)	0.31
Prior Myocardial Infarction	19 (25.3)	25 (29.4)	0.73
Prior Stroke	12 (16.0)	16 (18.8)	0.59
Prior PCI	20 (26.7)	26 (30.6)	0.28
Peripheral arterial disease	8 (10.7)	19 (22.4)	0.79
Atrial fibrillation	29 (38.7)	27 (31.8)	0.15

Congestive heart failure	25 (33.3)	14 (16.5)	0.12
Unstable angina	12 (16)	19 (22.4)	0.05
Hemoglobin (g/dL)	12.8 (11.2-13.9)	13.1 (12.1-14.2)	0.07
eGFR (Cockcroft, mL/min)	47 (36-62)	46 (36-60)	0.35
C-reactive protein CRP (mg/dl)	2.3 (0.6-11.7)	1.3 (0.2-4.8)	0.01

Table-II e-GFR based in-hospital outcome

Variables	Mild Renal dysfunction (%)	Moderate Renal dysfunction (%)	Severe Renal dysfunction (%)	P-value
Composite ischemia endpoint	8.6%	14.5%	25.8%	<0.01
Risk of hospitalization due to cardiovascular reasons	6.3%	9.4%	15.9%	0.01
Recurrent non-fatal MI	5.8%	6.2%	9.2%	<0.01
Debilitating stroke	0.3%	0.8%	1.6%	<0.01
Bleeding	1.2%	0.9%	2.1%	<0.01

DISCUSSION

The current investigation studied the assessment of AKI in ACS elderly patients undergoing PCI and found that almost one-third of older (≥ 80 years) patients having PCI experienced AKI, a complication that was substantially associated with death and severe cardiovascular events. Moreover, Patients with acute coronary syndrome who underwent percutaneous coronary intervention showed a higher death rate among older patients (>80 years), which was mostly linked with baseline renal impairment. In keeping with earlier findings [14, 15], the AKI incidence was significantly higher in normal baseline renal function individuals. AKI is defined in a variety of ways, including risk, injury, failure, loss of kidney function, and end-stage renal disease.

The pathophysiological processes behind AKI are very partially understood. Different risk factors includes chronic kidney disease, advance age, congestive heart failure, and diabetes [16, 17]. Furthermore, individuals with acute coronary syndromes requiring immediate coronary revascularization have an elevated risk of AKI [18, 19]. The presence or absence of ACS comparison in this study was challenging due to limited sample size underwent PCI for unwavering coronary artery disease (CAD).

The AKI associated independent predictors included C-reactive protein levels, advanced age (>80 years), diabetes, and congestive heart failure among elderly patients. A higher risk of AKI and C-reactive protein was found in a previous study [20]. A special investigation is needed for the determination of AKI association with active inflammation in elderly patients with coronary revascularization [21, 22].

The impact of renal dysfunction on clinical outcomes in ACS is complex and involves various factors. This includes alterations in endothelial function, platelet adhesion, coagulation cascade, and mineral metabolism, leading to accelerated atherosclerosis and changes in aggregation, coagulation, and drug response. Some studies suggest that patients with chronic kidney disease (CKD) who experience acute coronary syndrome (ACS) are less inclined to receive evidence-based treatments like early intervention. This may potentially worsen their already unfavorable prognosis. This adds complexity to the evaluation of outcome data within existing data [23, 24].

It's worth noting that our ongoing research did not uncover a substantial connection between CKD and the likelihood of bleeding, whether during the hospitalization period or in the extended follow-up. The collective bleeding rate in the collaborative studies involving elderly ACS patients was relatively modest. However, if we consider the average age of the patients included in our study, the prevalent utilization of the radial approach for percutaneous coronary intervention (PCI) in almost 75% of cases, and the widespread administration of proton pump inhibitors (used in over 90% of

instances), the frequency of bleeding events remained relatively low. This aligns with recent research findings and suggests a consistent pattern of limited bleeding events in our study population [25, 26].

In contrast to earlier investigations, our study observed a relatively lower incidence of acute kidney injury (AKI) among the elderly population. However, it is noteworthy that AKI was nearly twice as prevalent in patients with chronic kidney disease (CKD) when compared to those with normal renal function. An intriguing finding was the significantly higher occurrence of AKI in patients presenting with ST-segment elevation myocardial infarction (STEMI) compared to those with non-ST-segment elevation ACS (NSTEMI), regardless of their baseline renal function. This observation is consistent with previous studies, which have consistently documented a greater occurrence of acute kidney injury (AKI) in patients with acute coronary syndrome (ACS) when compared to individuals with stable coronary artery disease [27, 28]. The multifactorial etiology of AKI in the context of ACS likely encompasses several factors. This renal injury is primarily mediated by reduced renal perfusion and the activation of neurohormonal mechanisms [29].

CONCLUSION

Elderly patients (those aged ≥ 80 years) undergoing PCI for ACS exhibit a higher mortality rate, primarily attributable to baseline renal dysfunction. Renal impairment is a prevalent condition in older ACS patients who undergo PCI during their initial hospitalization, and it functions as an independent predictor for both overall mortality and cardiovascular-related mortality.

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