Original Research Article

A single centered, observational study of prognosis, incidence and outcomes of acute and chronic kidney disease in patients with ischemic heart disease in a tertiary care hospital

Kavya Pingali

Assistant Professor, Department of Cardiology, Government General Hospital, Vijayawada, Andhra Pradesh, India

Received: 24-04-2021 / Revised: 27-05-2021 / Accepted: 03-07-2021

Abstract

Objective: To assess the incidence of acute and chronic kidney disease in patients' with the ischemic heart disease (IHS) and the in-hospital prognosis and outcomes. **Methods**: This single-centered, observational study included 240 patients, who were admitted to the hospital for treatment of IHS between August 2020 to November 2020. The incidence of AKI and CKI during hospital admission was assessed such that creatinine levels were measured at admission and at discharge. **Results**: Of 240 patients, 50 (20.8%) patients had AKI, 40(16.67) patients had CKD, 50% patients had ST elevated myocardial infarction (STEMI), 40% had NSTEMI, 10%had unstable angina. In-hospital complications were atrial fibrillation (24%), ventricular tachycardia (VT) (16%), pulmonary edema (42%), cardiogenic shock (26%), bleeding complications (14%), and mortality (22%). Of 240 patients, 40 (16.67%) patients had CKI, 67.5% patients had ST elevated myocardial infarction (STEMI), 55% had NSTEMI, 10% had unstable angina. In-hospital complications were atrial fibrillation (32.5%), ventricular tachycardia (VT) (15%), pulmonary edema (50%), cardiogenic shock (27.5%), bleeding complications (15%), and mortality (25%). **Conclusion**: In the light of these results, it can be concluded that the incidence of acute kidney injury and chronic kidney injury in ischemic heart disease patients has been allied with increased incidences of in-hospital complications and mortality.

Keywords: ischemic heart disease; chronic kidney injury; acute kidney injury; mortality; ST-elevation myocardial infarction.

Introduction

India has the highest burden of ischemic heart diseases (IHS) in the world(Xavier et al., 2008), and existence of comorbidity makes the matter worse. Acute kidney injury (AKI), as per Kidney Disease: Improving Global Outcomes (KDIGO),is increase of serum creatinine by ≥0.3 mg/dl (≥26.5 µmol/l) in48 hours or by ≥1.5 times baseline within seven days, or if urine volume is <0.5 ml/kg per hour for six hours(Kellum et al., 2012). In other words, AKI is a complex disorder exemplified by early worsening of renal function, with clinical signs ranging from increase in serum creatinine) to anuric renal failure(Marenzi et al., 2015). Even a slight rise in serum creatinine has been related with an escalated risk of end-stage renal disease and all-cause short and long-term mortality, irrespective of partial or full recovery of renal function at discharge(Buargub et al., 2016).

Literature states that the occurrence of AKI has been heterogeneous, ranging up to 40% in patients with IHS and other critical conditions(Toso et al., 2015). Although the negative impact of contrast volume on kidney has widely recognized (Narula et al., 2014; Wi et al., 2011), the chief mechanisms involved in AKI are systemic and renal hemodynamic changes secondary to impaired cardiac output and increased venous congestion that lead to diminished glomerular filtration rate. Moreover, variation in volume status, atheroembolism during percutaneous coronary intervention (PCI) or intra-aortic balloon pump counter pulsation and bleeding, which are usual conditions in patients with IHS, probably contribute towards the development of AKI(Marenzi et al., 2015). The ST elevated myocardial infarction (STEMI) patients appear to be at utmost risk for developing AKI, since they represent patients with IHS of greatest hemodynamic impact and /or with lowest hemodynamic and renal functional reserve(Neves et al., 2016).

The prognostic impact of AKI has been influenced by the severity of acute renal damage, nevertheless even minimal deteriorations of renal function during hospitalization for IHS have been demonstrated to be linked with worse outcome(Toso et al., 2015). Therefore, in this study we assessed the incidence of AKI in patients with IHS and the in-hospital prognosis and outcomes.

*Correspondence

Dr. Kavya Pingali

Assistant Professor, Department of Cardiology, Government General Hospital, Vijayawada, Andhra Pradesh, India

E-mail: pingali.kavya@yahoo.com

Methods

This single-centered, observational study included 200 patients, who were admitted to the hospital for treatment of IHS between August 2020 to November 2020. The incidence of AKI and CKI during hospital admission was assessed such that creatinine levels were measured at admission and at discharge. Patients underwent optimal treatment and any in-hospital complications and outcomes were noted down.

Continuous variables are presented as mean ± standard deviation and categorical variables are expressed as percentages.

Results

Table 1: Baseline demographics and characteristics of patients with acute kidney injury

Characteristics	N = 50 patients
Age >70 years, n (%)	25 (50%)
Male, n (%)	35 (70%)
Smoker, n (%)	17 (34%)
Diabetes, n (%)	20 (40%)
Hypertension, n (%)	33 (66%)
Dyslipidemia, n (%)	18 (36%)
Previous myocardial infarction, n (%)	17 (34%)
Left ventricular ejection fraction <40%, n (%)	23 (46%)
Average serum creatinine at admission (Mean ± SD, mg/dl)	2.0 ± 0.5
Clinical presentation	
ST elevated myocardial infarction (STEMI), n (%)	25 (50%)
Non- STEMI, n (%)	20 (40%)
Unstable angina, n (%)	5 (10%)

Of 200 patients, 50 (20.8%) patients had AKI. Table 1 outlines the baseline demographics and characteristics of patients with AKI. 50% patients had ST elevated myocardial infarction (STEMI), 40% had NSTEMI, 10%had unstable angina. 25 (50%) patients had age more than seventy years, males constituted 70% of the total patients, 34% patients were smokers, diabetes coexisted in 40% patients, 33 (66%) patients were hypertensive, 36% patients had dyslipidemia, 34% patients had a history of previous MI, left ventricular ejection fraction was <40% in 46% patients. Average serum creatinine at admission was 2.0 ± 0.5 mg/dl and at discharge was 1.2 ± 0.3 mg/dl.

Table 2: Baseline demographics and characteristics of patients with chronic kidney injury

Characteristics	N = 40 patients
Age >70 years, n (%)	20 (50%)
Male, n (%)	24 (60%)
Smoker, n (%)	20 (50%)
Diabetes, n (%)	22 (55%)
Hypertension, n (%)	33 (82.5%)
Dyslipidemia, n (%)	13 (32.5%)
Previous myocardial infarction, n (%)	18 (45%)
Left ventricular ejection fraction <40%, n (%)	24 (60%)
Average serum creatinine at admission (Mean ± SD, mg/dl)	3.2 ± 0.5
Clinical presentation	
ST elevated myocardial infarction (STEMI), n (%)	27 (67.5%)
Non- STEMI, n (%)	22 (55%)
Unstable angina, n (%)	6 (15%)

Of 200 patients, 40 (16.67%) patients had CKI. Table 2 outlines the baseline demographics and characteristics of patients with CKI. 67.5% patients had ST elevated myocardial infarction (STEMI), 55% had NSTEMI, 15% had unstable angina. 25 (50%) patients had age more than seventy years, males constituted 50% of the total patients, 50% patients were smokers, diabetes coexisted in 40% patients, 33 (82.5%) patients were hypertensive, 32.5% patients had dyslipidemia, 45% patients had a history of previous MI, left ventricular ejection fraction was <40% in 60% patients. Average serum creatinine at admission was 3.2 ± 0.5 mg/dl and at discharge was 1.3 ± 0.3 mg/dl.

Table 3: In-hospital complications in patients with acute kidney injury

Complications	N = 50 patients
Atrial fibrillation, n (%)	12 (24%)
Ventricular tachycardia, n (%)	8 (16%)
Pulmonary edema, n (%)	21 (42%)
Cardiogenic shock, n (%)	13 (26%)
Bleeding complications, n (%)	7 (14%)
Mortality, n (%)	11 (22%)

Of 50 patients with AKI, 28% patients underwent treatment with medical therapy, 66% underwent PCI, and 6% underwent CABG. In-hospital complications were atrial fibrillation (24%), ventricular tachycardia (VT) (16%), pulmonary edema (42%), cardiogenic shock (26%), bleeding complications (14%), and mortality (22%). The in-hospital complications in patients with AKI are shown in Table 3.

Table 4: In-hospital complications in patients with chronic kidney injury

Complications	N = 40 patients
Atrial fibrillation, n (%)	13 (32.5%)
Ventricular tachycardia, n (%)	6 (15%)
Pulmonary edema, n (%)	20 (50%)
Cardiogenic shock, n (%)	11 (27.5%)
Bleeding complications, n (%)	6 (15%)
Mortality, n (%)	10 (25%)

Of 40 patients with CKI, 29% patients underwent treatment with medical therapy, 62% underwent PCI, and 9% underwent CABG. In-hospital complications were atrial fibrillation (32.5%), ventricular tachycardia (VT) (15%), pulmonary edema (50%), cardiogenic shock (27.5%), bleeding complications (15%), and mortality (25%). The in-hospital complications in patients with CKI are shown in Table 4.

Discussion

The incidence of AKI in IHS patients included in the present study was 25% and 23% respectively. The reported incidences of AKI in various studies vary. This is due to difference in the criteria used for diagnosing AKI, the clinical setting and the population(Marenzi et al., 2015). Moreover, the etiology of incidence of AKI in IHS patients involves several factors like congestive heart failure, volume depletion, medication toxicity, septic disease, etc. Clinically compromised patients are likely to develop AKI more easily and the related comorbidities lead to worse prognosis (Toso et al., 2015).

The patients with AKI in this study were mostly males (70%) and 50% patients had age >70 years. STEMI was more prevalent in patients with AKI, i.e., in 50% patients, followed by NSTEMI in 40% patients. 34% patients were smokers, diabetes coexisted in 40% patients, 33 (66%) patients were hypertensive, 36% patients had dyslipidemia, 34% patients had a history of previous MI, and left ventricular ejection fraction was <40% in 46% patients. In accordance to our results, a recent meta-analysis has stated that several features often associated with AKI are age, male gender, presence of diabetes, hypertension, current smoker, STEMI, and reduced left ventricular ejection fraction(Pickering et al., 2016).

According to a study which is prospective observational conducted in swedish during a period of 2003 and 2009 on total of 37 991 patients were included in the analyses, mens were 25 062 (66%) and womens were 12 929 (34%). Women were older, had lower weight, body mass index (BMI), heart rate and Killip class on admission. They also had a higher prevalence of comorbidities such as diabetes, hypertension, COPD, PAD, previous stroke or dementia whereas men were more often smokers, had more often suffered from a previous MI and had more often been previously revascularised. Among men, 33% and 45% were in the best CKD stage compared with 20% and 19% among women according to both formulas. In the youngest group, more than 90% of men and 75% of women were in CKD stage 1 [Sofia Sederholm Lawesson]*

In a recent study, Neves D et al. have reported the incidence of AKI in IHS patients to be 17.53%. Mean age in AKI patients was 73 years and male gender constituted 66.5% patients. In these patients, STEMI was present in 41.7% of patients (Neves et al., 2016). In another study, Marenzi G et al. have stated that AKI occurred in 12.74% patients with IHS. In this study, 50% patients had age >75 years and 74% of patients were males. 47% patients had left ventricular ejection fraction<40% (Marenzi et al., 2013). Though the incidences of AKI in IHS patients in the two aforementioned studies were less than that of our study, yet the patient characteristics and demographics were parallel to our study.

The IHS itself has been associated with high risk of mortality and moderate renal dysfunction along with IHS at baseline is associated with an at least two-fold increase in mortality (AlFaleh et al., 2013). Moreover, baseline renal impairment has showed to be a strong predictor of in-hospital and long-term adverse cardiac outcomes in IHS patients (AlFaleh et al., 2013).The in-hospital complications in present study were atrial fibrillation (24%),ventricular tachycardia (16%),pulmonary edema (42%), cardiogenic shock (26%),bleeding complications (14%),and mortality (22%). Whereas, Neves D et al. observed the following in-hospital complications: re-infarction (1.0%), congestive heart failure (9.2%), atrial fibrillation (4.0%), stroke (0.7%), major bleeding (2.4%), AV block (2.5%), and sustained VT (1.8%) (Neves et al., 2016). Marenzi G et al. have reported the in-hospital complications as atrial fibrillation (25%), VT/ventricular fibrillation (16%), high-degree conduction disturbances (11%), acute pulmonary edema (42%), cardiogenic

shock (26%), major bleeding (14%), mechanical ventilation (30%), and in-hospital death (21%) (Marenzi et al., 2013).

Though the AKI patients would recover and get discharge from hospitals, these patients are more likely to result in persistent loss of kidney function, faster subsequent rate of decline in kidney function and future risk of progression to ESRD(Chawla et al., 2012; Coca et al., 2012). Therefore, the KDIGO recommends management of high-risk patients, such that to discontinue nephrotoxic agents when possible, maintain volume status and perfusion pressure, avoid hyperglycemia and monitor serum creatinine and urine output (Kellum et al., 2012).

Conclusion

In the light of these results, it can be concluded that incidence of acute kidney injury and chronic kidney injury in ischemic heart disease patients has been allied with increased incidences of in-hospital complications and mortality.

References

1. AlFaleh, H. F., Alsuwaida, A. O., Ullah, A., Hersi, A., AlHabib, K. F., AlNemer, K., . . . Balghith, M. A. (2013). The prognostic impact of in-hospital worsening of renal function in patients with ischemic heart disease. *International journal of cardiology*, *167*(3), 866-870.
2. Buargub, M., & Elmokhtar, Z. O. (2016). Incidence and mortality of acute kidney injury in patients with ischemic heart disease: A retrospective study from a single coronary care unit. *Saudi Journal of Kidney Diseases and Transplantation*, *27*(4), 752.
3. Chawla, L. S., & Kimmel, P. L. (2012). Acute kidney injury and chronic kidney disease: an integrated clinical syndrome. *Kidney international*, *82*(5), 516-524.
4. Coca, S. G., Singanamala, S., & Parikh, C. R. (2012). Chronic kidney disease after acute kidney injury: a systematic review and meta-analysis. *Kidney international*, *81*(5), 442-448.
5. Kellum, J., Lameire, N., & Aspelin, P. (2012). KDIGO clinical practice guidelines for acute kidney injury. *Kidney Int Suppl*, *2*, 1-138.
6. Marenzi, G., Cabiati, A., Bertoli, S. V., Assanelli, E., Marana, I., De Metrio, M., . . . Campodonico, J. (2013). Incidence and relevance of acute kidney injury in patients hospitalized with ischemic heart diseases. *The American journal of cardiology*, *111*(6), 816-822.
7. Marenzi, G., Cosentino, N., & Bartorelli, A. L. (2015). Acute kidney injury in patients with ischemic heart diseases. *Heart*, *101*(22), 1778-1785.
8. Narula, A., Mehran, R., Weisz, G., Dangas, G. D., Yu, J., Généreux, P., . . . Guagliumi, G. (2014). Contrast-induced acute kidney injury after primary percutaneous coronary intervention: results from the HORIZONS-AMI substudy. *European heart journal*, ehu063.
9. Neves, D., Belo, A., Damásio, A. F., Carvalho, J., Santos, A. R., Piçarra, B., & Aguiar, J. (2016). Acute kidney injury in ischemic heart diseases–An important multifactorial consequence. *Revista Portuguesa de Cardiologia*, *35*(7), 415-421.
10. Pickering, J. W., Blunt, I. R., & Than, M. P. (2016). Acute Kidney Injury and mortality prognosis in Ischemic heart disease patients: A meta-analysis. *Nephrology*.
11. Toso, A., Servi, S. D., Leoncini, M., Morici, N., Murena, E., Antonicelli, R., . . . Piscione, F. (2015). Acute kidney injury in elderly patients with non-ST elevation ischemic heart disease: insights from the Italian elderly: IHS study. *Angiology*, *66*(9), 826-830.
12. Wi, J., Ko, Y.-G., Kim, J.-S., Kim, B.-K., Choi, D., Ha, J.-W., . . . Jang, Y. (2011). Impact of contrast-induced acute kidney injury with transient or persistent renal dysfunction on long-term outcomes of patients with acute myocardial infarction undergoing percutaneous coronary intervention. *Heart*, hrt. 2010.218677.
13. Xavier, D., Pais, P., Devereaux, P., Xie, C., Prabhakaran, D., Reddy, K. S., . . . Thanikachalam, S. (2008). Treatment and outcomes of ischemic heart diseases in India (CREATE): a prospective analysis of registry data. *The Lancet*, *371*(9622), 1435-1442.
14. *ederholm Lawesson S, Alfredsson J, Szummer K, et alPrevalence and prognostic impact of chronic kidney disease in STEMI from a gender perspective: data from the SWEDEHEART register, a large Swedish prospective cohortBMJ Open 2015;5:e008188. doi: 10.1136/bmjopen-2015-008188

Conflict of Interest: Nil Source of support: Nil