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Original Research Article

FREQUENCY OF ACUTE KIDNEY INJURY IN PATIENTS POST-CORONARY ARTERY BYPASS GRAFTING AT TERTIARY CARE HOSPITAL, KARACHI

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Abstract: *A descriptive study was conducted at the Department of Medicine and Cardiothoracic Surgery, Aga Khan University Hospital, Karachi, from May 27, 2019, to November 27, 2019, to determine the frequency of acute kidney injury in patients after coronary artery bypass grafting. A total of 174 patients who underwent coronary artery bypass graft surgery were enrolled in the study. Postoperatively, all patients were closely observed for acute kidney injury up to 48 hours post-surgery. The demographic characteristics of the participants revealed a mean age of 54.14±9.49 years, with 108 (62.1%) being males and 66 (37.9%) females. Out of the total participants, 25 (14.4%) experienced acute kidney injuries, while 149 (85.6%) did not show any signs of acute kidney injuries. The findings suggest that acute kidney injury is a common complication following isolated coronary artery bypass graft (CABG) surgery. This observation holds significant clinical importance, as it is associated with unfavourable postoperative outcomes, prolonged stays in the intensive care unit (ICU), and elevated fatality rates. These insights underscore the need for careful monitoring and management of renal function in patients undergoing CABG surgery to mitigate the impact of acute kidney injury on overall postoperative well-being.*

Keywords: Coronary Artery Bypass Grafting (CABG), Acute Kidney Injury (AKI), Estimated Glomerular Filtration Rate

Introduction

Coronary artery bypass grafting is a revascularisation technique done in significant (>50%) stenosis of all major coronary trunks and their branches (Brown et al., 2007). Coronary artery bypass grafting improves both symptoms and survival. Acute kidney injury is a significant cause of morbidity and mortality (Harel and Chan, 2008). Moreover, the prevalence varies from 5-31%3 and up to 1% of patients that develop AKI will require dialysis (Chertow et al., 1998).

Acute kidney injury patients have a higher incidence of prolonged hospital stay, more use of resources and increased mortality rate, which lead to renal replacement therapy (Santos et al., 2004; Shahian et al., 2012). Diagnosis of acute kidney injury after cardiac surgery involves various risk factors, including cardiogenic shock, left central disease, deteriorated left ventricular function, peripheral vascular disease, total circulatory arrest and diabetes mellitus (Del Duca et al., 2007; Tarakji et al., 2011). Several related mechanisms can lead to AKI's development, such as free haemoglobin generation and renal auto-regulation impairment (Huen and Parikh, 2012; Mirmohammad-Sadeghi et al., 2013; Rydén et al., 2014). Other causative factors that can lead to AKI are CPB circuit, gram-negative endo-toxaemia and ischemia-reperfusion injury (Pickering et al., 2015). Early recognition of acute kidney injury is always better for early intervention (Sakhuja et al., 2017). Shah et al (Ali et al., 2019). Studies showed the prevalence of acute kidney injury to be 7.82% in patients who underwent coronary artery bypass grafting.

Methodology

A descriptive study within the duration of 27th May 2019 to 27th November 2019 was conducted at the Department of Medicine and Cardiothoracic Surgery, Aga Khan University Hospital, Karachi and 174 patients were enrolled. Patients with a history of three-vessel coronary artery disease proven by angiography undergoing elective CABG, both gender and age 30-70 years, were included. Patients with non-consenting, emergent CABG, inotropes/intra-aortic balloon pump (IABP) before CABG and history of administration of radioactive contrast agents within 72 hours were excluded. The coronary artery disease duration and demographic data were obtained from medical record files. Postoperatively, the researcher observed all patients to detect acute kidney injury until the 48th post-operative hour. The blood sample was collected in a sterile manner. It was sent to the laboratory for serum creatinine, and patients were labelled as having acute kidney injury as per the operational definition. The findings of quantitative variables (age, serum creatinine level and duration of AKI) and qualitative variables (gender, hypertension, diabetes mellitus type II, dyslipidemia, anaemia, socioeconomic status) were noted. The data was entered and analysed through SPSS-20.

Results

There were 108 (62.1%) males and 66 (37.9%) female. Twenty-two (12.6%), 48 (27.6%), 53 (30.5%), and 51

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(29.3%) patients were in the age group 30-40 years, 41-50 years, 51-60 years and 61-70 years, respectively. Eight (4.6%), 42 (24.1%), 36 (20.7%), 61 (35.1%) and 27 (15.5%) were in lower-income, lower middle-income, middle-income, upper-middle-income and upper-income. Sixty-seven (38.5%) have <7 years duration of disease and 107 (61.5%) have >7 years duration of disease. Seventy (40.2%) and 104 (59.8%) have no diabetes mellitus type II. One hundred and twenty-three (70.7%) patients were hypertensive, and 51 (29.3%) had no hypertension. Fifty-one (29.3%) have dyslipidemia, and 123 (70.7%) have no dyslipidemia. Twenty (11.5%) have chronic kidney disease, and 154 (88.5%) have no chronic kidney disease. Twenty-five (14.4%) have acute kidney injury, and 149 (85.6%) have no acute kidney injury (Table 1).

The mean age was 54.14±9.49 years, the mean duration of CAD was 9.72±3.24 years, and the mean serum creatinine was 5.98±2.03 mg/dl, respectively (Table 2).

Table 1: Demographic information of the patients (n=174)

Variable	No.	%
Gender		
Male	108	62.1
Female	66	37.9
Age (years)		
30-40	22	12.6
41-50	48	27.5
51-60	53	30.5
61-70	51	29.3
Socioeconomic status		
Low income	8	4.6
Low, middle income	42	24.1
Middle income	36	20.7
Upper middle income	61	35.1
Upper income	27	15.5
Duration of coronary artery disease		
<7 years	67	38.5
>7 years	107	61.5
Type 2 diabetes mellitus		
Yes	70	40.3
No	104	59.7
Hypertension		
Yes	123	70.7
No	51	29.3
Dyslipidemia		
Yes	51	29.3
No	123	70.7
Chronic kidney disease		
Yes	20	11.5
No	154	88.5
Acute kidney injury		
Yes	25	14.7
No	149	85.3

Table 2: Descriptive statistics of patients (n=174)

Variable	Mean±SD
Age (years)	54.14±9.49
Duration of CAD (years)	9.72±3.24
Serum creatinine (mg/dl)	5.98±2.03

Discussion

Acute kidney injury is a significant medical risk, particularly following cardiac surgery6. It is linked to illness and a greater risk of death. AKI exacerbates the disease and impacts the medical treatment related to cardiac surgery. Coronary artery bypass grafting is inherently associated with acute kidney injury (AKI) (Sakhuja et al., 2017).

The average age in our sample was 54.14±9.49 years. Out of the total sample, 108 individuals (62.1%) were male, and 66 (37.9%) were female. Among them, 25 individuals (14.4%) were diagnosed with acute kidney injury, whereas 149 individuals (85.6%) did not have acute kidney injury. Acute kidney injury was developed in 40.5% of the patients (85 patients out of 210 patients) (Kwon et al., 2019). Ortega-Loubon et al (Ortega-Loubon et al., 2018). also showed the prevalence of AKI was 12.4%. Barkhordari et al (Barkhordari et al., 2018). Conducted a study on 3473 patients, the majority of whom were male.

Lagny et al (Lagny et al., 2015). Also conducted a study on 443 patients and reported that the male/female ratio was 2.3; the median age was 69 years, with 50% postoperative AKI. A higher level of creatinine and oliguria was also observed. In another study conducted on AKI, almost 25% required RRT (Amini et al., 2019). We found that CABG-associated AKI increases mortality and morbidity. Prompt identification of AKI is crucial as it serves two primary purposes: firstly, it enables the identification of patients who require nephrology referral, and secondly, it facilitates prompt therapies that have the potential to enhance outcomes.

Conclusion

Acute kidney injury is a frequently occurring condition following heart surgery and is commonly associated with adverse outcomes such as the development of coronary renal disease. Discovery and recognition of nephron biomarkers may accelerate the timely diagnosis. Renal impairment is preventable; knowledge and awareness may enhance public awareness and influence health policymakers. These may lead to minimising the burden, especially in regions with scarce resources.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned.

Consent for publication

Approved

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Conflict of interest

The authors declared absence of conflict of interest.

Author Contribution

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Coordination of collaborative efforts.
Conception of Study, Development of Research Methodology Design, Study Design,, Review of manuscript, final approval of manuscript.
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References

Ali, S., Khan, N. U., Gul, S., Goher, R., Naz, I., Khan, S. A., Ali, N., Saeed, M., Hussain, I., and Khan, S. M. (2019). Heterotic effects for yield related attributes in F1 populations of maize. *Pak. J. Bot* **51**, 1675-1686.

Amini, S., Najafi, M. N., Karrari, S. P., Mashhadi, M. E., Mirzaei, S., Tashnizi, M. A., Moeinipour, A. A., Hoseinikhah, H., Aazami, M. H., and Jafari, M. (2019). Risk factors and outcome of acute kidney injury after isolated CABG surgery: a prospective cohort study. *Brazilian Journal of Cardiovascular Surgery* **34**, 70-75.

Barkhordari, K., Yasseri, A. M. F., Yousefshahi, F., and Shafiee, A. (2018). Risk factors for acute kidney injury in coronary artery bypass graft surgery patients based on the acute kidney injury network criteria. *The Journal of Tehran University Heart Center* **13**, 52.

Brown, J. R., Cochran, R. P., Leavitt, B. J., Dacey, L. J., Ross, C. S., MacKenzie, T. A., Kunzelman, K. S., Kramer, R. S., Hernandez Jr, F., and Helm, R. E. (2007). Multivariable prediction of renal insufficiency developing after cardiac surgery. *Circulation* **116**, I-139-I-143.

Chertow, G. M., Levy, E. M., Hammermeister, K. E., Grover, F., and Daley, J. (1998). Independent association between acute renal failure and mortality following cardiac surgery. *The American journal of medicine* **104**, 343-348.

Del Duca, D., Iqbal, S., Rahme, E., Goldberg, P., and de Varennes, B. (2007). Renal failure after cardiac surgery: timing of cardiac catheterization and other perioperative risk factors. *The Annals of thoracic surgery* **84**, 1264-1271.

Harel, Z., and Chan, C. T. (2008). Predicting and preventing acute kidney injury after cardiac surgery. *Current opinion in nephrology and hypertension* **17**, 624-628.

Huen, S. C., and Parikh, C. R. (2012). Predicting acute kidney injury after cardiac surgery: a systematic review. *The Annals of thoracic surgery* **93**, 337-347.

Kwon, J.-T., Jung, T.-E., and Lee, D.-H. (2019). Predictive risk factors of acute kidney injury after on-pump coronary artery bypass grafting. *Annals of Translational Medicine* **7**.

Lagny, M.-G., Jouret, F., Koch, J.-N., Blaffart, F., Donneau, A.-F., Albert, A., Roediger, L., Krzesinski, J.-M., and Defraigne, J.-O. (2015). Incidence and outcomes of acute kidney injury after cardiac surgery using either criteria of the RIFLE classification. *BMC nephrology* **16**, 1-9.

Mirmohammad-Sadeghi, M., Naghiloo, A., and Najarzadegan, M. R. (2013). Evaluating the relative frequency and predicting factors of acute renal failure following coronary artery bypass grafting. *ARYA atherosclerosis* **9**, 287.

Ortega-Loubon, C., Fernández-Molina, M., Pañeda-Delgado, L., Jorge-Monjas, P., and Carrascal, Y. (2018). Predictors of postoperative acute kidney injury after coronary artery bypass graft surgery. *Brazilian Journal of Cardiovascular Surgery* **33**, 323-329.

Pickering, J. W., James, M. T., and Palmer, S. C. (2015). Acute kidney injury and prognosis after cardiopulmonary bypass: a meta-analysis of cohort studies. *American Journal of Kidney Diseases* **65**, 283-293.

Rydén, L., Ahnve, S., Bell, M., Hammar, N., Ivert, T., Sartipy, U., and Holzmann, M. J. (2014). Acute kidney injury after coronary artery bypass grafting and long-term risk of myocardial infarction and death. *International journal of cardiology* **172**, 190-195.

Sakhuja, A., Kashani, K., Schold, J., Cheungpasitporn, W., Soltesz, E., and Demirjian, S. (2017). Hospital procedure volume does not predict acute kidney injury after coronary artery bypass grafting—a nationwide study. *Clinical Kidney Journal* **10**, 769-775.

Santos, F. O., Silveira, M. A., Maia, R. B., Monteiro, M. D. C., and Martinelli, R. (2004). Acute renal failure after coronary artery bypass surgery with extracorporeal circulation: incidence, risk factors, and mortality. *Arquivos brasileiros de cardiologia* **83**, 145-149.

Shahian, D. M., O'Brien, S. M., Sheng, S., Grover, F. L., Mayer, J. E., Jacobs, J. P., Weiss, J. M., DeLong, E. R., Peterson, E. D., and Weintraub, W. S. (2012). Predictors of long-term survival after coronary artery bypass grafting surgery: results from the Society of Thoracic Surgeons Adult Cardiac Surgery Database (the ASCERT study). *Circulation* **125**, 1491-1500.

Tarakji, K. G., Sabik, J. F., Bhudia, S. K., Batizy, L. H., and Blackstone, E. H. (2011). Temporal onset, risk factors, and outcomes associated with stroke after coronary artery bypass grafting. *Jama* **305**, 381-390.

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