



PREVALENCE OF ACUTE RENAL INJURY (ARI) AFTER CARDIAC SURGERY AT CONDUCTED AT TERTIARY CARE CARDIAC SETTING IN KARACHI.

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ABSTRACT

BACKGROUND: Cardiovascular disease (heart disease and stroke) is commonly recognized as the leading cause of mortality not just in the Western world, but also globally, accounting for a whopping 44% of total fatalities. Acute kidney Injury (AKI) is a common and significant prognostic complication of heart surgery. The total mortality rate following open-heart surgery is between 2 and 8%. **OBJECTIVE:** To determine the prevalence of Acute renal injury (ARI) after cardiac surgery at conducted at National Institute of Cardiovascular diseases, Karachi. **MATERIALS AND METHODS:** This descriptive cross sectional study was conducted at National Institute of Cardiovascular diseases, Karachi. Using a non-probability consecutive sampling technique 108 patients who underwent cardiac surgery were included in the study. **RESULTS:** The mean age was 62.5 ± 9.2 years, mean BMI was 28.2 ± 7.5 and creatinine level was 1.89 ± 0.54 mg/dl. Out of 108 patients 5 (4.63%) who underwent found to have post- surgery acute renal injury. **CONCLUSION:** The study revealed that acute renal failure following heart surgery is a prevalent outcome in our study population, but it is only mild to moderate in the majority of patients. **KEYWORDS:** Acute Renal Failure, Cardiac Surgery, Complications

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INTRODUCTION

Cardiovascular disease (heart disease and stroke) is commonly recognized as the leading cause of mortality not just in the Western world, but also globally, accounting for a whopping 44% of total fatalities. This gloomy number is combined with the reality that medical advancements have resulted in significant decreases in cardiovascular mortality in Japan and the United States¹. Thus, despite significant advancements in therapy, cardiovascular

events continue to kill more individuals than any other cause². People with no recorded history of overt cardiac illness continue to account for over half of all sudden cardiac deaths³. Cardiovascular risk factors are rising in Pakistan⁴. In Pakistan, ischemic heart disease accounts for more than 12% of all deaths each year⁵. Every year, an estimated three to four million people suffer from MI^{6,7}. CVD is a growing problem in poor and middle-income

countries⁸. Acute myocardial infarction (AMI) is a leading cause of death globally⁹. Acute kidney Injury (AKI) is a common and significant prognostic complication of heart surgery¹⁰. The total mortality rate following open-heart surgery is between 2 and 8%¹¹⁻¹³. The risk of death, however, rises exponentially for patients who develop postoperative acute renal failure or injury (ARF/I), with mortality rates exceeding 60%¹⁴⁻¹⁷.

This concerning data makes it necessary and prompts us to do study and assess the prevalence of acute renal damage following heart surgery.

MATERIALS AND METHODS

Study Design and Sample Selection

This descriptive cross sectional study was conducted at National Institute of Cardiovascular diseases, Karachi. Using a non-probability consecutive sampling technique 108 patients who underwent cardiac surgery were included in the study. All the Male and female patient aged between 50 to 70 years, undergoing elective CABG diagnosed on primary percutaneous coronary angiography as per record of patient were made part of the study however, the cases requiring excision of atrial myxoma, complex congenital abnormality repair, ventricular assist device placement, and Bentall - De Bono surgery were excluded.

Data Collection Procedure:

Data was collected for a period of six months after approval of study from the College of Physicians and Surgeons of Pakistan. Patients', demographic details (including name, age and gender) were obtained. After selection of patient brief history regarding heart disease, cardiac surgery (CABG) and its duration were asked and labs were checked from patient record (all labs including ECG, CBC, urine D/R, C/S, electrolytes, urea creatinine, x-ray and ultrasound chest are or were carried out in our intuitional laboratory as per institutional policy, blood sample were drain from the vein of any arm and send to the laboratory (results were available on the same day) as per operational definition. final outcomes i.e ARI as per operational

definition were measured on 2nd post-operative day. All data (as mention in data analysis) were filled by researcher in a predesigned Performa.

Data Analysis Plan:

We used SPSS version 26.0 for data entry and analysis. The quantitative variables were reported in Mean and standard deviation. Frequency and proportions were calculated for categorical variables such gender, diabetes mellitus, hypertension, obesity, smoking status, dyslipidemia and acute renal injury. We employed the chi-square test of association to evaluate the strength of association between variables P- value of <0.05 were considered to be significant

RESULTS

A total of 108 patients who underwent cardiac surgery were included in this study. Mean age was 62.5 ± 9.2 years, mean BMI was 28.2 ± 7.5 and creatinine level was 1.89 ± 0.54 mg/dl. Table I Forty five (41.7%) patients were female and 63(58.3%) were male, 49(45.3%) patients had diabetes mellitus, 82(75.9%) women had hypertension, Obesity found in 66 (61.1%) patients. 79(73.1%) patients had dyslipidemia and 50(46.3%) were smoker Table II. Out of 108 patients 5(4.63%) who underwent found to have post- surgery acute renal injury. Fig I. Stratification was done to check the association between acute renal injury and effect modifiers like age, gender, diabetes mellitus, hypertension, dyslipidemia and smoking status results showed non-significant effect with p-value>0.05. Table III

DISCUSSION

It has been we established in literature that the acute renal failure, a serious postoperative complication of cardiac surgery, is associated with a high mortality and morbidity rate^{18,19}. In our study, we used serum creatinine variation as an index of renal function decline; although, it is important to consider that a rise in serum creatinine is not significantly related to renal function decline, since there is an exponential correlation curve between renal function and serum creatinine, a

minute rise shall result in sluggish renal performance^{20,21}.

| Table I Descriptive Statistics of Quantitative Variables in the Study | | | | |
|--|------------|------------|-------------|-----------|
| Variables | Min | Max | Mean | SD |
| Age | 50 | 70 | 62.5 | 9.2 |
| BMI | 22.9 | 34.8 | 28.2 | 7.5 |
| Creatinine level | 0.42 | 5.3 | 1.89 | 0.54 |

| Table II Frequency Distribution of qualitative Variables in the study participants (n=108) | | |
|---|------------------|-------------------|
| Variables | Frequency | Percentage |
| Gender | | |
| Female | 45 | 41.67 |
| Male | 63 | 58.33 |
| Diabetes mellitus | | |
| Yes | 49 | 45.37 |
| No | 59 | 54.63 |
| Hypertension | | |
| Yes | 82 | 75.93 |
| No | 26 | 24.07 |
| Obesity | | |
| Yes | 66 | 61.11 |
| No | 42 | 38.89 |
| Dyslipidemia | | |
| Yes | 79 | 73.15 |
| No | 29 | 26.85 |
| Smoker | | |
| Yes | 50 | 46.30 |
| No | 58 | 53.70 |

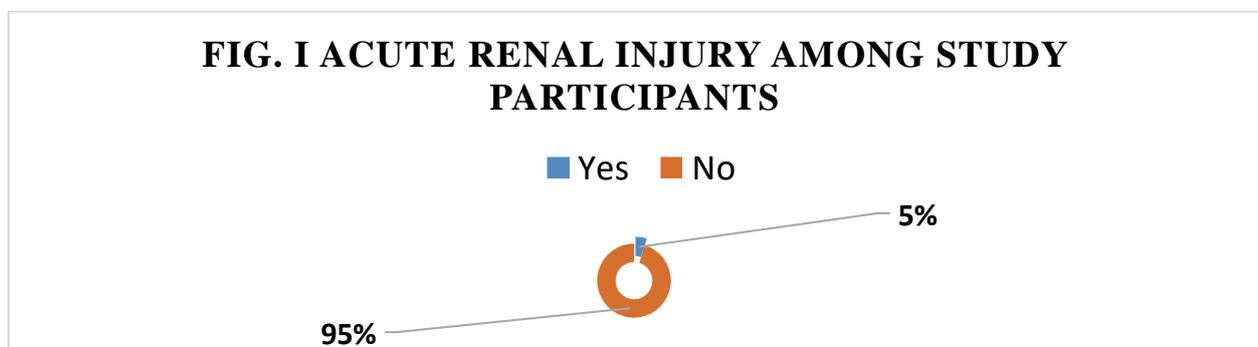


Table III Chi Square Test of Association Among study Variables

| Variables | Acute renal injury | | Total | P-value |
|--------------------------|--------------------|-------------|----------|---------|
| | Yes | No | | |
| | 5(4.63%) | 103(95.37%) | | |
| Gender | | | | |
| Female | 2(4.4%) | 43(95.6%) | 45(100%) | 0.408 |
| Male | 3(9.1%) | 30(90.9%) | 63(100%) | |
| Diabetes mellitus | | | | |
| Yes | 4(8.2%) | 45(91.8%) | 49(100%) | 0.111 |
| No | 1(1.7%) | 58(98.3%) | 59(100%) | |
| Hypertension | | | | |
| Yes | 3(3.7%) | 79(96.3%) | 82(100%) | 0.394 |
| No | 2(7.7%) | 24(92.3%) | 26(100%) | |
| Obesity | | | | |
| Yes | 4(6.0%) | 63(94%) | 66(100%) | 0.383 |
| No | 1(2.4%) | 41(97.6%) | 42(100%) | |
| Dyslipidemia | | | | |
| Yes | 4(8.2%) | 45(91.8%) | 79(100%) | 0.411 |
| No | 1(3.4%) | 28(96.6%) | 29(100%) | |
| Smoker | | | | |
| Yes | 3(6.0%) | 47(94%) | 50(100%) | 0.529 |
| No | 2(3.4%) | 56(96.6%) | 58(100%) | |
| Maternal age | | | | |
| <=60 years | 2(3.1%) | 62(96.9%) | 64(100%) | 0.396 |
| >60 years | 3(6.8%) | 41(93.2%) | 44(100%) | |

It is reported that the prevalence of acute renal failure-D is between 0.5% and 15.0% after the heart surgery^{19,21}. Subsequent to the heart surgeries, the frequency of acute renal failure reported in this research was 16.1%, which is similar to the rates reported by Andersson et al 19 (16.4%)²² and Zanardo et al 12 (15.1%)²³. However, it is twice as high as the values reported by Mangano et al 11 (7.7%)²⁴ and Conlon et al 8 (8.0%)²⁵, who used less stringent criteria for diagnosing acute renal failure. The requirement for dialysis is a less heterogeneous indicator for the diagnosis of the condition; nevertheless, the criteria for initiating dialysis therapy may change, increasing the risk of acute renal failure-D if initiated too early. This is one of the factors that may influence the requirement for dialysis; however, it was not quantified for analysis in this study.

CONCLUSION

The study revealed that acute renal failure following heart surgery is a prevalent outcome in our study population, but it is only mild to moderate in the majority of

patients. Effective preventive and treatment options for acute kidney injury following heart surgery are need of the hour.

ETHICS APPROVAL: The ERC gave ethical review approval.

CONSENT TO PARTICIPATE: written and verbal consent was taken from subjects and next of kin.

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AUTHORS' CONTRIBUTIONS:

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated in the work to take public responsibility of this manuscript. All authors read and approved the final manuscript.

CONFLICT OF INTEREST: No competing interest declared

REFERENCES

1. Rosamond W, Flegal K, Furie K, Go A, Greenlund K, Haase N, et al. Heart disease and stroke statistics—2008 update. *Circulation*. 2008 Jan 29;117(4):e25-146. Epub 2007 Dec 17.

2. Kannel WB. Silent myocardial ischemia and infarction: Insights from the Framingham study. *CardiolClin*. 1986 Nov;4(4):583-91.
3. Corrado D, Basso C, Thiene G. Sudden cardiac death in young people with apparently normal heart *Cardiovasc Res*. 2001; 50: 399 – 408.
4. Hafeez S, Javed A, Kayani AM. Clinical profile of patients presenting with acute ST elevation myocardial infarction. *J Pak Med Assoc*. 2010;60:190- 3.
5. Ahmed S, Ahsan MB, EhsanUllah. Stable angina: the frequency of coronary artery stenosis among patients having left bundle branch block. *Professional Med J*. 2009;16:94-9.
6. Bhalli MA, Khan MQ, Samore NA, Mehreen S. Frequency and clinical outcome in conduction defects in acute myocardial infarction. *J Ayub Med Coll Abbottabad*. 2009; 21(3):32-7
7. Singh SP, Rajender M. A prospective observational study on risk assessment of STEMI patients at a tertiary care hospital. *Intern J Pharm and Pharmaceutical Sci*. 2014 Dec 19;7(2):148-53.
8. Gaziano T. Cardiovascular Disease in the Developing World and Its Cost-Effective Management. *Circulation*. 2005;112(23):3547-53.
9. Yasuda S, Shimokawa H. Acute myocardial infarction. *Circ J*. 2009 Nov;73(11):2000-8. Epub 2009 Oct 7.
10. Rosner MH, Okusa MD. Acute kidney injury associated with cardiac surgery. *Clin J Am SocNephrol*. 2006;1:19 –32
11. Kennedy JW, Kaiser GC, Fisher LD, Fritz JK, Myers W, Mudd JG, et al. Clinical and angiographic predictors of operative mortality from the collaborative study in coronary artery surgery (CASS). *Circulation*. 1981 Apr;63(4):793-802.
12. Bridges CR, Edwards FH, Peterson ED, Coombs LP: The effect of race on coronary bypass operative mortality. *J Am CollCardiol*. 2000 Nov 15;36(6):1870-6
13. Higgins TL, Estafanous FG, Loop FD, Lee JC, Starr NJ, Knaus WA, et al. ICU admission score for predicting morbidity and mortality risk after coronary artery bypass grafting. *Ann Thorac Surg*. 1997 Oct;64(4):1050-8.
14. Abel RM, Buckley MJ, Austen WG, Barnett GO, Beck JC, Fischer JE. Etiology, incidence, and prognosis of renal failure following cardiac operations. Results of a prospective analysis of 500 consecutive patients. *J ThoracCardiovasc Surg*. 1976 Mar;71(3):323-33.
15. Chertow GM, Lazarus JM, Christiansen CL, Cook EF, Hammermeister KE, Grover F, et al. Preoperative renal risk stratification. *Circulation*. 1997 Feb 18;95(4):878-84.
16. Mangano CM, Diamondstone LS, Ramsay JG, Aggarwal A, Herskowitz A, Mangano DT. Renal dysfunction after myocardial revascularization: risk factors, adverse outcomes, and hospital resource utilization. *Ann Intern Med*. 1998 Feb 1;128(3):194-203.
17. Frost L, Pedersen RS, Lund O, Hansen OK, Hansen HE. Prognosis and risk factors in acute, dialysis-requiring renal failure after open-heart surgery. *Scand J ThoracCardiovasc Surg*. 1991;25(3):161-6.
18. Chertow GM, Levy EM, Hammermeister KE, Grover F, Daley J. Independent association between acute renal failure and mortality following cardiac surgery. *Am J Med* 1998; 104: 343-8.
19. Hilberman M, Myers BD, Carrie BJ, Derby G, Jamison RL, Stinson EB. Acute renal failure following cardiac surgery. *J Thorac Cardiovasc Surg* 1979; 77: 880-8.
20. Abel RM, Buckley MJ, Austen WG, Barnett GO, Beck CH Jr., Fischer JE. Etiology,
21. 21Levy EM, Viscoli CM, Horwitz RI. The effect of acute renal failure on mortality. A cohort analysis. *Jama* 1996; 275: 1489-94.
22. Andersson LG, Ekroth R, Bratteby LE, Hallhagen S, Wesslen O. Acute renal failure after coronary surgery a study of incidence and risk factors in 2009 consecutive patients. *Thorac Cardiovasc Surg* 1993; 41: 237-41.
23. Zanardo G, Michielon P, Paccagnella A et al. Acute renal failure in the patient undergoing cardiac operation. Prevalence, mortality rate, and main risk factors. *J Thorac Cardiovasc Surg* 1994; 107: 1489-95.
24. Roach GW, Kanchuger M, Mora Mangano C et al. Adverse cerebral outcome after coronary bypass surgery. *N Engl J Med* 1996;335:1857-63.
25. Conlon PJ, Stafford-Smith M, White WD et al. Acute renal failure following cardiac surgery. *Nephrol Dial Transplant* 1999; 14: 1158-62.