Original Article

Nephropathy and Complications

Frequency of Contrast Induced Nephropathy: Complications in Patients Undergoing PPCI for Acute STEMI

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ABSTRACT

Objective: To determine frequency of contrast induced nephropathy and post-operative complications in patients undergoing Primary Percutaneous Coronary Intervention (PPCI) for acute ST-elevation myocardial infarction.
Study Design: Observational/ Cross-sectional study.
Place and Duration of Study: This study was conducted at the Department of Nephrology, Shaikh Zayed Hospital Lahore from January 2019 to June 2019.
Materials and Methods: Total 220 male/female patients with ages 35 to 80 years undergoing Primary Percutaneous Coronary Intervention (PPSCI) were included. Patients demographic including age, sex and co-morbidities were recorded after written consent. Increase of 0.5mg/dl of serum creatinine level from baseline to 72 hours after contrast administration was set a criteria for contrast induced nephropathy. Postoperative complications, in-hospital mortality and hospital stay was recorded.
Results: One hundred and sixty five (75%) patients were males while 55 (25%) were females. Eighty eight (40%) patients were ages <50 years while 132 (60%) patients had ages above 50 years. Contrast induced nephropathy was found in 32 (14.55%) patients. Post-operative complications rate was high in patients with CIN as compared to non CIN patients (p=<0.05). Length of hospital stay was high in CIN patients. Overall mortality rate was 10% in which 7.72% patients had CIN.
Conclusion: Frequency of contrast induced nephropathy was high and was directly associated with increased mortality, post-operative complications and increased length of hospital stay.
Key Words: ST-segment elevation myocardial infarction, PPCI, Contrast Induced Nephropathy, Complications

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INTRODUCTION

Abnormal kidney functions are fairly common in the field of interventional cardiology. Such alterations in kidney function are often seen with the utilization of contrast, hence called contrast induced acute kidney injury (CI-AKI), also known as contrast induced nephropathy. Contrast induced nephropathy (CIN) is associated with increased morbidity and mortality prolonged hospitalization, and increased healthcare cost.[1,2] It is the third most common cause of hospital acquired renal failure, after decreased renal perfusion and use of nephrotoxic medications.

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The incidence of contrast induced nephropathy as a post procedure complication of radiographic diagnostic and intervention varies markedly in past studies. The incidence rate is varying from one study to other depends on the definition used, with regard to number and type of risk factors and length of patients follow-up. The incidence rate reported in literature is 3-22%.[3,4] The reported incidence from the National Cardiovascular Data Registry (NCDR) was 7% in general population and 16% in those presenting with acute myocardial infarction (MI).[5]

Acute kidney injury after cardiac catheterization is related to the use of intravascular contrast agents. However, in spite of their widespread use in radiographic diagnostic and intervention studies, the mechanism of kidney injury caused by contrast agents has not been fully elaborated.[6] There are different studies which devise the pathophysiological mechanisms of direct toxic injury to the renal tubules and ischemic injury to the renal medulla, from vasomotor changes and decreased perfusion. The later appears to be mediated impart by the development of reactive oxygen species, such as superoxide, and has important implications for treatment with scavenging agents.[7]

Chronic kidney disease, diabetes, medications and hemodynamic changes etc are causative factors that can exaggerate the development of acute kidney injury (AKI) after cardiac catheterization. Volume depletion and hemodynamic alterations from heart failure or cardiogenic shock may exacerbate contrast induced nephropathy (CIN) by decreasing renal perfusion and predisposing the renal medulla to ischemic injury.[8] Such a pathophysiological state becomes even more complicated and oblique in patients undergoing primary percutaneous coronary intervention (PCI) because of high thrombogenic state, a high burden of inflammation due to the myocardial damage, and a potential decrease in per fusion to the kidneys through vasoconstriction or hemodynamic instability.[9]

The interventional cardiology and radiology literature has traditionally defined contrast induced acute kidney injury as a rise in serum creatinine level of at least 0.5 mg/dL or a twenty-five percent from baseline within forty-eight to seventy-two hours after contrast administration.[10]

The present study was conducted to examine the prevalence of contrast induced nephropathy and post-operative complications in patients undergoing primary PCI for acute STEMI.

MATERIALS AND METHODS

This cross-sectional study was carried out at Department of Nephrology, Shaikh Zayed Hospital, Lahore from 1st January 2019 to 30th June 2019.. Total 220 both male and female patients with ages 35 to 80 years undergoing primary percutaneous coronary intervention were included. Patients demographic including age, sex and co-morbidities were recorded after written consent. Patient's history of previous PCI and those with no consent were excluded from this study. All the patients were received primary PCI for acute ST segment elevation myocardial infarction. Blood samples were collected to examine the serum creatinine level. For examine the prevalence of contrast induced nephropathy, we set criteria as increase of 0.5mg/dl of serum creatinine level from baseline to 72 hours after contrast administration. Post-operative complications such as were recorded. In-hospital mortality was examined and compares the findings between CIN patients and non-CIN patients. All the data was analyzed by SPSS 24. Chi-square test and student t' test were applied to compare the complication between CIN and non-CIN patients. P-value was set at <0.05 as statistical significant difference.

RESULTS

One hundred and sixty five (75%) patients were males while 55 (25%) were females. 88 (40%) patients were ages <50 years while 132 (60%) patients had ages above 50 years. Co-morbidities such as diabetes mellitus, hypertension, smoking, dyslipidemia, chronic kidney disease and family history of CHD was found in 79 (35.91%), 102 (46.36%), 72 (32.72%), 58 (26.36%), 12 (5.45%) and 20 (9.09%) patients respectively (Table 1).

Contrast induced nephropathy was found in 32 (14.5%) patients (Table 2) In CIN patients mean amount of contrast used was 180±25.58 ml while in non-CIN patients it was 164.32±29.10 ml. Length of hospital stay was high in CIN patients as compared to non-CIN patients 4.02±2.65 days vs 3.42±1.38 days (p=0.016).

Table No.1: Demographic information of the patients

Variable	No.	%
Gender		
Male	165	75.0
Female	55	25.0
Age (years)		
<50s	88	40
>50	132	60
Co-morbidities		
DM	79	35.91
Hypertension	102	46.36
Smoking	72	32.72
Dyslipidemia	58	26.36
CKD	12	5.45
Family history of CHD	20	9.09

Table No.2: Frequency of contrast induced nephropathy

Contrast induced nephropathy	No.	%
Yes	32	14.6
No	188	85.4

Table No.3: Post-operative complication between CIN and Non-CIN patients

Variable	CIN (n=32)	Non-CIN (n=188)	P value
Contrast used	180±25.58	164.32±29.10	0.005
Mean hospital stay (days)	4.02±2.65	3.42±1.38	0.016
Complications			
Dissection	2 (6.25)	5 (2.66)	0.062
Shock	3 (9.37)	5 (2.66)	0.068
Pulmonary Edema	1 (3.13)	9 (4.79)	0.358
Ventilator Need	5 (15.63%)	6 (3.19)	0.042
CHB	4 (12.5)	9 (4.79)	0.048
TIMI Major Bleeding	3 (9.37)	1 (0.53)	0.003

Dissection found in 7 patients 2 in CIN and 5 in non-CIN patients (p=>0.05). Shock occurred in 8 patients 3 in CIN and 5 in non-CIN (p=0.589). 1 patient had pulmonary edema in CIN group while 9 patients in non-CIN group had pulmonary edema. In CIN group 5

patients need ventilator and in non-CIN patients 6 patients need of ventilator. Complete heart block found in 4 patients in CIN group and 9 patients in non-CIN group had CHB. Major bleeding found in 3 patients in CIN group while 1 patient in non-CIN group had TIMI major bleeding (Table 3). In-hospital mortality was found in 22 (10%) patients in which 13 patients were in CIN group and 9 in non-CIN group (Table 4).

Table No.4: In-hospital mortality between CIN and Non-CIN patients

Mortality	CIN (n=32)	Non-CIN (n=188)	P-value
Yes	10 (31.25)	12 (6.38)	0.001
No	22 (68.75)	176 (93.62)	

DISCUSSION

Contrast induced nephropathy is the most common clinical disorders found in patients who receive primary percutaneous coronary intervention for acute St-segment elevation myocardial infarction.[11] Globally, CIN is associated with high rate of morbidity and mortality and increased length of hospital stay.[12] Present study was conducted to determine the prevalence of contrast induced nephropathy in patients undergoing primary PCI for acute STEMI. In present study majority of patients 75% out of 220 were males while 25% patients were females. We found that mostly patients were ages above 50 years 60% as compared to 40% patients with ages below 50 years. These results showed similarity to many other studies in which male patients population was high 60 to 80% as compared to females and majority of patients 60 to 70% patients were ages above 50 years.[13,14]

In present study, we found 35.91% patients had diabetes mellitus, 46.36% patients had hypertension, smoking found 32.72% patients, 26.36% patients had dyslipidemia, 9.09% patients had family history of CHD and 5.45% patients had chronic kidney disease. A study conducted by Batra et al[15] reported that diabetes mellitus, hypertension, smoking, family history of CHD and chronic kidney disease were the most common co-morbidities found in patients undergoing PPCI for ST-segment elevation myocardial infarction.

In our study contrast induced nephropathy was found in 32 (14.55%). A study Batra et al[15] reported the incidence of contrast induced nephropathy was 12.41%. Some other previous studies showed similarity to our study results regarding frequency of contrast induced nephropathy and reported 10.2% to 19.23%.[16-18]

In present study, we found that patients with contrast induced nephropathy had high rate of complications as compared to patients with non-CIN. These results were comparable to some other studies.[19,20] In this study we found significant difference in length of hospital stay in CIN patients and non-CIN patients 4.02±2.65 days vs 3.42±1.38 days (p=0.016). These results showed similarity to some other studies in which patients with contrast induced nephropathy had increased length of hospital stay as compared to patients with non-CIN.[21,22]

In this study, in-hospital mortality rate was high in CIN patient was 31.25% as compared to non-CIN patients 6.38%. A study conducted by Tsai et al[23] reported 9.4% death in AKI patients as compared to non-AKI patients 1.4%. Another study by Lucreziotti et al[24] reported mortality 20.4% in CIN patients as compared to 2.6%.

CONCLUSION

Contrast induced nephropathy associated with high rate of complication and mortality. We concluded that frequency of contrast induced nephropathy was high and was directly associated with increased mortality, post-operative complications and increased length of hospital stay.

Author's Contribution:

Concept & Design of Study:	Abad ur Rehman Awan
Drafting:	Ali Saqlain Haider, Ali Sajjad
Data Analysis:	Ayesha Tariq, Mateen Akram
Revisiting Critically:	Abad ur Rehman Awan, Ali Saqlain Haider
Final Approval of version:	Abad ur Rehman Awan

Conflict of Interest: The study has no conflict of interest to declare by any author.

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