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ORIGINAL ARTICLE

Contrast Induced Nephropathy in Patients with Acute Coronary Syndrome Undergoing Percutaneous Coronary Intervention

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ABSTRACT

Objective: To determine the frequency of contrast induced nephropathy in patients with acute coronary syndrome undergoing percutaneous coronary intervention.

Material & Methods: This study was conducted on all patients underwent percutaneous coronary intervention between the age of 20 years to 70 years at the Department of Cardiology, Aga Khan University Hospital, Karachi. Percutaneous coronary intervention was performed as per latest ESC guidelines and frequency of CIN was observed among all patients through comparing renal function test from baseline to post-procedure.

Results: A total of 237 patients were included. 180 patients (75.9%) were males & 57 (24.1%) were females, with mean age of 58.94±11.49 years. The mean BMI was 26.76±5.40 kg/m^2. 107 patients (45.1%) had DM, 153 (64.6%) were hypertensive and 100 (42.2%) had left ventricular dysfunction. 205 (86.1%) were in Killip class 1 and 33 (13.9%) were in Killip class 2. The mean pre PCI creatinine was 0.88±0.20 mg/dl. Type of contrast was non-ionic in 235 patients (99.2%). The mean volume of contrast was 201.18±79.15 ml. The mean post PCI (48 hours) creatinine was 0.95±0.27 mg/dl. Contrast induced nephropathy was seen in 5 patients (2.1%)

Conclusion: The frequency of Contrast induced nephropathy in our study was much lower but measures should be taken to further minimize such complication in which patient's quality of life and may be compromised with subsequently higher mortality rates.

Keywords: contrast induced nephropathy, acute coronary syndrome, Primary PCI

INTRODUCTION

Acute coronary syndrome is a broad term in which patients with unstable angina, non-ST segment elevation myocardial infarction (NSTEMI), and ST segment elevation myocardial infarction (STEMI) are included, occurring due to reduction of blood supply to the cardiac cells and ultimately leading to damage and death of the cells, causing significant morbidity and mortality. It has been shown that effective revascularization achieved by angioplasty enhances both in hospital and long-term outcomes in such patients.[1,2] However nephropathy caused by contrasted medium is a known complication in patients underwent percutaneous coronary intervention.[3-7]

Various risk factors such as hypertension, diabetes mellitus, hypotension, congestive heart failure, hypovolemia, chronic renal insufficiency, nephrotoxic drugs and the type and amount of contrast used among patients with ACS may contribute to the development of CIN.[8-10] In a study by Yoon HJ et al. demonstrated a direct relationship between increased contrasted material used with the incidence of CIN.[11] Similarly, the beneficial effect of non-ionic and iso-osmolar dye over ionic and hyperosmolar dye was shown in a multi centered clinical trial.[12] In prior studies an estimated 12% of cases of in hospital acute renal failure (ARF) are as a consequence of contrast administration, making it third leading cause of hospital acquired ARF.[13-15]

Among general population the incidence of CIN undergoing coronary procedures has been estimated to be between 1–6%.[16] The frequency of CIN in India was 10.5%.[17] The data from Pakistan regarding post-angioplasty induced CIN is very limited. Huge numbers are being treated in Pakistan but due to limited data we do not know what the actual burden of this disease is in recent times. That is why we planned to conduct this study to determine the contrast-medium induced nephropathy among patients planned for coronary angioplasty so by knowing this, interventionalist can risk stratify their patients and reduce the rates of complications and also associated mortality.

MATERIAL AND METHODS

A prospective hospital-based study was conducted through convenience sampling technique in the Department of Cardiology, Aga Khan University Hospital, Karachi from 1st Jan 2017 to 1st June 2017. The sample size was estimated using Open Epi online sample size calculator. The statistics considered for ACS patients undergoing percutaneous coronary intervention was 19% (9), 5% bound on the error & 95% level of confidence. The calculated sample size came out as 237 patients. The non-probability consecutive sampling technique was applied. All patients of age between 30-70 years, both male and female, admitted in Cardiology Section of Aga Khan university hospital, either directly or referred to our hospital with the presentation of acute coronary syndrome and undergoing PCI were included. Patients who did not give informed consent, patient with end stage renal disease requiring hemodialysis or patient requiring bypass grafting, who are not amenable to PCI or Killip Class IV due to ACS or patients who self-report that they were taking or taken nephrotoxic drugs in the immediate past 07 days in the history were excluded from the study. After approval from the ethical review committee of AKUH, patients who were admitted in the cardiology department of AKUH undergoing PCI and fulfilling the inclusion criteria were asked to participate in the study. After informed consent, baseline demographic data, Killip class, serum Creatinine level, hemoglobin level and other variables in the questionnaire like diabetes mellitus, hypertension and LV dysfunction were checked and recorded in the study proforma. Creatinine levels was rechecked at 48 hours after PCI and recorded in the proforma to assess for rise of creatinine fulfilling the diagnosis of CIN. No additional laboratory tests were sent for this study, results of laboratory tests that were conventionally done were recorded. For final analysis we used Statistical package for social sciences SPSS (Release 2.6). Mean ± standard deviation was calculated for continuous variables such as patient's age, baseline creatinine, blood pressure, contrast volume, height, and weight. Frequency and Percentage for qualitative variable i.e. gender, hypertension, diabetes mellitus,

presence of LV dysfunction were calculated. Outcome variable contrast induced nephropathy present or absent was compared with age, gender, type and volume of contrast, presence of LV dysfunction, hypertension, and diabetes and Killip class using x^2 test and a p value ≤0.05 was considered statistically significant.

RESULTS

Final analysis was performed on a total of 237 patients with acute coronary syndrome undergoing percutaneous coronary intervention were included in the study. The mean age, height, weight & BMI of the patients were calculated as 58.94 ± 11.49 years, 176.38±8.08 cm, 82.93±12.74 kg & 26.76±5.40 kg/m^2. Out of 237 patients, 75.9% were males & 24.1% were females. The mean volume of contrast was 201.18±79.15 ml, mean pre-PCI creatinine was 0.88±0.20 mg/dl & mean post PCI (48 hours) creatinine was 0.95±0.27 mg/dl. In our study 107 patients (45.1%) had DM, 153 patients (64.6%) were hypertensive and 100 patients (42.2%) had left ventricular dysfunction. Type of contrast was non-ionic in 235 patients (99.2%) and was visi paque in 2 patients (0.8%). Out of 237, 205 patients (86.1%) were in Killip class 1 and 33 patients (13.9%) were in Killip class 2. (Table 1)

Contrast induced nephropathy was seen in 5 patients (2.1%). The distribution of contrast induced nephropathy is presented in Fig 1.

Table no. 02 shows comparison between baseline and clinical characteristics with contrast induced nephropathy. All the variables had insignificant associated with CIN.

Table 1: Characteristics of study variables n=237

Variables	Statistics	
	Mean	SD
Age in years	58.49	11.49
Height (cm)	176.38	8.08
Weight (kg)	82.93	12.74
BMI (kg/m2)	26.76	5.4
Volume of Contrast (ml)	201.18	79.15
Pre PCI-Creatinine (mg/dl)	0.88	0.2
Post PCI Creatinine (mg/dl)	0.95	0.27
	Frequency	%
Diabetes Mellitus		
Yes	107	45.10%
No	130	54.90%
Hypertension		
Yes	153	64.60%
No	84	35.40%
LVD		
Yes	100	42.20%
No	137	57.80%
Type of contrast		
Non-ionic	235	99.20%
Visi Paque	2	0.80%
Killip Class		
1	204	86.10%
2	33	13.90%

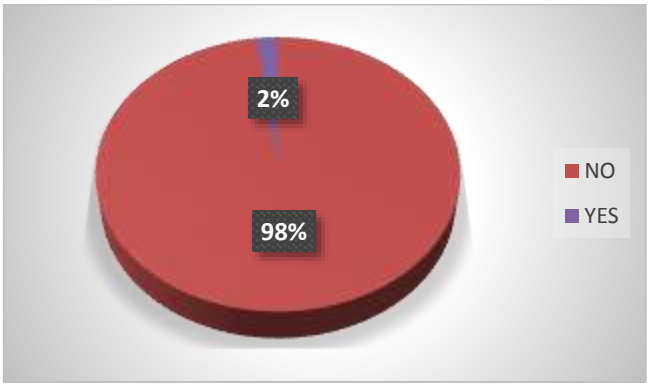

Fig 1: Frequency Distribution Of Contrast Induced Nephropathy

Table 2: Stratification Of Cin W.R.T Effect Modifiers

Variables	CIN		Total	P-value
	Yes	No		
Age groups				
30-60 years	2	137	139	
61-87 years	3	95	98	0.68
Gender				
Male	4	56	60	
Female	1	176	177	0.83
DM				
Yes	4	103	107	
No	1	129	130	0.26
HTN				
Yes	4	149	153	
No	1	83	84	0.85
LVD				
Yes	4	96	100	
No	1	136	137	0.19
Types of contrast				
Non-ionic	5	230	235	
Visi Paque	0	2	2	0.96
Volume of contrast				
35-230	4	173	177	
231-490	1	59	60	0.99
Killip Class				
I	4	200	204	
II	1	32	33	0.97
BMI				
19-35 kg/m^2	5	224	229	
36-52 kg/m^2	0	8	8	0.83

DISCUSSION

Contrast induced nephropathy (CIN) is a serious and a life-threatening complication caused by the dye used during coronary angiography and coronary angioplasty. The exact mechanism is still not well understood, thus patients with normal renal function may also develop CIN. Due to increase in the rates of acute myocardial infarction and advanced facilities available in almost all over the world the frequency of CIN has also increased and unfortunately associated with higher rates of in-hospital mortality and may range up to 10% of all cases underwent coronary intervention.[18]

The overall incidence of CIN in a general population range between 1% to 6% but the highest was observed as in those patients who were diabetics and low eGFR.[16] Study conducted in Iran has shown prevalence of CIN cause by post-angioplasty was 12%.[19] While in our study the frequency of CIN was only 2% which is quite lower than the previously conducted study. Besides patient's characteristics, expertise of interventionalist also plays an important role to prevent patients from procedure induced complications.

In a previously conducted study by Gallagher et al. in 2012 in which cohort of more than 2,200 patients with acute myocardial infarction were included to determine the shot and long term complications who underwent coronary intervention and observed higher death rates following follow-up on short-term and long-term periods and among them patients having age more than 63 years, and females were more likely to have poor prognosis, p <0.001.[20] In our study although there were no significant association observed between CIN and these variables but older males were more frequently had CIN as compared to females, p >0.05. The reason behind this difference could be their older population as in our study the mean age group was 58.49 years. Secondly, they included all the patients who were planned for primary PCI in which chances of CIN would be increased. A local study conducted in Pakistan also showed higher prevalence of CIN (9.6%).[16] While, prevalence from India is also higher (10.05%) but their patient's cohort was elder than ours.[17,21]

Reperfusion therapy in patients with blockage in any of the coronary artery is performed to reduce the mortality rate and also to improve patient's quality of life but on the other hands, it is

utmost necessary to risk stratify these patients who are prone for CIN. Our study only included who underwent elective coronary intervention in such patients, prior precautionary hydration methods was also adopted to reduce the risk of CIN, could be the reason of low prevalence of CIN in our study.

CONCLUSION

The frequency of Contrast induced nephropathy in our study was much lower but measures should be taken to further minimize such complication in which patient's quality of life and may be compromised with subsequently higher mortality rates.

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