ORIGINAL ARTICLE

Frequency of Contrast-Induced Nephropathy in Patients Undergoing PCI

MUHAMMAD ZAFARULLAH[1], GULSHAN AHMAD[1], MUHAMMAD SULEMAN KHAN[1], MUHAMMAD AHMAD RAZA BUTT[2], UMAR FAROOQ[3], MUHAMMAD IMRAN ASHRAF[4].
[1]Punjab institute of cardiology Lahore, Punjab, Pakistan
[2]Hameed Latif Teaching Hospital, Lahore, Punjab, Pakistan
[3]Rashid Latif College of Pharmacy, Rashid Latif Khan University, Lahore, Punjab, Pakistan
[4]Associate Professor Pharmacology, Allama Iqbal Medical College, Lahore, Punjab, Pakistan.
Correspondence to: Muhammad Zafarullah

ABSTRACT

Background: Contrast-induced nephropathy (CIN) is accompanied by a considerable increase in illness and death following percutaneous coronary intervention (PCI).

Aim: The present work aims to detect the frequencies of patients with different risk factors that affected how much with CIN Percutaneous coronary intervention.

Methodology: This is a planned distinct study that included 200 patients that received PCI at the Punjab Institute of Cardiology in Punjab, Pakistan. Regarding the baseline values, a CIN was described as a 25 percent or 0.5 mg/dl increase in serum creatinine after 48 hours following PCI. Several reliable indicators of CIN were examined in this study like patient's demographics (age and gender), Body mass index (kg/m^2), Co-morbidities and Serological parameters as well as angiographic and practical characteristics of patients.

Results: Out of 200 patients, (11%) developed contrast nephropathy and the (89%) didn't. CIN patients were found to be older, more commonly males, more likely to have Diabetes mellitus, dyslipidemia as well as Hypertension, and higher levels of peak creatine kinase and LDL (mg/dl). In the CIN group, the causative artery was found in the left anterior descending artery more frequently and the patients (100%) in the CIN group who received contrast volume > 100ml developed CIN more frequently, significantly than those without CIN (22.4%,), at p< 0.001.

Keywords: Percutaneous coronary intervention, Contrast-induced nephropathy, serum creatinine, diabetes, and hypertension.

INTRODUCTION

Percutaneous coronary intervention (PCI) is a lifesaving technique in the treatment of acute coronary syndrome, and it enhances the worth of life in patients with established coronary artery ailment. However, it is possible to develop Contrast-Induced Nephropathy (CIN) after undergoing PCI due to the administration to contrast material during the treatment (1). In contrast to other causes of hospital-acquired severe kidney impairment, contrast-induced nephropathy (CIN) is induced by severe renal damage produced due to contrast media. In the $48 - 72$ hour period following the injection of radiographic contrast media, CIN is well-defined as "a 25 percent rise in serum creatinine from the baseline value, or an exact elevation of at most 0.5 mg/dL (44.2 mmol/L)" (2).

Although the exact cause of renal tubular epithelial toxicity (RTE) is not known, however, it is believed that it is caused by a toxic effect on the renal tubular epithelium, oxidative stress, ischemia injury, and obstruction of renal tubules (RTO) (3). Higher intratubular pressure as a consequence of contrast-induced diuresis, in addition to heightened perivascular hydrostatic pressure, may lead to medullary hypoxia as a result of reduced medullary blood flow in some patients (4). If there is a loss of balance between vasoactive chemicals (such as endothelin and adenosine) and vasodilators (nitric oxide and prostaglandins), renal ischemia may occur (5). A significant amount of urine is required to flush the body of the high osmotic load of the contrast medium. Due to the high osmotic load, the kidneys develop the distinctive histological alterations of osmotic nephritis, which manifests itself as morphological changes characterized by inflammation and vacuolization of the renal proximal tubular cells (RPT) (6).

A significant number of patients are undergoing PCI as a result of advancements in device technology and the development of new antithrombotic therapies (7). Therefore, the current study aimed to detect the frequencies of patients with different risk factors that affected with CIN during Percutaneous coronary intervention.

MATERIALS AND METHODS

Study design and data collection: This study was carried out at Punjab Institute of Cardiology, Lahore, among a group of 200 patients. This was a cross-sectional, quantitative study, and data related to patients under study were collected from the record department. The study approach was certified by the local Ethics Review committee as well as written informed agreement was taken from all participants before angiography was performed. All information was kept secret under a password-protected laptop. No data related to any patient understudy was revealed to anyone. To maintain secrecy, numbers were assigned to each patient.

Study variables: In this study, both males and females of any age with unstable angina or non− ST-segment elevation myocardial infarction were included. A questionnaire was designed to record data about patients demographics (age and gender), Body mass index, co-morbidities (Diabetes mellitus, hypertension, smoking, and dyslipidemia), and serological parameters (Total cholesterol, serum creatinine, low-density lipoprotein, triglycerides, high-density lipoprotein, peak creatine kinase as well as angiographic and procedural characteristics of patients including unstable angina and myocardial infarction with non-ST-segment elevation; AMI and the culprit artery; as well as coronary heart disease in general. All patients were subjected to an echocardiographic evaluation at the time of their arrival. After contrast medium exposure, serum creatinine (SCr) levels were assessed on days 1, 2, 7, and 30 following admission (the baseline measurement). The standard clinical practice called for emergency PCI to be conducted by a 24-hour-on-call interventional team.

Exclusion criteria: Patients were removed from the trial if lacked sufficient required information. Those who couldn't undergo PCI because of their coronary anatomy or needed an urgent bypass transplant were excluded. Patients who require longer hemodialysis or peritoneal dialysis, as well as those who were in cardiogenic shock upon admission, were disqualified for this study.

Statistical analysis: The data analysis was carried out with the help of the SPSS v.20 statistical programs (IBM SPSS, Inc.). The mean of continuous variables, whereas the frequencies of categorical data is demonstrated. Student's t-test was employed to compare different variables. Chi square and fisher's exact test were used to compare categorical data. P-value of < 0.05 for different parameters were considered to be significant.

RESULTS

In total, 200 recurrent patients with an average age of 66.11 years were recruited in the current study. There was a total of 200 individuals, with 22 patients (11 percent) developing contrast-induced nephropathy and the remaining 178 patients (89 percent)

not developing CIN. The basic features of the participants are listed in Table 1. According to the findings, the patients who acquired contrast-induced nephropathy were typically old age (66 ± 12) and male, more probable to have diabetes, dyslipidemia, and hypertension, and to have higher levels of peak creatine kinase and LDL (mg/dl) than the general population. The serum creatinine levels of the two groups were not different significantly. It was higher in the CIN group.

Table 1: Baseline features of the patients

Variable	Contrast-induced nephropathy		p-value
	Yes (n = 22)	No (n = 178)	
Age	66 ± 12	64 ± 10	0.05
Age > 75 years	7 (31.8 %)	34 (19.1 %)	0.03
Gender (male)	15 (68.1 %)	141 (79.2 %)	0.02
BMI (kg/m^2)	23.8 ± 3.3	24.1 ± 3.7	0.43
Co-morbidities			
Diabetes mellitus	9 (40.9 %)	53 (29.7 %)	0.07
Hypertension	15 (68.1 %)	107 (60.1 %)	0.23
Smoking	11 (50 %)	110 (61.7 %)	0.06
Dyslipidemia	14 (63.6 %)	133 (74.7 %)	0.04
Serological parameters			
Serum creatinine (mg/dl)	0.92 ± 0.47	0.82 ± 0.48	0.30
Total cholesterol (mg/dl)	182 ± 44	185 ± 42	0.54
Triglycerides (mg/dl)	103 ± 71	117 ± 83	0.14
LDL (mg/dl)	118 ± 48	117 ± 45	0.98
HDL (mg/dl)	44 ± 17	45 ± 18	0.87
Peak creatine kinase (U/L)	4,049 ± 3,639	3,095 ± 2,911	0.01

"BMI: Body mass index, LDL: Low-density lipoprotein, HDL: High-density lipoprotein"

Table 2 lists the geographic and surgical characteristics of patients who had surgery. It was discovered that the culprit artery in the CIN group was the left anterior descending artery, found more frequently, and the patients (100 percent) in the CIN group who got contrast volume > 100ml established CIN more frequently than those who did not develop CIN (22.4 percent), which was statistically significant at P < 0.001.

Table 2: Angiographical and procedural properties of patients

Variable	CIN		P-value
	Yes (22)	No (178)	
Unstable angina/NSTEMI	1 (4.5 %)	12 (6.7 %)	0.56
AMI	21 (95.4 %)	165 (92.6 %)	0.43
Culprit artery			
Left main artery	1 (4.5 %)	4 (2.2 %)	0.32
LAD	14 (63.6 %)	84 (47.2 %)	0.003
LCX	2 (9 %)	12 (6.7 %)	0.64
RCA	5 (22.7 %)	78 (42.8 %)	< 0.001
Contrast volume ≥ 100 ml, no. (%)	22 (100 %)	40 (22.4 %)	< 0.001

NSTEMI: Non– ST-segment elevation myocardial infarction; LAD: Left anterior descending, LCX: Left circumflex artery; RCA: Right coronary artery

DISCUSSION

Percutaneous coronary intervention (PCI) is a life-protecting treatment for several sufferers, and it plays an important role in the field of interventional cardiology as a result of this. As the frequency of cardiac interventions rises, so do the number of problems, such as coronary artery disease (CAD). CIN is a substantial basis of mortality and morbidity after PCI. Risk assessment is therefore essential in the screening of patients that are at greater threat for CIN.

The prevalence of CIN has been reported in a variety of research, with the current study reporting a frequency of 11 percent. According to a study performed by Victor et al (2), it is 9.7 percent, 13.1 percent according to research made by Mehran et al (8), and 5.5 percent according to research published by Amal Abdel Ghani et al (9). According to a study conducted by McCullough et al (10), the prevalence of CIN in individuals receiving PCI is 14.5 percent in their sample. Approximately one-third of all patients receiving emergency PCI for acute myocardial infarction will acquire CIN, according to recent research by Marenzi et al (11).

The current study's strength was that it found numerous predictor variables of CIN in patients who were treated with PCI. In current research work, factors such as Hypertension, Diabetes mellitus, left anterior descending artery, peak creatine kinase (U/L), and contrast volume were investigated for their possible association with CIN after PCI. In addition, the prevalence of CIN was found to be associated with the male gender and in contrast to present work, Kiski et al. (12) reported female gender as significantly associated with higher occurrence of CIN. Our findings are consistent with those of earlier research in that older age (8, 13) and male gender (9, 13) are also predictors of CIN. The observed connections between CIN and all these characteristics reflect that several factors play a vital role to increase the incidence of CIN and the mortality of patients with the disease. These findings are consistent with those of Victor et al (2). Various studies have been conducted in past, Diabetes mellitus is a reliable predictor of contrast induced nephropathy (10, 13).

Several previous studies have provided evidence to support the other recognized risk variables in the current study, such as hypotension (8, 14), and a high contrast volume (8, 15), which together form the remaining elements of this risk scoring system. The results of Fu et al (16) with reference to hypertension and contrast volume were also consistent with present work. Dosage of contrast volume is also important factor for the development of CIN after PCI. The outcomes of present work are in line with studies of Lakovou et al. (17) with the results that prevention of contrast-induced renal failure is possible with use of lesser volumes of contrast. Higher contrast volumes are directly associated with higher incidences of CIN after PSI (10).

There were some study weaknesses in the current investigation. This is attributed to the fact that the current study comprised a limited sample at a single location. Finally, it is argued that these findings will serve as a valuable indicator for the emergence of CIN following immediate PCI and that patients with CIN should be treated with caution.

CONCLUSION

From the results of present study, it is concluded that incidence of Contrast induced nephropathy after PSI treatment is 11% in our setting and it is directly related to various factors including gender sometime but particularly, different risk factors including diabetes mellitus, hypertension and contrast volume are found most important factor. These factors are commonly found associated with occurrence of CIN.

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