DOI: https://doi.org/10.53350/pjmhs211582515

ORIGINAL ARTICLE

Contrast Induced Nephropathy; Prevalence and Associated Risk Factors in Patients Undergoing Multi-vessel Percutaneous Coronary Intervention (PCI)

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ABSTRACT

Objective: To examine the prevalence and associated risk factors of contrast induced nephropathy in patients undergoing multi-vessel percutaneous coronary intervention (PCI).

Study Design: Prospective/Observational

Place and Duration: The study was conducted at the cardiology department of DHQ Teaching Hospital, Sargodha and Wazirabad Institute of Cardiology, Wazirabad for duration of six months from October 2020 to March 2021.

Methods: Total 135 patients of both genders with ages 20 to 80 years undergoing percutaneous coronary intervention were enrolled in this study. Patients' detailed demographics were recorded after written consent. Contrast induced nephropathy was defined as serum creatinine >0.5mg/dl from baseline value. Risk factors associated with CIN were examined; Data was analyzed by SPSS 23.0.

Results: Out of 130 patients 90 (66.7%) were males while 45 (33.3%) were females with mean age 54.87±12.44 years. We found contrast induced nephropathy in 27 (20%) patients. Anemia, diabetes mellitus, hypertension, contrast volume >150ml, congestive heart failure and age >70 years were significantly associated risk factors of contrast induced nephropathy with p-value <0.05.

Conclusion: It is concluded that the incidence of contrast induced nephropathy in patients undergoing PCI is high. Significant risk factors for CIN were anemia, age >70 years, diabetes mellitus, contrast volume >150ml and heart failure.

Keywords: Percutaneous Coronary Intervention, Contrast Induced Nephropathy, Risk Factors.

INTRODUCTION

In contrast-induced nephropathy (CIN), acute renal failure occurs as a result of contrast exposure and is therefore reversible. PCI-related CIN has been linked to higher morbidity, including the requirement for short-term hemodialysis, extended hospitalization, and permanent renal function impairment [1]. CIN is a significant consequence of PCI. Most notably, the emergence of CIN is linked to an increase in short-term and long-term mortality [2].

Patients with coronary artery disease (CAD) have a significant frequency of chronic kidney disease (CKD), with estimates ranging from 23 percent to 46 percent in various studies [3-5]. Cardiovascular events are more common in CKD patients [6-8] than in the overall population. More than half of those who die from end-stage renal disease (ESRD) do so from cardiovascular disease [9]. Raise the risk of death, cardiovascular events, and hospitalization by reducing renal function in large groups of people [8, 10].

The use of radiographic contrast in increasingly sophisticated cardiac interventional procedures is increasing the frequency of renal failure in this high-risk population receiving coronary intervention [11]. This has a direct impact on mortality, as demonstrated by Brown et al., who found that both transitory and persistent postprocedural renal impairment were associated with an increased risk of death during long-term follow-up [12].

Preexisting clinical and periprocedural variables, which are consistent with the theorized pathological processes of CIN, can be used to assess an individual's risk of acquiring CIN, as mentioned in the following sections. Most typically, a pre-existing stage III chronic renal disease (eGFR 60 mL/min/1.73m2) for more than three months is associated with an increased risk of CIN; nevertheless, CIN can emerge even in the absence of an underlying eGFR abnormality when several other risk factors are present. [13 Through the use of risk score systems, doctors have been able to estimate the likelihood of CIN and target prophylactic medications based on the results of cohort studies[14,15].

The purpose of this study is to examine the prevalence and associated risk factors of contrast induced nephropathy in patients undergoing multi-vessel percutaneous coronary intervention (PCI).

MATERIALS AND METHODS

This prospective/observational study was conducted the cardiology department of DHQ Teaching Hospital, Sargodha and Wazirabad Institute of Cardiology, Wazirabad for duration of six months from October 2020 to

March 2021.Total 135 patients of both genders with ages 20 to 80 years undergoing percutaneous coronary intervention were enrolled in this study. Patients detailed demographics including age, sex and co-morbidities such as diabetes mellitus, anemia, hypertension, smoking, heart failure and family history of CAD were recorded after taking informed written consent from all the patients/attendants. Patients <20 years of age, patients with pre-existing imapired renal functions and those with no consent were excluded.

Contrast induced nephropathy was defined as increase in serum creatinine >0.5mg/dl from baseline to 48hours post procedure. Frequency of CIN was recorded. Predictors of contrast induced nephropathy were examined such as anemia, diabetes mellitus, hypertension, contrast volume, congestive heart failure and age. All the data was analyzed by SPSS 23.0. Mean±SD was done. Frequencies and percentages were recorded in tabulation form. Chi-square, student t test was applied to examine the risk factors associated with CIN with p-value <0.05 was taken as significant.

RESULTS

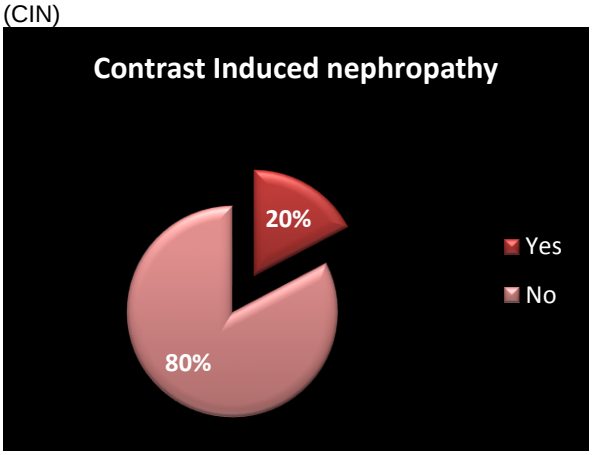
Out of 130 patients 90 (66.7%) were males while 45 (33.3%) were females with mean age 54.87±12.44 years. Anemia was found in 42 (31.1%) patients, diabetes mellitus found in 55 (40.8%) patients, hypertension in 84 (62.2%) patients, smoking found in 57 (42.2%) patients, family history of CAD found in 24 (17.8%) patients, congestive heart failure found in 17 (12.6%) patients. Mean serum creatinine at baseline was 2.01±1.18mg/dl. 49 (36.3%) patients had contrast volume >150ml and 86 (63.7%) had contrast volume <150ml. (table 1)

We found contrast induced nephropathy in 27 (20%) patients. (Figure 1)

Table No 1: Demographic of all the patients

Characteristics	Frequency No.	%age
Mean age (yrs)	54.87±12.44	-
Gender		
Male	90	66.3
Female	45	33.3
Co-morbidities		
Hypertension	84	62.2
Diabetes Mellitus	55	40.8
Smoking History	57	42.2
Family history of CAD	24	17.8
CHF	17	12.6
Contrast Volume		
>150 ml	49	39.3
<150 ml	86	60.7
Mean Serum Creatinine(mg/dl)	2.01±1.18	-

Figure No 1: Incidence of contrast induced nephropathy (CIN)



According to the risk factors associated with contrast induced nephropathy age above 70 years, diabetes mellitus, anemia, hypertension, contrast volume >150ml, and congestive heart failure were the significant risk factors with p-value <0.05. (table 2)

Table No 2: Risk factors associated with contrast induced nephropathy

Characteristics	Frequency No.	CIN Yes (n=27)	CIN No (n=108)	P-value
Age >70 years	20	15 (55.55)	5 (4.7)	0.002
Hypertension	84	19 (70.4)	65 (60.3)	0.038
Diabetes Mellitus	55	16 (59.3)	39 (36.1)	0.027
Smoking History	57	12 (44.4)	45 (41.7)	N/S
Family history of CAD	24	5 (18.5)	19 (17.6)	N/S
CHF	17	14 (51.9)	3 (2.8)	0.009
>150 ml	49	20 (74.1)	29 (26.9)	0.004

DISCUSSION

Percutaneous coronary intervention (PCI) is one of the most performing technique in all over the world and contrast induced nephropathy is one of the most prominent cause of morbidity and mortality in PCI patients [16,17]. Many of studies have been undertaken to assess the frequency of CIN in patients after percutaneous coronary intervention and reported high prevalence of CIN 3 percent to 40 percent with high risk of death and morbidity [18,19]. This research was done to see how often patients who had a percutaneous coronary intervention (PCI) developed coronary artery disease (CIN) and what the risk variables were. In this regard 135 patients were analyzed in which majority 66.7% were male while 33.3% were female and majority of patients 74.1% were ages 40 to 60 years. These results showed similarity to several previous studies in which male patients population was high 60% to 78% as compared to females and the average age in these studies was 55.8 years [20,21].

In present study the incidence rate of contrast induced nephropathy was 20% while 80% patients had no CIN. The incidence of contrast-induced nephropathy in PIC patients ranged from 10% to 38% in other investigations [22,23].

We discovered that anemia, diabetes mellitus, age over 70 years, hypertension, contrast volume >150ml, and heart failure were the independent risk variables substantially linked with contrast induced nephropathy with a p-value of 0.05. According to Ahmad F et al [24], diabetes mellitus, being over 65 years old, having heart failure, and the amount of contrast used in the procedure are all risk factors for contrast induced nephropathy. Other investigations have shown that risk factors for CIN are comparable to those found in our study [25,26].

Diabetes mellitus, hypertension, age >75 years, and contrast volume 100 ml were all found to be risk factors for CIN in a research by sasidharan M et al [27]. Anemia and contrast volume were found to be major risk factors for CIN by Valappil SP et al [28].

The Mayo Clinic PCI Registry underwent a retrospective study, and the results showed that patients with CIN had considerably higher short-term mortality. When it comes to in-hospital mortality, the difference between patients who developed CIN and those who did not was statistically significant (p 0.0001) of 254 patients (3.3%), with a mortality rate of 22% for those individuals [29]. Diabetics were shown to be more likely than non-diabetics to have CIN in the same study. In contrast to prior findings from the Mayo clinic and Victor's observation, where 0.5 percent of patients died as a result of CIN [30], the current study demonstrated a greater CIN without any mortality.

CONCLUSION

One of the most common causes of complication and death in patients receiving percutaneous coronary intervention is contrast-induced nephropathy. We came to the conclusion that contrast-induced nephropathy occurs often in patients undergoing PCI. Anemia, age >70 years, diabetes mellitus, contrast volume >150ml, and heart failure were all significant risk factors for CIN.

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