

# Determine the Prevalence and Associated Risk Factors of Contrast Induced Nephropathy in Patients Undergoing Percutaneous Coronary Intervention

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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.

**Study Design:** Prospective/Observational

**Place and Duration of Study:** This study was conducted at the Department of Cardiology, Bolan Medical Complex Hospital Quetta from July 2019 to December 2019.

**Materials and Methods:** One hundred and fifty patients of both genders with ages 20 to 80 years undergoing percutaneous coronary intervention were enrolled in this study. Patient's detailed demographics were recorded after written consent. Contrast induced nephropathy was defined as serum creatinine  $\geq 0.5$ mg/dl from baseline value. Risk factors associated with contrast induced nephropathy were examined.

**Results:** There were 105 (70%) males and 45 (30%) were females with mean age  $57.64 \pm 7.28$  years. Contrast induced nephropathy was found in 26 (17.33%) patients. Anemia, diabetes mellitus, hypertension, contrast volume  $>150$ ml, congestive heart failure and age  $>70$  years were significantly associated risk factors of contrast induced nephropathy with p-value  $<0.05$ .

**Conclusion:** The incidence of contrast induced nephropathy in patients undergoing percutaneous coronary intervention is high. Significant risk factors for contrast induced nephropathy were anemia, age  $>70$  years, diabetes mellitus, contrast volume  $>150$ ml and heart failure.

**Key Words:** Percutaneous coronary intervention (PCI), Contrast induced nephropathy (CIN), Risk factors

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## INTRODUCTION

Contrast induced nephropathy is an important and well-known complication in patients with chronic renal insufficiency undergoing both coronary angiography and coronary interventions. The estimated incidence of contrast nephropathy after coronary angiography was around 15%. In fact, CIN is the third leading cause of acute renal failure in hospitalized patients.<sup>1</sup>

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Contrast induced nephropathy is usually transient disorder, but in some cases may result in residual permanent renal damage, prolong hospital stay and increase medical cost.<sup>2</sup> Renal failure increases the risk of developing severe nonrenal complications that can lead to death. The mortality rate in subjects without renal failure was 7%, compared with 34% in patients with renal failure.<sup>3</sup> Contrast induced nephropathy is an important cause of nosocomial renal impairment. This deleterious effect of contrast agents on renal function is defined as an impairment of renal function with increase in serum creatinine level by more than 25% or  $44 \mu\text{mol/l}$  occurring within 3 days after intravascular administration of contrast agents and in the absence of alternative cause.<sup>4</sup>

Reported incidence of CIN varies ( $<2$  to 30%) depending up on the study population, the prevalence of associated risk factors and the definition of CIN.<sup>5-7</sup> Patients undergoing coronary angiography or PCI have the highest CIN incidence compared to other procedures using contrast media for diagnostic or therapeutic purposes. The risk factors predicting contrast induced nephropathy consists of 5 patient related factors including creatinin clearance, diabetes

mellitus, congestive heart failure, hypertension and peripheral vascular disease, along with 3 procedure-related factors including intra-aortic balloon pump usage, contrast volume >260 ml and urgent/emergency procedure.<sup>8-10</sup> The present study was conducted to examine the incidence and predictors of contrast induced nephropathy in patients of high risk undergoing percutaneous coronary interventions.

## MATERIALS AND METHODS

This prospective/observational study was conducted at Department of Cardiology, Bolan Medical Complex Hospital Quetta from 1<sup>st</sup> July 2019 to 31<sup>st</sup> December 2019. A total of 150 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 impaired renal functions and those with no consent were excluded. Contrast induced nephropathy was defined as increase in serum creatinine  $\geq 0.5$ mg/dl from baseline to 48 hours 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 24. 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

One hundred and five (70%) patients were males while 45 (30%) were females with mean age  $57.64 \pm 7.28$  years. Anemia was found in 50 (33.33%) patients, diabetes mellitus found in 64 (42.67%) patients, hypertension in 90 (60%) patients, smoking found in 60 (40%) patients, family history of CAD found in 28 (18.67%) patients, congestive heart failure found in 21 (14%) patients. Mean serum creatinine at baseline was  $1.18 \pm 0.43$ mg/dl. 48 (34.67%) patients had contrast volume >150ml and 102 (65.33%) had contrast volume <150ml (Table 1).

Contrast induced nephropathy was found in 26 (17.4%) patients while 124 (82.6%) had no CIN (Table 2). 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 3)

**Table No.1: Demographic information of all the patients**

Variable	No.	%
Age (years)	57.64±7.28	
Gender		
Male	105	70.0
Female	45	30.0
Co-morbidities		
Hypertension	90	60.2
Diabetes Mellitus	64	42.8
Smoking History	60	40.0
Family history of CAD	28	18.8
CHF	21	14.2
Contrast volume		
≥150 ml	48	34.7
<150 ml	102	65.3
Serum creatinine (mg/dl)	1.18±0.43	

**Table No.2: Incidence of contrast induced nephropathy (CIN)**

CIN	No.	%
Yes	26	17.4
No	124	82.6

**Table No.3: Risk factors associated with contrast induced nephropathy**

Variable	CIN		P value
	Yes	No	
Age >70 years	12 (46.15)	6 (4.84)	0.001
Hypertension	18 (69.23)	72 (58.06)	0.041
Diabetes Mellitus	17 (65.38)	47 (37.90)	0.032
Smoking History	10 (38.46)	50 (40.32)	N/S
Family history of CAD	4 (15.38)	24 (19.35)	N/S
CHF	13 (50)	8 (6.45)	0.001
$\geq 150$ ml	21 (80.77)	27 (21.77)	0.001

## DISCUSSION

Percutaneous coronary intervention is one of the most performing procedure in all over the world and contrast induced nephropathy is one of the most important cause of morbidity and mortality in PCI patients.<sup>11,12</sup> Many of studies have been conducted to examine the frequency of CIN in patients undergoing percutaneous coronary intervention and reported high prevalence of CIN 3% to 40% with high rate of mortality and morbidity.<sup>13,14</sup> We conducted this study with aimed to examine the frequency of CIN and risk factors associated with CIN in patients whom were received percutaneous coronary intervention at our institute. In this regard 150 patients were analyzed in which majority 70% were male while 30% were female and majority of patients 68% were ages 40 to 60%.

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.<sup>15,16</sup>

This study showed that the incidence rate of contrast induced nephropathy was 17.33% while 82.67% patients had no CIN. A study conducted by Mandal et al<sup>17</sup> reported the frequency of CIN was 13.20% among 152 patients whom were received PCI. A meta-analysis regarding prevalence of CIN in patients undergoing PCI conducted by He et al<sup>18</sup> in 2019 and they reported that the frequency of CIN was 13.3%. Some other previous studies demonstrated that the incidence rate of contrast induced nephropathy in PIC patients was 10% to 38%.<sup>19,20</sup>

In the present study we found that anemia, diabetes mellitus, age above 70 years, hypertension, contrast volume >150ml and heart failure were the independent risk factors significantly associated with contrast induced nephropathy with p-value <0.05. A study conducted by Sasidharan et al<sup>21</sup> reported that diabetes mellitus, hypertension, age >75 years and contrast volume ≥100 ml were the risk factors significantly associated with CIN (p>0.001). Valappil et al<sup>22</sup> demonstrated that anemia and contrast volume were the significantly associated risk factors of CIN.

A study conducted in Pakistan by Ullah et al<sup>23</sup> reported that diabetes mellitus, age above 65 years, heart failure and contrast volume were the risk factors associated with contrast induced nephropathy. Some other studies demonstrated the similar findings to our study regarding risk factors of CIN.<sup>24,25</sup>

## CONCLUSION

Contrast induced nephropathy is one of the commonest cause of complication and mortality in patients undergoing percutaneous coronary intervention. We 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.

### Author's Contribution:

Concept & Design of Study:	Dost Muhammad
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**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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