CODEN (USA): IAJPBB ISSN: 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

http://doi.org/10.5281/zenodo.293710

Available online at: http://www.iajps.com Research Article

IMPACT OF PERCUTANEOUS CORONARY INTERVENTION IN PATIENTS WITH MILD RENAL DYSFUNCTION AND ITS IMPACT ON IN-HOSPITAL OUTCOME

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Received: 28 December 2016 **Accepted:** 28 January 2017 **Published:** 15 February 2017

Abstract:

Objective: *To observe impact of percutaneous coronary intervention in patients with mild renal dysfunction and its impact on in-hospital outcome.*

Patients and Methods: *This is descriptive case series study conducted at department of Cardiology at Liaquat University Hospital, Jamshoro From 11-02-2015 to 11-08-2015. Total 50 patients who satisfy KDOQI criteria for mild renal disease and underwent PCI were included in the study. Contrast medium was injected. Pre and post PCI level of serum creatinine was estimated. GFR was calculated by CKD-EPI equation. Patient was discharge after seven days and followed after one week. Descriptive statistics were calculated. Chi-square and T-test was used as applicable. The p-value ≤0.05 was considered as significant.*

Results: *There were 46 male and 4 female patients. Mean age was 50.48±6.61 years. 24% PCI for RCA & LAD, 42% for LAD, 30.0% for RCA, and 4.0% for LCx was done. The mean volume of contrast used was 158.20±30.88 ml. Mean difference of urea at base line and after 72 hrs is significant with P-value 0.000. Mean difference of creatinine at base line and after 72 hrs is not significant with P-value 0.280 but it was significant between after 24 hrs and after 72 hrs with P-value 0.023. Acute renal failure was 24.0%, hemodialysis was 6.0% cases, and in 70.0% cases no remarkable change in renal function was observed.*

Conclusion: *Patients with baseline elevation of serum Cr-concentration were at risk of ARF after PCI and increased in risk of in-hospital development of renal disease.*

Key Words: *Percutaneous Coronary Intervention, Mild Renal Dysfunction, In-Hospital Outcome.*

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Please cite this article in press as Syed Fasih Ahmed Hashmi et al, ***Impact of Percutaneous Coronary Intervention in Patients with Mild Renal Dysfunction and Its Impact on In-Hospital Outcome****, Indo Am. J. P. Sci, 2017; 4(01).*

INTRODUCTION:

Cardiovascular disease accounts for over 50% of mortality among patients with chronic kidney disease before reaching end-stage renal disease[1].The prevalence of chronic kidney disease continues to increase worldwide, and the relationship between renal impairment (RI) and risk of coronary artery disease is well established [2].Patients with RI typically present with advanced and more complex coronary artery disease compared to patients without RI, as indicated by a higher proportion of multivessel disease, left main disease, ostial lesions, heavily calcified lesions, and lesions located in vein grafts.[3] Percutaneous coronary intervention (PCI) is the most commonly utilized revascularization modality for treatment of CAD both in patients with acute coronary syndromes (ACS) and those with stable ischemic heart disease (SIHD)[4]. In patients undergoing coronary revascularization for either stable coronary artery disease or acute myocardial infarction, CKD is one of the strongest risk factors for short- and long term mortality[5]. There is evidence that coronary revascularization reduces the cardiac mortality and improves prognosis compared to medical treatment for CKD patients with CAD[6]. With regard to evidence of best mode of coronary revascularization, percutaneous coronary intervention (PCI) are two alternative methods, but it remains controversial as which one is associated with reduced major adverse cardiac and cerebral events (MACCE), reduced risk of worsening kidney function and need of hemodialysis and reduced in-hospital stay for CKD patients[7]. PCI in patients with CKD is also high-risk due to their increased incidence of worsening kidney function, restenosis, and mortality[8]. To the best of our knowledge, there is paucity of prospective study results on clinical outcomes of CKD in patients undergoing coronary revascularization as well as optimal strategy for coronary revascularization which is associated with lower risks of cardiovascular mortality and morbidity in resource constraint countries of South-Asian region particularly Pakistan[4]. There are few studies of patients with mild to moderate abnormalities of renal function who have coronary artery disease, although this population is quite large[9]. The third National Health And Nutrition Examination Survey (NHANES) found creatinine levels ≥1.5 mg/dL (132.6 µmol/L) in 9.74% of men and 1.78% of women. The association between chronic kidney disease (CKD) and adverse cardiovascular prognosis has been well established from large community-based studies[10]. This association has been observed in patients with a history of myocardial infarction (MI) and congestive heart failure, as well as after coronary artery bypass grafting surgery or percutaneous coronary interventions [11]. However, between CKD and non-CKD patients, the importance of stress MPI for patients with no evidence of CAD is unclear[12].

Renal dysfunction significantly increases the risk of death and cardiac death during and after PCI in a dose-dependent manner. Thus, this study was conducted to observe impact of percutaneous coronary intervention in patients with mild renal dysfunction and its impact on in-hospital outcome.

PATIENTS AND METHODS:

This is descriptive case series study conducted at department of Cardiology at Liaquat University Hospital, Jamshoro From 11-02-2015 to 11-08-2015. The inclusion criteria of the study were age between 30 to 60 years in both sexes who underwent percutaneous coronary intervention, patients who presented with chest pain lasting more than 30 minutes with electrocardiographic changes suggestive of acute coronary syndrome, patients associated with or without diabetes mellitus and hypertension, all the Patients satisfying the KDOQI criteria for mild renal disease and those who consent to participate. While the exclusion criteria of the study were patients who were < 30 years and > 60 years of age, who didn’t give the consent, patients who did not satisfy kidney disease outcome quality initiative (KDOQI) criteria for mild renal failure and the patients whose coronary anatomy was not suitable for PCI. After informed consent all the patients meeting inclusion criteria were included in the study, the Patients were selected from coronary care unit (C.C.U). The treatment procedure was done by a well experienced consultant cardiologist. For the procedure the patient was injected a contrast medium (NON-IONIC dye) via femoral artery. Pre and post PCI level of serum creatinine was estimated and the patient was kept under observation in cardiac emergency for a period of 1 week. Severity of renal disease was assessed by KDOQI criteria and GFR of the patients was calculated by CKD-EPI equation. Patient was discharge after seven days and was followed after one week. Regarding safety profile of the patients participated in this study if deteriorate or become vitally unstable then emergency effective measures including nephrologist and physician opinion was taken accordingly on priority basis. The data of all patients were entered and analyzed in SPSS version 16.00. The categorical variables were expressed as frequency and percentage. Continuous variable such as age, was expressed as mean±SD. Pre and post intervention results were assessed in relation to age, gender and serum creatinine level. The post stratification chi-square test was applied on categorical variables and student T-test for continuous variables at 95% confidence interval and the p-value ≤0.05 was considered as statistically significant.

RESULTS:

The results showed that there were 46 male and 4 female patients. The frequency distribution is presented in Table-1. The overall mean age of study subjects was 50.48±6.61 years, with range of 24 years. The results about comorbids showed that among all study subjects, 86.0% were smokers, 56.0% patients were hypertensive, 46.0% patients were diabetes, ischemic heart disease was present in 24.0% patients, and 4.0% patients also had family history of CAD.

The percentage and severity of stenosis was recorded in terms of range and all patients were of severe stenosis and presented in Table-02. As far as lesions are concerned it was observed RCA was involved in 4.0%, distal RCA was involved in 6.0%, mid RCA was involved in 8.0%, proximal RCA was involved in 20.0%, LAD was observed in 2.0%, mid LAD was observed 18.0%, proximal LAD was observed in 36.0%, mid LAD & mid RCA was observed in 2.0%, and proximal LCx was observed in 4.0%cases. The frequency distribution is presented in Table-03. Among 74.0% cases single vessels was involved and in remaining 26.0% cases, 2 vessels disease was found. PCI for RCA & LAD was done in 24.0% cases, PCI for LAD was done 42% cases, PCI for RCA was done in 30.0% cases, PCI for LCx was done in 4.0% cases. The overall mean volume of contrast was 158.20±30.88 ml/min, with range of 130 ml/min. The comparisons of mean value of urea and creatinine at baseline, after 24 hrs, and after 72 hrs were done using t-test. The results showed that mean difference of urea at base line and after 24 hrs is significant with p<0.01. The mean difference of urea at base line and after 72 hrs is significant with p<0.01. The mean difference of urea after 24 hrs and after 72 hrs is not significant with p>0.05. The results showed that mean difference of creatinene at base line and after 24 hrs is significant with p<0.01. The mean difference of creatinine at base line and after 72 hrs is not significant with p>0.05. The mean difference of creatinine after 24 hrs and after 72 hrs is significant with p<0.05.

The final outcome was observed after 72 hours of PCI and results showed that ARF was observed in 24.0% cases, hemodialysis was observed in 6.0% cases, and no remarkable change in renal function was observed in 70.0% cases. Stratification with respect to male, female, age ≤50 years, and age > 50 years was done to observe effect of these modifiers on mean difference of urea and creatinine. Post stratification t-test was applied and P-value ≤0.05 was considered as significant. The results are presented in Table-4 and Table-05. The chi-square test was applied to see the effect of gender and age on in-hospital outcome. P-value ≤0.05 was also considered as significant. The results are presented in Table-06.

Table 1: Frequency Distribution Of Gender (n=50)

	Frequency (n)	Percentage (%)
MALE	46	92.0%
FEMALE	4	8.0%
TOTAL	**50**	100%

Table 2: Frequency Distribution of Stenosis Range Diagnosed in c. Angiography. (n=50)

STENOSIS RANGE	Frequency (n)	Percentage (%)
70% – 80%	15	30.0%
80% – 90%	16	32.0%
90% – 99%	19	38.0%
TOTAL	**50**	100%

Table 3: Frequency Distribution of Vessel Involved In C. Angiography (n=50)

	Frequency (n)	Percentage (%)
RCA	2	4.0%
DISTAL RCA	3	6.0%
MID RCA	4	8.0%
PROXIMAL RCA	10	20.0%
LAD	1	2.0%
MID LAD	9	18.0%
PROXIMAL LAD	18	36.0%
MID LAD & MID RCA	1	2.0%
PROXIMAL LCx	2	4.0%
TOTAL	**50**	

Table 4: Mean Difference of Urea and Creatinine At Baseline, after 24 of PCI, and after 72 Hrs of PCI Among Male Patients (n=46)

		MEAN	SD	t	df	P-value
UREA	**At Baseline**	3.04	8.13	-14.492	45	0.000*
	After 24 Hrs of PCI	81.52	15.20			
	At Baseline	53.04	8.13	-5.321	45	0.000*
	After 72 Hrs of PCI	78.59	35.51			
	After 24 Hrs of PCI	81.52	15.20	.771	45	0.445**
	After 72 Hrs of PCI	78.59	35.51			
CREATININE	**At Baseline**	1.60	0.09	-17.236	45	0.000*
	After 24 Hrs of PCI	1.85	0.12			
	At Baseline	1.60	0.09	-1.237	45	0.223**
	After 72 Hrs of PCI	1.70	0.57			
	After 24 hrs of PCI	1.85	0.12	1.915	45	0.062**
	After 72 Hrs of PCI	1.70	0.57			

Paired sample t-test was applied.
P-value ≤0.05 considered as significant
* Significant at 0.01 levels
** Not Significant at 0.05 levels

Table 5: Mean Difference of Urea and Creatinine at Baseline, after 24 of PCI, and after 72 Hrs of PCI Among Female Patients
(n=04)

		MEAN	SD	t	df	P-value
UREA	**At Baseline**	52.50	5.00	-5.745	3	0.010*
	After 24 Hrs of PCI	80.00	11.55			
	At Baseline	52.50	5.00	-5.000	3	0.015++
	After 72 Hrs of PCI	65.00	10.00			
	After 24 Hrs of PCI	80.00	11.55	3.000	3	0.058**
	After 72 Hrs of PCI	65.00	10.00			
CREATININE	**At Baseline**	1.58	0.05	-11.000	3	0.002*
	After 24 Hrs of PCI	1.85	0.10			
	At Baseline	1.58	0.05	5.000	3	0.015++
	After 72 Hrs of PCI	1.45	0.06			
	After 24 hrs of PCI	1.85	0.10	9.798	3	0.002*
	After 72 Hrs of PCI	1.45	0.06			

Paired sample t-test was applied.
P-value ≤0.05 considered as significant

* Significant at 0.01 levels
++ Significant at 0.05 levels
** Not Significant at 0.05 levels

Table 6: Frequency and Association of In-Hospital Outcome with Gender
(n=50)

	Male	Female	Total	P-value
No Remarkable Change in Renal Function	31	4	**35**	0.659**
Acute Renal Failure	12	0	**12**	
Hemodialysis	3	0	**3**	
TOTAL	**46**	**4**	**50**	

Chi Square test was applied.

P-value ≤0.05 considered as significant

** Not Significant at 0.05 levels

DISCUSSION:

In our study, most of the study subjects were male and the mean age was 50.48±6.61 years. 86.0% patients were smokers followed by 56.0% hypertensive patients. ST depression was observed in most of the cases. Majority of the echo findings were hypokinetic, which was observed in 64.0% patients. It was observed that after echo findings, PCI for RCA & LAD was done in 24.0% cases, PCI for LAD was done 42% cases, PCI for RCA was done in 30.0% cases, PCI for LCx was done in 4.0% cases. The baseline creatinine was 1.60±0.08. After 24 and 72 hrs of PCI, creatinine was 1.84±0.11 and 1.68±0.55 respectively. The results showed that mean difference of creatinene at base line and after 24 hrs is significant with p<0.01. The mean difference of creatinine at base line and after 72 hrs is not significant with p>0.05. The mean difference of creatinine after 24 hrs and after 72 hrs is significant with p<0.05. The final outcome results showed that ARF was observed in 24.0% cases, hemodialysis was observed in 6.0% cases, and no remarkable change in renal function was observed in 70.0% cases.

Renal insufficiency is often encountered in patients who have coronary artery disease. Some studies have documented the adverse prognostic impact of chronic renal insufficiency after percutaneous coronary intervention (PCI) [13]. Acute, or acute on chronic, renal failure may occur after PCI for multiple reasons, including hemodynamic instability, radiocontrast administration, atheroembolism, and drug toxicity [14]. In current practice, the incidence and prognostic importance of acute renal failure (ARF) after PCI are unknown. Most studies of renal insufficiency and coronary artery disease have focused on patients on long-term dialysis [15]. Herzog, et al observed a dismal prognosis for patients with ESRD on long-term dialysis after MI; only 41% survived for 1 year and 27% for 2 years [16].

A retrospective study of 3954 patients undergoing PCI demonstrated mild renal insufficiency (serum creatinine 1.5 to 3.0 mg/dL) to be independently associated with higher 30-day mortality, postoperative bleeding, and ventilatory complications [17].

Complication rates were comparable to patients with severe renal insufficiency (serum creatinine >3.0 mg/dL). In the ESRD population, percutaneous revascularization may be associated with a high rate of restenosis. Someprevious investigators have identified chronic RF as an important predictor of morbidity and mortality after MI.

The association between CKD and adverse cardiovascular prognosis has been well established from large community-based studies [18]. One study showed that even in patients with normal stress MPI (SSS < 4), the rate of cardiac death was significantly higher in CKD than in non-CKD patients (2.7% vs. 0.8%, $p < 0.0001$) [19]. However, the study included cases with previously known CAD. Even in normal stress MPI cases, 29% of non-CKD and 28% of CKD patients had a history of CAD. Therefore, assessing the prognosis of major cardiac events was important in patients with no history of CAD, who had normal stress MPI and CKD. CKD was a significant and independent risk factor for major cardiac events. The prognosis was not good for CKD patients (3.9%/year). As shown in some studies, proteinuria has been a significant risk factor for cardiovascular or1. total mortality[20].

There has been rapidly growing interest in the relation between kidney disease and the risk of death and cardiovascular disease. With recognition that the presence of chronic kidney disease that does not necessitate dialysis is of considerable importance, several studies have examined the association of different cutoff values of serum creatinine with the risks of death from any cause, death from cardiovascular causes, and cardiovascular events [21].

The mechanism for the increased risk of mortality and adverse outcomes among patients with mild CKD may be related to the increased prevalence of atherosclerotic risk factors. Patients with CKD have a greater risk profile, with more advanced age, congestive heart failure, hypertension, peripheral vascular disease, and chronic obstructive lung disease. Prior studies demonstrate that patients with CKD also have an increased prevalence of lipid abnormalities, hypertension,insulin resistance, and hyperhomocysteinemia.[22,23] Supporting the association between CKD and accelerated atherogenesis is the increased requirement for subsequent revascularization (CABG) among patients with CKD. Accelerated atherogenesis among patients with CKD could be explained by an increased prevalence of conventional cardiovascular risk factors in this population. CKD is also a powerful risk factor for acute renal failure after coronary artery revascularization, and acute renal failure is associated with a greater risk of adverse outcomes.

Furthermore, important mortality reducing therapies (ie, β-blockers, ACE inhibitors, and cholesterol agents) did not significantly affect outcomes. Although these drugs may be used at lower rates among patients with CKD, the limited power and the potential for bias in terms of the patients selected for their use make assessment of their contribution to outcomes difficult to ascertain.

CONCLUSION:

Renal dysfunction is present in a substantial proportion of patients with acute coronary syndromes patients. Patients with baseline elevation of serum Cr-concentration were at risk of ARF after PCI and increased in risk of in-hospital development of renal disease. Recognition of the risk burden of renal dysfunction is essential for risk stratification and may assist in development of management strategies tailored to improve outcome, including appropriate utilization of cardiovascular diagnostic tests and therapeutics used in current cardiovascular care.

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