

# Frequency of in Stent Restenosis in Diabetic and Patients Undergoing PCI at Tertiary Care Cardiac Center

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## ABSTRACT

**Objective:** To determine the frequency of in-stent restenosis in diabetic patients undergoing primary percutaneous coronary intervention (PCI).

**Study Design:** Retrospective/Observational study

**Place and Duration:** Department of Adult Cardiology, Peshawar Institute of Cardiology, Peshawar KPK During the Period from January, 2022 to June, 2022.

**Methodology:** Total 380 patients of either gender with ages 25-70 years underwent primary percutaneous coronary intervention were enrolled. Patients were divided into two groups, diabetic (n=180) and non-diabetic (n=200). Detailed demographics including age, sex, BMI, hypertension, family history of ischemic heart disease and smoking status were recorded after taking informed written consent. Patients were followed to examine the incidence of restenosis. Data was analyzed by SPSS 24.0.

**Results:** There were 140 (77.78%) males and 40 (22.22%) females with mean age 48.26±9.55 years in diabetic group and in non-diabetic group 148 (74%) patients were males and 52 (26%) were females with mean age 47.85±10.66 years. Overall frequency of in-stent restenosis was 28 (7.37%), among them 25 (89.29%) were diabetic and 3 (10.71%) were non-diabetic. There was a significant association between diabetes and in-stent restenosis with p-value <0.05.

**Conclusion:** It is concluded that frequency of in-stent restenosis was high and significantly associated with diabetes in patients undergoing primary PCI.

**Keywords:** Percutaneous Coronary Intervention (PCI), Diabetes, In-stent Restenosis

## INTRODUCTION

Patients suffering from diabetic mellitus (DM) account for a disproportionately high percentage of the worldwide burden of cardiovascular disease [1-4]. Diabetes mellitus is associated with an increased risk of coronary artery disease (CAD) and peripheral vascular disease (PVD) that ranges from a two- to fourfold increase [5-7]. Some of the factors that contribute to this increased risk are hyperglycemia, insulin resistance, and an elevated level of advanced glycation end products (AGEs). Studies have shown a connection between the inflammatory and oxidative stress that certain components have on the vascular endothelium and macrovascular disorders such as diffuse atherosclerosis [8]. However, diabetics are a population that is notoriously difficult to treat due to the complications that are linked with diabetes-related heart disease. Some of these complications include vascular occlusion, restenosis, and in-stent restenosis (ISR).

In-stent restenosis (ISR) is the most significant challenge associated with percutaneous coronary intervention (PCI). Despite the fact that drug-eluting stents (DES) have significantly reduced the rate of in-stent restenosis (ISR), it is still a significant problem that affects 5-10% of patients who have PCI [9].

The risk of ischaemic stroke in diabetes patients is increased by a number of factors, including excessive neointimal hyperplasia, hypercoagulability, heightened inflammatory response, endothelial dysfunction, and the presence of comorbidities [10]. Diabetes was a strong predictor of both in-stent restenosis (ISR) and major adverse cardiac events (MACE) during percutaneous coronary intervention (PCI) before the widespread use of bare-metal stents (BMS) [11]. It is unknown whether people who have diabetes have a greater risk of developing ISR at this age of DES. There are two schools of thought regarding whether or not diabetes is still a risk factor for ISR following DES implantation: one school of thought maintains that diabetes is no longer a risk factor, while the other school of thought maintains that diabetes is still a risk factor [12]. Despite this, diabetics have been shown to have poorer clinical outcomes than non-diabetics following PCI, and this has been recorded even in the age of DES [13]. It is unknown whether diabetic patients with DES-ISR have a poorer prognosis than their

counterparts who do not have diabetes because there is a dearth of evidence on the clinical presentation and outcomes of diabetic patients who have DES-ISR. Comparative clinical trials of different PCI modalities are extremely rare, and the results of these trials are not typical of actual practice (14-15).

We conducted present study to compare the frequency of in-stent restenosis in diabetic and non-diabetic patients underwent primary percutaneous coronary intervention.

## MATERIALS AND METHODS

This retrospective/observational study was conducted at Department of Adult Cardiology, Peshawar Institute of Cardiology, Peshawar KPK during from the period January, 2022 to June, 2022. Total 380 patients of either gender with ages 25-70 years underwent primary percutaneous coronary intervention were enrolled. Patients were divided into two groups, diabetic (n=180) and non-diabetic (n=200). Detailed demographics including age, sex, BMI, hypertension, family history of ischemic heart disease and smoking status were recorded after taking informed written consent. Patients who were unwilling to participate in the study, those who had coronary artery disease in addition to myocarditis, pericarditis, congenital heart disease, or valvular heart disease, and patients who had a combination of immune system disease, infection, tumour, hematologic disease, or severe liver and renal insufficiency were not allowed to participate.

Depending on the decision of the physician, the patient who acquired typical symptoms of angina during follow-up following DES implantation received repeat coronary angiography (CAG) with or without conducting stress test (myocardial perfusion imaging or treadmill test). In accordance with the recommendations made by the ACC and AHA, a coronary angiography was performed on the patient who developed acute coronary syndrome (ACS) throughout the course of the follow-up. In the population of the study, a routine follow-up coronary angiography was not performed as part of the diagnostic process for ISR. Patients who had undergone a repeat angiogram were labelled as having a case of ISR if they had a stenosis of less than fifty percent of the diameter of the stented vessel or one that was

five millimetres proximal or distal to the stent margin on visual assessment. This assessment was carried out by two independent observers who were blinded to the study. The information regarding the treatment that was administered to these patients was gathered.

All the data was analyzed by SPSS 24.0. Mean ± SD was done for quantitative variables. Chi-square test was applied to examine the association of in-stent restenosis between diabetic and non-diabetic patients. P-value <0.05 was considered as statistically significant.

**RESULTS**

There were 140 (77.78%) males and 40 (22.22%) females with mean age 48.26±9.55 years in diabetic group and in non-diabetic group 148 (74%) patients were males and 52 (26%) were females with mean age 47.85±10.66 years. Mean BMI was 24.26±2.74 and 23.96±2.88 kg/m<sup>2</sup> in diabetic and non-diabetic patients. 36 (20%) and 30 (15%) were hypertensive in diabetic and non-diabetic groups. 8 (4.44%) and 7 (3.5%) patients had family history of CAD in diabetic and non-diabetic patients. 58 (32.22%) and 60 (30%) patients were smokers in diabetic and non-diabetic patients. (Table 1)

Table 1: Baseline characteristics of all the included patients

Variables	Diabetic (n=180)	Non-Diabetic (n=200)
Mean Age (years)	48.26±9.55	47.85±10.66
Mean BMI (kg/m)	24.26±2.74	23.96±2.88
Gender		
Male	140 (77.78%)	148 (74%)
Female	40 (22.22%)	52 (26%)
Comorbidities		
HTN	36 (20%)	30 (15%)
Family History of CAD	8 (4.44%)	7 (3.5%)
Smokers	58 (32.22%)	60 (30%)

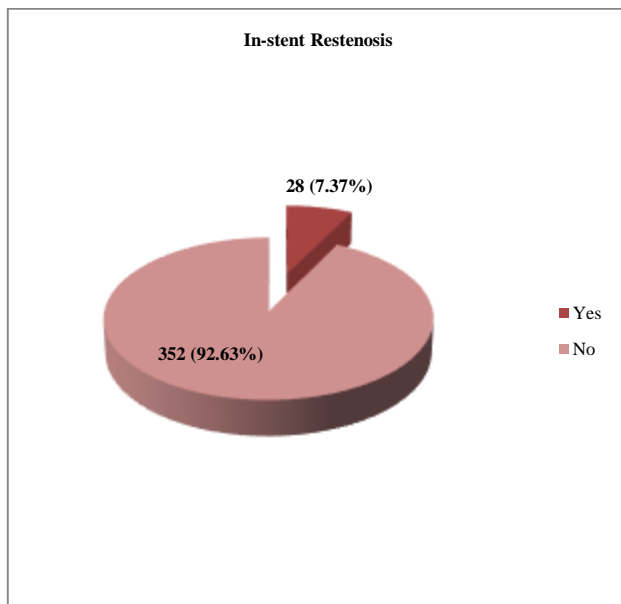


Figure 1: Overall frequency of in-stent restenosis was 28 (7.37%) while 352 (92.63%) patients had no in-stent restenosis

Among 28 patients of ISR, 25 (89.29%) were diabetic and 3 (10.71%) were non-diabetic. There was a significant association between diabetes and in-stent restenosis with p-value <0.05.

Table 2: Comparison of ISR between diabetic and non-diabetic patients (n=28)

Variables	Diabetic	Non-Diabetic	P-value
In-Stent Restenosis	25 (89.29%)	3 (10.71%)	0.001

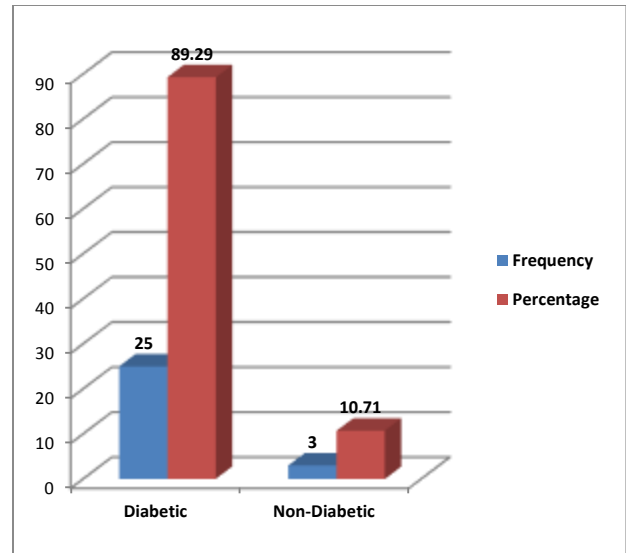


Figure 2: Comparison of ISR between diabetic and non-diabetic patients

**DISCUSSION**

The chance of developing coronary heart disease is increased by having diabetes mellitus. Patients suffering from coronary heart disease who also have diabetes mellitus have a poorer prognosis and a greater mortality rate [16, 17]. In a large sample meta-analysis, diabetes was found to be an independent risk factor for in-stent restenosis [18]. Impairment in the shape and function of vascular endothelial cells is a common result of abnormal glucose metabolism in DM patients [19]. Coronary artery intima proliferation is promoted by endothelial injury because of the increased synthesis of growth factors and the accelerated proliferation of smooth muscle cells and inflammatory cells [20]. Moreover, platelets are more likely to cling to the injured vascular endothelium in DM patients, leading to thrombus formation and a narrowing of the arterial lumen and the development of ISR [21]. For this reason, research into the causes of ISR in people with DM is crucial. In this regard we conducted present study to determine the frequency of in stent restenosis in diabetic patients whom were underwent primary PCI. Majority of patients in our study were males 75.89% while females were 24.11%. Mean age of study participants was 49.52±8.45 years. These results showed similarity to other previous studies in which male patients population was high 65-80% as compared to females and the average age of patients was 45 years [22-23].

In present study we divided all the patients in to two groups and named as diabetic and non-diabetic. We found no significant difference between both groups regarding age, sex, BMI, HTN, smoking status and family history of CAD.

In our study we found that the overall frequency of In-Stent restenosis was 28 (7.37%) while 352 (92.63%) patients had no in-stent restenosis. Many of previous studies demonstrated that the frequency of in stent restenosis was 5-10% in patients undergoing primary percutaneous coronary intervention [24-25].

We found that among 28 ISR patients, 25 (89.29%) were diabetic and 3 (10.71%) were non-diabetic. There was a significant association between diabetes and in-stent restenosis with p-value <0.05. A study conducted by raja W et al [26] regarding prevalence of ISR in patients undergoing primary PCI, reported that the overall prevalence of ISR was 3.75% and diabetes mellitus was the commonest risk factor found in In-Stent restenosis patients 22.9%.

Another study by Paramasivam G et al [27] reported that diabetic patients had higher prevalence of stent-edge restenosis 20.3% as compared to non-diabetic patients 9.2%. Praveen K. Gupta [28] et al reported that in-stent restenosis was found in

5.63% out of 550 patients and diabetes mellitus was the significant risk factor for developing In-Stent restenosis.

The previously reported study [29] had results that were comparable to the mean duration our study sample required to develop ISR. In our research, we found a substantial correlation between diabetes and the occurrence of restenosis. Studies that had been done in the past had unequivocally demonstrated that the DM is the risk factor that poses the greatest level of consistency and danger in relation to the onset of ISR [30]. Enhanced blood viscosity, elevated shear stress, and increased proliferation of smooth muscle cells have all been linked to the existence of diabetes mellitus. Neointimal proliferation and restenosis are both conditions that are associated with an increased risk when there is a greater effect of stimulatory growth hormones, such as insulin-like growth factors, on the vascular smooth muscle cells.

The fact that our analysis was conducted using retrospective data was the most significant restriction of our work. Another significant limitation of our research is that it relied heavily on DES of the first generation, which is no longer in use. The fact that the study population didn't have routine angiograms or quantitative coronary angiogram data (lesion length, reference vessel diameter, luminal gain, luminal loss) is a significant restriction. Although the findings of this study can be extended to our demographic, a more comprehensive investigation with a large prospective cohort is still required.

## CONCLUSION

Diabetes mellitus is one of the commonest disorders and significantly associated with higher rate of morbidity and mortality in all over the world. We concluded that frequency of in-stent restenosis was high and significantly associated with diabetes in patients undergoing primary percutaneous coronary intervention.

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