

Post-catheterization complications in diabetic patients with myocardial infarction

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Abstract

Objective: To identify various post-catheterization complications in diabetic patients with myocardial infarction.

Methods: A retrospective study design was followed to include all diabetic patients with myocardial infarction who underwent cardiac catheterization at Prince Faisal Bin Khalid Cardiac Center, Aseer Region, Saudi Arabia, during the past year (n=500). Data were obtained from the center's medical record system. A data sheet was designed by the researchers and was used for data collection.

Results: Most patients were males (81.4%), aged 50 years or more (78.4%), Saudi (88.8%), married (94.2%), 26% were overweight, 15.3% were obese, and 17% were current smokers. Commonly associated comorbidities mainly included dyslipidemia (63.6%), and hypertension (52%). Anticoagulants were received by almost all cases (98.8%), while 98.2% were hospitalized for 2 weeks, and 55.2% were followed up for more than 4 weeks. Most participants underwent catheterization of one or two arteries (64.8% and 25.2%, respectively). Post-catheterization complications affected 65 patients (13%), but these complications did not differ significantly according to patients' characteristics.

Conclusions: Post-catheterization complications are common among diabetic patients with myocardial infarction, mainly chest pain, thrombosis, dyspnea and death. Anticoagulants are the most commonly administered medications. Hospital stay is mainly for less than two weeks, but they usually need follow-up for more than four weeks. It is important to achieve strict control for diabetes before conducting coronary catheterization.

Keywords: Myocardial infarction, diabetes, catheterization, complications.

Introduction

Diabetes mellitus is a metabolic illness caused by the pancreas' inability to produce sufficient insulin or the body's inability to use it effectively, resulting in hyperglycemia. Diabetes affects 23.7% of the Saudi population. Its diagnosis is based on symptoms and laboratory results, e.g., glycated hemoglobin (HbA1c) scores higher than 6.5% on two distinct occasions. End-organ damage can occur as a result of diabetes (1).

Diabetes has a greater impact on the outcome of coronary artery disease. Hence, early prevention is important (2). For patients with myocardial infarction, percutaneous coronary intervention is a common treatment option. Those with poor HbA1c management had a greater mortality and morbidity rates (3).

In recent years, prevalence of diabetes mellitus has been increasing in developing countries, due to changes in lifestyle and diet. Diabetes is a major cardiovascular risk factor for coronary artery disease, with the risk of coronary artery disease occurrence being 2-5 times higher in diabetics than non-diabetics (4).

Cardiac catheterization is a common procedure that is conducted for the diagnosis or treatment of several cardiac problems. However, it has some risks, while major complications are quite rare (5).

Prevalence of diabetes among the Saudi population is quite high (23.7%) (1). Therefore, it is important to explore the common complications among diabetic patients undergoing cardiac catheterization.

Objective

The present study aimed to identify various post-catheterization complications in diabetic patients with myocardial infarction.

Methodology

A retrospective cohort study design was followed to include all diabetic patients with myocardial infarction who underwent cardiac catheterization at Prince Faisal Bin Khalid Cardiac Center (PFBKCC) during the past year (2021).

Prince Faisal Bin Khalid Cardiac Center (PFBKCC) is a governmental 78-bed tertiary care hospital, under the General Directorate of Health in Abha City, Aseer Region, Saudi Arabia. It is a specialized center that provides healthcare services for cardiac patients.

Inclusion criteria were adult (aged above 18 years) diabetic patients (type 1 or 2), with myocardial infarction who underwent cardiac catheterization at PFBKCC during 2021. Patients who were recently diagnosed as diabetics (within the last 6 months) were not included.

Data were obtained from the center's medical record system. Based on relevant literature, a data file (in Excel

sheet) was designed by the researchers and was used for data collection. It included patients' personal characteristics (gender, age groups, nationality, and marital status); risk factors for ischemic heart disease (body mass index, and smoking status); associated comorbidities (dyslipidemia, hypertension, other heart diseases, and renal disease); received medications, number of catheterized arteries, hospital stay, duration of follow-up and recorded post-catheterization complications.

The relevant data of 500 diabetic patients fulfilling the inclusion criteria were enrolled in the present study. Data were collected during the period from January 2022 to March 2022. Collected data were statistically analyzed using the Statistical Package for the Social Sciences (IBM, SPSS, version 28). Descriptive statistics (frequencies and percentages) were calculated. Chi square (X^2) test was applied to test significance of differences regarding post-catheterization complications among diabetic patients according to their personal characteristics.

The official ethical approval was obtained from the General Directorate of Health in Aseer Region. During data collection, anonymity was fully considered. No personal or identifying data (e.g., names or mobile phone numbers) were used. However, since this is a record-based study, no consent was requested from patients.

Results

Table (1) shows that most patients were males (81.4%), aged 50 years or more (78.4%), Saudi (88.8%), married (94.2%), 26% were overweight, 15.3% were obese, and 17% were current smokers.

Table (2) shows that 63.6% had dyslipidemia, 52% were hypertensive, and 13.4% had past history of angina pectoris. Anticoagulants were received by almost all cases (98.8%). Most participants underwent catheterization of one artery (64.8%), while 35.2% underwent the catheterization of two or more arteries, as shown in Figure (1). Post-catheterization complications affected 65 patients (13%), as shown in Figure (2); they were mainly chest pain (16, 3.2%), thrombosis (5, 1%), dyspnea (4, 0.8%) and death (3, 0.6%).

Table (3) shows that incidence of post-catheterization complications were higher among males than females (14% vs. 8.6%, respectively), was highest among those aged 50 years or more (14.3%), almost equal among single and married patients (13.8% vs. 13.0%, respectively), highest among obese patients (19.6%), higher among cigarette smokers than non-smokers (17.6% vs. 12.0%, respectively), higher among patients with dyslipidemia than those without dyslipidemia (13.8% vs. 11.5%, respectively), and was higher among those who underwent more than one artery catheterization than those who underwent a single artery catheterization (14.8% vs. 12%, respectively). However, post-catheterization complications did not differ significantly according to participants' characteristics.

Table 1: Personal characteristics of study sample

Personal characteristics	No.	%
Gender		
• Male	407	81.4
• Female	93	18.6
Age groups		
• ≤30 years	2	0.4
• 31-40 years	23	4.6
• 41-50 years	83	16.6
• 50+ years	392	78.4
Marital status		
• Married	471	94.2
• Not married	29	5.8
Body mass index (n=334)		
• Normal weight	196	58.7
• Overweight	87	26.0
• Obese	51	15.3
Cigarette smoking status		
• Current smoker	85	17.0
• Non-smoker	415	83.0

Table 2: Medical history of study sample (n=500)

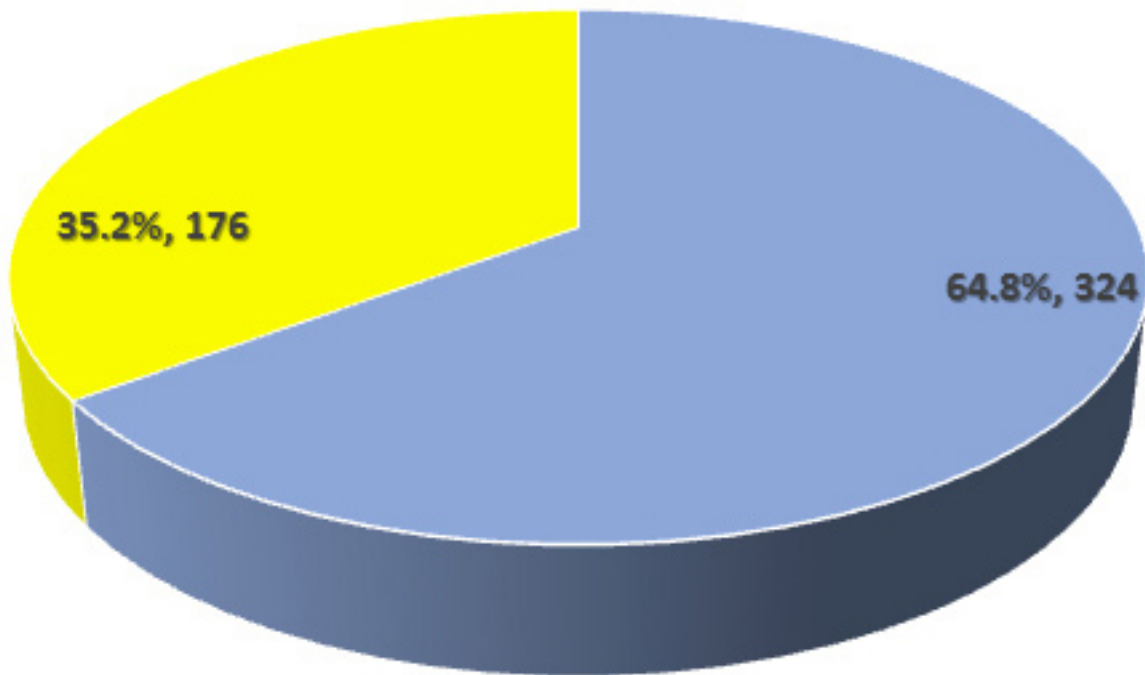
Medical history	No.	%
Associated comorbidities		
• Dyslipidemia	318	63.6
• Hypertension	260	52.0
• Other heart diseases	134	26.8
• Renal disease	35	7.0
Received medications		
• Anticoagulants	494	98.8
• Antibiotics	21	4.2
• Other drugs	492	98.4
Number of catheterized arteries		
• 1	324	64.8
• 2+	176	35.2
Post-catheterization complications:	46	9.2
• Chest pain	16	3.2
• Thrombosis	5	1.0
• Decompensated heart failure	5	1.0
• Cough	5	1.0
• Dyspnea	4	0.8
• Atrial fibrillation	4	0.8
• Death	3	0.6
• Heart block	2	0.4
• Others	2	0.4

Table 3: Post-catheterization complications according to personal characteristics of study sample

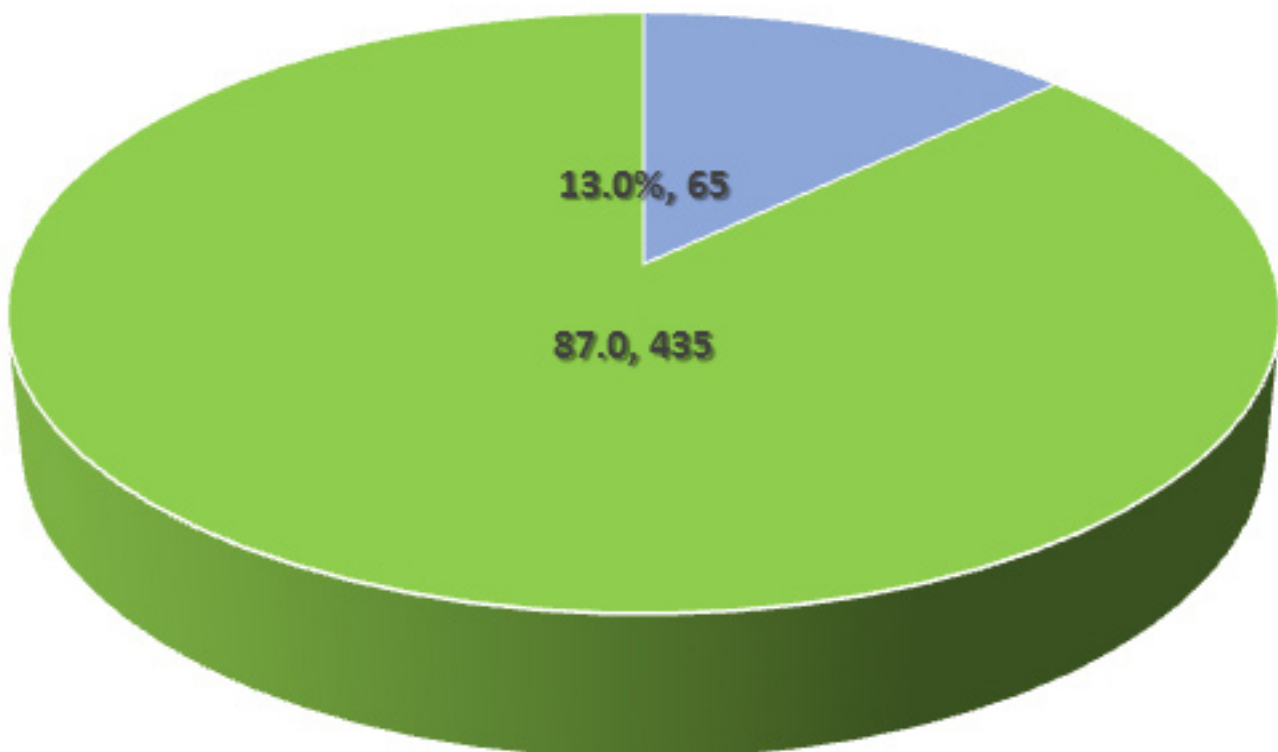
Personal characteristics	Yes		No		P Value
	No.	%	No.	%	
Gender					
• Male	57	14.0	350	86.0	0.162
• Female	8	8.6	85	91.4	
Age groups					
• ≤30 years	0	0.0	2	100.0	0.345
• 31-40 years	3	13.0	20	87.0	
• 41-50 years	6	7.2	77	92.8	
• 50+ years	56	14.3	336	85.7	
Nationality					
• Saudi	57	12.7	392	87.3	0.547
• Non-Saudi	8	15.7	43	84.3	
Marital status					
• Married	61	13.0	410	87.0	0.896
• Single	4	13.8	25	86.2	
Body mass index (n=334)					
• Normal weight	21	10.7	175	89.3	0.219
• Overweight	10	11.5	77	88.5	
• Obese	10	19.6	41	80.4	
Smoking status					
• Smoker	15	17.6	70	82.4	0.160
• Non-smoker	50	12.0	365	88.0	
Dyslipidemia					
• Yes	44	13.8	274	86.2	0.493
• No	21	11.5	161	88.5	
Number of catheterized arteries					
• 1	39	12.0	285	88.0	0.673
• 2+	26	14.8	150	85.2	

Figure 1: Number of catheterized arteries among diabetic patients with myocardial infarction

- Patients with one catheterized artery
- Patients with two or more catheterized arteries

**Figure 2: Incidence of post-catheterization complications among diabetic patients with myocardial infarction**

- Post-catheterization complications occurred
- No post-catheterization complications occurred



Discussion

Diabetic patients are at a higher risk of cardiovascular disease than non-diabetics. In general, this was associated with a 3-fold to 4-fold increase in all diabetic patients, but may rise to up to 40-fold increase in diabetes associated with chronic renal impairment (6).

The present study aimed to identify most frequently encountered post-catheterization complications among diabetic patients with myocardial infarction, admitted to Prince Faisal Bin Khalid Cardiac Center, Aseer Region, Saudi Arabia.

The present study showed that most patients were males, aged 50 years or more, either overweight, or obese, with 17% being cigarette smokers. Moreover, commonly associated comorbidities included dyslipidemia and hypertension.

These findings underline the characteristic risk factors for myocardial infarction, repeatedly reported in literature. Rathore et al. (7) argued that since type 2 diabetes shares several risk factors in common with coronary artery disease, (e.g., older age, hypertension, dyslipidemia, obesity), the increasing prevalence of diabetes indirectly implicates an escalating risk of coronary artery disease as well.

Furthermore, it is well-known that men tend to have heart attacks earlier in life than women, whose heart attacks increase after menopause. In addition, smoking is a strong risk factor of myocardial infarction, premature atherosclerosis and sudden cardiac death (8). Infarction is also greatly enhanced by increased body mass index (9).

Our study indicated that about one-third of patients underwent catheterization of two or more arteries. Anticoagulants were received by almost all cases.

Saito and Kobayashi argued that percutaneous coronary intervention has become a standard of care procedure in the setting of angina or acute coronary syndrome, and anticoagulation therapy is the cornerstone of pharmacological treatment aiming at preventing ischemic events following this intervention. Dual antiplatelet therapy as the combination of aspirin and anti-platelet drugs has been proven to decrease stent-related thrombotic risks (10).

Craig et al. concluded that, compared to clopidogrel and low-dose aspirin, the use of rivaroxaban and low-dose aspirin reduced the risk of major adverse cardiovascular events, cardiovascular death and stroke including ischemic stroke in patients with or at high risk for chronic coronary artery disease. These benefits of rivaroxaban and low-dose aspirin compared to clopidogrel and low-dose aspirin appear to be achieved without significantly increasing patients' risk of moderate-to-severe bleeding, including intracranial hemorrhage or fatal bleeding (11).

Moreover, findings of the double blind randomized clinical trial of Eikelboom et al. (12) revealed that, in patients with atherosclerotic vascular disease, the outcome

of anticoagulant therapy with rivaroxaban-plus-aspirin was better than in the aspirin-alone group (hazard ratio: 0.76; 95% confidence interval: 0.66-0.86; $P < 0.001$). Nevertheless, major bleeding events occurred in more patients in the rivaroxaban-plus-aspirin group (288 patients [3.1%] vs. 170 patients [1.9%]; hazard ratio, 1.70; 95% CI, 1.40 to 2.05; $P < 0.001$).

Miller (13) noted that the use of anticoagulation therapy is common after cardiac intervention, but may also increase the risk and amount of bleeding.

Our study showed that post-catheterization complications were observed to be relatively high among participants, affecting up to 13% of diabetic patients, mainly in the form of post-catheterization chest pain (3.2%), but about 1% had thrombosis, or dyspnea while 3 cases died (0.6%).

Tavakol et al. (14) stated that the risk of major complications during cardiac catheterization procedure is not high, being usually less than 1%, while the risk of mortality is quite low (0.05%). The complications can range from minor discomfort at the site of catheterization, to major ones like death.

This very high incidence of post-catheterization complications among our diabetic patients may provide evidence that diabetes constitutes a high risk for these post-catheterization complications among patients with myocardial infarction.

Our study also revealed that the post-catheterization complications among diabetic patients were higher among males than females, among those aged 50 years or more, among obese patients, among smokers, among patients with dyslipidemia, and among those who underwent more than one artery catheterization.

Miller (13) noted that post-catheterization complication rates are dependent on several factors, such as patients' demographics, vascular anatomy, comorbid conditions, clinical presentation, the procedure being performed, and the experience of the operator. She listed several risk factors that are associated with developing a complication after cardiac catheterization, such as older age, female sex, and among those who had previous cardiac intervention.

It is to be emphasized that knowing who is at high risk of developing post-catheterization complications will help guide clinicians' assessment of the cardiac catheterization procedure. Manda and Baradhi (15) stated that when the risk of complications is expected to be more than what is considered acceptable for the procedure, alternative modes of imaging and assessment can be used. Experienced operators should modify the technique of the procedure in a way as to get the best possible outcomes for each individual patient with the least amount of risk.

Study limitations

There are few limitations that should be stated. First, this study was conducted at a single-center (i.e., PFBKCC) in Abha City, Aseer Region, Saudi Arabia. This may limit the generalizability of our results. Second, the present

study followed a retrospective hospital record-based design. Although this research design is relatively cheap, quick, and easy to perform, it has some disadvantages. Hospital records may not include all pertinent risk factors. Moreover, since different healthcare professionals have been involved in patient care, the measurement of risk factors and outcome(s) throughout the hospital records would probably be less accurate and consistent than those obtained from prospective cohort studies (16).

Conclusions

Most patients with diabetes mellitus and myocardial infarction are males. Post-catheterization complications are common among diabetic patients with myocardial infarction, mainly chest pain, thrombosis, dyspnea and death. Anticoagulants are the most frequently administered medications to these patients. Hospital stay for these cases is mainly for less than two weeks, but they usually need follow up for more than four weeks. It is important to achieve strict control for diabetes before conducting coronary catheterization.

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