Adherence to clinical practice guidelines and use of secondary cardiovascular prevention medications in Middle Eastern patients undergoing percutaneous coronary intervention: Results from The First Jordanian PCI Registry (JoPCR1)

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Abstract

Background. Adherence to guidelines-recommended secondary cardiovascular (CV) prevention therapies has not been adequately studied in Middle Eastern patients undergoing percutaneous coronary interventions (PCI) for acute coronary syndrome (ACS) or stable coronary disease (SC). The First Jordanian PCI Registry (JoPCR1) is a prospective multicenter study that evaluated the adherence to guidelines and use of evidence-based therapies in a large PCI population.

Methods. Consecutive patients undergoing PCI in 12 tertiary care centers in Jordan were included in this analysis. Baseline clinical features and laboratory data were evaluated at admission. Use of recommended CV medications was evaluated on admission and at one year.

Results. Consecutive patients (N=2426) who underwent PCI from January 2013 to February 2014 were enrolled. PCI was indicated for ACS (N=1870, 77.1%) or SC (N=556, 22.9%). Dual antiplatelet therapy was administered for 99.1% and 96.8% of patients during hospitalization and at one year; respectively. Prescription of recommended CV medications during index hospitalization included beta blockers (74.8%), renin angiotensin aldosterone system blockers (57.1%), and statins (94.2%). At one year, these medications were used in 74.3%, 57.2%, and 92.3%; respectively. Five high risk groups were defined: women (N=500, 21%), patients older than 60 years of age (N=1013, 42%), diabetic patients (N=1300, 54%), overweight, i.e., body mass index >25 kg/m2 (N=1877, 77%) and patients who developed heart failure during hospitalization (N=194, 8%). No significant underuse of the secondary CV prevention medications in these groups was observed during index admission or at one year.

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Conclusions. In a larger PCI registry; adherence rates of the use of evidence-based secondary CV preventive medications during hospitalization and at one year were remarkably high and comparable to other regions in the world. There was no underutilization of these medications in high risk groups.

Keywords: Adherence to guidelines, Percutaneous coronary intervention, Cardiovascular disease in the Middle east.

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Introduction

Cardiovascular disease (CVD) is the leading cause of death in the Middle East, and an increasing number of patients undergoes percutaneous coronary interventions (PCI).[1,2] Clinical practice guidelines endorsed by international cardiology societies advocate the adoption of, and adherence to, specific therapeutic strategies that combine pharmacological agents and invasive procedures to reduce early and late major cardiovascular (CV) events in patients who undergo PCI for acute coronary syndrome (ACS) or stable coronary disease (SC).[3,4] We analysed the data from the recently completed local registry; the First Jordanian PCI Registry (JoPCR1) in order to assess the adherence to guidelines in utilizing revascularization strategies and evidence-based secondary CV prevention medications during hospitalization and at one year in a large PCI group as a whole, and in five high risk subgroups; women, older patients, overweight patients, diabetic patients (DM), and patients with heart failure (HF). These groups are underrepresented in clinical studies and less often prescribed evidence-based medications.[5,6] Evaluating these issues has become an important focus of quality improvement efforts,[7-9] and helps identifying opportunities to improve the quality of care in patients undergoing PCI.

Methods

JoPCR1 is a prospective, observational, multicenter registry of consecutive patients who underwent PCI at 12 tertiary care centers in Jordan between January 2013 and February 2014. A case report form was used to record data at hospital admission, at discharge, and at 1, 6, and 12 months later. Data were collected during out-patients visits or by phone calls to the patients, household relatives, or primary care physicians. The study was approved by the Institutional Review Board of each participating hospital.

Baseline data included clinical, laboratory, electrocardiographic, echocardiographic, and coronary angiographic features. Details of the PCI procedure and its outcome were also recorded. The arterial access site, pharmacological agents, and procedural options were left to operator's discretion. PCI was indicated for either ACS or stable coronary disease. ACS was classified as acute ST-segment elevation myocardial infarction

(STEMI); or non-ST-segment elevation ACS (NSTEACS), that included non-ST-segment elevation MI (NSTEMI); and unstable angina (UA). Stable coronary disease was defined as either chronic stable angina or silent ischemia.

GRACE (Global Registry of Acute Coronary Events) risk score[10] and CRUSADE (Can Rapid risk stratification of unstable angina patients Suppress Adverse outcomes with early implementation of the ACC/AHA guidelines) bleeding risk score[11] were calculated for each patient by online calculators by entering certain clinical, laboratory, and echocardiographic characteristics. In hospital major adverse CV events were documented. After discharge; CV events, adherence to prescribed medications, and cigarette smoking cessation (in smokers) were documented at 1, 6, and 12 months.

Data were described using means and percentages wherever appropriate. The differences in percentages of medications use in high risk groups were analyzed using chi-square test. Data were analyzed using SPSS IBM 20. A p-value of <0.05 was considered statistically significant.

Results

The study involved 2426 patients, including Jordanians (80%) and non-Jordanian Arabs (20%). Table 1 shows the baseline characteristics of all patients. The majority of patients (77%) had PCI for ACS, 58.4% of patients had single-vessel CAD, and 71.4% had single-vessel PCI. Details of the PCI procedures, in-hospital management and complications are shown in Table 2. About half of the patients with STEMI had primary PCI, and one-third of patients with NSTEACS had either urgent or early invasive PCI. Of the stents used (N=3038); 2722 (89.6%) were drug-eluting (DES), 286 (9.4%) were bare metal and 30 (1.0%) were bioresorbable. Serum fasting lipid profile was measured in 1233 patients (51%). More than 95% of patients received dual antiplatelet therapy (DAPT), parenteral anticoagulation (heparin), and statins. Beta blockers (BB) were used in 74,8% and renin angiotensin aldosterone system blockers (RAASB) in 57.1%. However, only 13.5% received glycoprotein IIb/IIIa inhibitors (GPI). At one year, 96.8% of patients were still using DAPT, 74.3% BB, 57.2% RAASB, and 92.3% statins (Table 3). The five high risk groups consisted of women (N=500, 20%), patients older than 60 years of age (N=1013, 42%), DM (N=1300, 54%), overweight or obese patients, i.e., body mass index $\geq$25 kg/m^2 (N=1877, 77%), and patients who developed HF during hospitalization (N=194, 8%). The use of the secondary CV prevention medications during index admission and at one year in these groups is shown in Table 3. At one month, 33% of cigarette smokers reported quitting smoking, and at one year, 31% reported quitting.

Discussion

The main finding of this study is that adherence to guidelines concerning the use of dual antiplatelet therapy and the recommended secondary prevention CV medications among Middle Eastern patients undergoing PCI for ACS, or SC is comparable to that observed in similar studies from other regions in the world. No underuse was observed in the specified five

high-risk subgroups. GPI were underused, and only 50% of patients had their serum lipid profile measured during hospitalization. Statins were prescribed for >95% of all patients, implicating that measurement of serum lipoproteins was not a prerequisite for prescribing statin in about 50% of patients.

Despite landmark advances in the care of patients with ACS or those who undergo PCI, and the strong evidence that adopting these guidelines is associated with lower short- and long-term CV events[12,13], there are still gaps in physicians' and patients' adherence to clinical practice guidelines in different regions in the world.

DAPT was used in the majority of our patients. Since prasugrel is not available in the local market, DAPT combined aspirin with either clopidogrel or ticagrelor. DAPT was prescribed according to guidelines[3,4,14] for at least one year after ACS (regardless of the type of stent used), and SC when drug-eluting stents were used.

We did not observe underuse of DAPT in any of the five high risk subgroups, contrary to the gap observed by other investigators.[15] Unlike the high rate of use of DAPT and parenteral anticoagulation (i.e., heparin) in our patients; the use of GPI was suboptimal. We share this finding with other published studies, despite a high prevalence of patients with potential benefits from this medication, i.e., diabetics, patients with elevated serum levels of cardiac enzymes, and patients with ST-segment deviation. GPI were utilized in higher rates in two local ACS studies published eight years ago.[16,17]

Coronary revascularization does not affect the underlying disease process of coronary atherothrombosis, so medical therapy is routinely recommended post PCI. Medications that reduce mortality or subsequent MI in patients with CAD include, in addition to antiplatelet agents, BB, RAASB, and statins.[7,8,17,18] The rate of use of secondary CV prevention medications was quite high in our study and comparable to, if not better than, other registries. In a study from the Arab Gulf area, the rates of use of BB, RASB, and statins at one year in CAD patients were 28%, 28%, and 34%; respectively.[20] In a French study, the rates were 56% for each of the three classes of medications[5], and in an American study, the rates were 73%, 62%, and 73%; respectively.[21] The variation in the rates of use of the medications observed in different studiers is related to the threshold at which the physicians adopt practice guidelines and to adherence of patients to prescribed medications. The latter is influenced by the belief that such medications are no longer needed after PCI, or due to the occurrence of side effects.[7,22,23]

Unlike other studies that demonstrated underuse of secondary prevention medications in high-risk groups, such as women, diabetics, and older patients[6,24,25]; we did not share this finding with those studies. In fact women, older patients, and diabetics had higher rate of use of RAASB and/or BB.

An important secondary prevention measure in patients with CAD particularly those undergoing PCI is the counselling for cigarette smoking cessation. Similar to other studies from Jordan and other regions, 1/3 of smokers

in our cohort quit smoking at one year after PCI.[26] In the absence of routine referral to smoking cessation counselling; physicians should spare enough time during index hospitalization and subsequent out-patient visits to urge and encourage smokers to quit, as this is one of the important factors that decrease future events.[27,28]

Guidelines recommend calculation of GRACE and CRUSADE risk scores for each patient admitted with ACS.[3] The former score estimates the ischemic events, including death from the index hospitalization to one year[10], and the latter predicts the in-hospital risk of major bleeding events.[11] Although not a routine practice in local hospitals, calculating these two scores is strongly encouraged because both were shown to have strong predictability of clinical events in our patients.[29]

Cardiac rehabilitation constitutes structured exercise training integrated with broader secondary prevention reinforcements. Despite the proven benefits of such programs to lower mortality and future events [3,4,30]; the majority, if not all, of local hospitals lack such program in the care plan of CV patients.

This study has limitations inherent to observational studies. It may be subject to selection bias, collection of non-randomized data, and missing or incomplete information. Participation was voluntary and enrolling consecutive patients was encouraged, but not verified, similar to other registries.[31] Moreover, ACS patients who die before or shortly after admission and those who do not undergo angiography are not represented in the group of patients we enrolled. The registry included high volume tertiary care centers and may not fully represent PCI practice and outcome in all areas in the country or region. Data during follow up, especially the use of medications relied fully on the patients' or contacts' recall. There was no pill count to verify the actual use of medications. Adherence to medications could have also been improved due to the frequent follow-up calls our patients received, which might not be offered to other PCI patients.

In conclusion, we have shown remarkable adherence to the majority of practice guidelines following PCI in this contemporary "real life" study. We believe that the high rate use of DES, DAPT and other evidence-based medications in the majority of the enrolled patients in accordance with guidelines, and the presence of high-volume tertiary centers are all contributing factors to the low short- and long-term event rates observed in this registry. These results clearly identify opportunities for improving the care of patients undergoing PCI, particularly establishing cardiac rehabilitation programs.

Funding

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Table 1. Baseline characteristics of the 2426 patients.

Feature	N	%
Age in years (mean±SD)	59.0 ± 10.1	-
Females	500/2426	20.6
Hypertension	1511/2426	62.3
Diabetes mellitus	1300/2426	53.6
BMI		
≥25 kg/m^2	1877/2426	77.4
>25 kg/m^2	549/2426	22.6
Hypercholesterolemia	1184/2426	48.8
Current smoker	1055/2426	43.5
Past myocardial infarction	263/2426	10.8
Past stroke	50/2426	2.1
Prior PCI	589/2426	24.3
Prior CABG	84/2426	3.5
Medications prior to admission		
Aspirin	1568/2424	64.7
Clopidogrel	532/2423	22.0
Ticagrelor	16/2425	0.7
Oral anticoagulants	34/2425	1.4
Statins	1266/2424	52.2
Beta blockers	1150/2423	47.5
RAAS	987/2421	40.8
ST-segment deviation	1181/2426	48.6
Elevated serum cardiac biomarkers	970/2426	40.0
LVEF<45%	302/2419	12.5
Heart failure on admission	269/2426	11.1
Diagnosis		
ACS:	1870/2426	77.1
-STEMI	726/2426	29.9
-Non STEMI	306/2426	12.6
-UA	838/2426	34.5
Stable coronary syndrome:	556/2426	22.9
-Chronic stable angina	500/2426	20.6
-Silent ischemia	56/2426	2.3
Number of diseased coronary arteries:		
-1 coronary artery	1417/2426	58.4
-2 coronary arteries	718/2426	29.6
-≥3 coronary arteries	291/2426	12.0
Number of treated coronary arteries with PCI:		
-1 coronary artery	1732/2426	71.4
-2 coronary arteries	568/2426	23.4
-≥3 coronary arteries	119/2426	5.6
-PCI of left main coronary artery	28/2426	1.2
-PCI of saphenous vein graft	25/2426	1.0

ACS: acute coronary syndrome; BMI: body mass index; CABG: coronary artery bypass graft surgery; PCI: percutaneous coronary intervention; RAASB: Renin angiotensin aldosterone system blockers; STEMI: ST-segment elevation myocardial infarction; UA: unstable angina.

Table 2. PCI procedures and cardiovascular events during hospitalization and at one year.

Feature	Number	%
Indications for PCI:		
STEMI	36/2424	30.3
- primary	398/2424	16.4
- rescue	68/2424	2.8
- elective	270/2424	11.1
NSTEACS	1138/2424	46.9
- urgent	30/2424	1.2
- early invasive	368/2424	15.2
- invasive	740/2424	30.5
Stable coronary syndrome	550/2424	22.7
Medications during hospitalization:		
Aspirin	2404/2421	99.1
Clopidogrel	1968/2426	81.1
Ticagrelor	455/2426	18.8
Thrombolytic agents	81/2426	3.3
Glycoprotein IIb/IIIa inhibitors	327/2426	13.5
Heparin	2362/2426	97.4
Medications on discharge:		
-Aspirin	2397/2410	99.5
-Clopidogrel	1977/2411	82.0
-Ticagrelor	410/2413	17.0
-Statins	2358/2412	97.9
-Beta blockers	1924/2411	79.8
-RAASB	1502/2410	62.3
In hospital events:		
-Cardiac mortality	19/2426	0.78
-Stent thrombosis	9/2426	0.37
-Major bleeding	20/2426	0.82
-Cardiogenic shock	14/2426	0.58
-Ventricular arrhythmias	21/2426	0.87
One year events:		
-Cardiac mortality	43/2292	1.90
-Stent thrombosis	47/2386	1.97
-Major bleeding	31/3403	1.29
-Percutaneous coronary revascularization	82/2140	3.83
-Readmission for ACS	125/2328	5.37
-Readmission for heart failure	29/2377	1.22

ACS; acute coronary syndrome, NSTEACS: non-ST-segment elevation ACS, PCI: percutaneous coronary intervention; RAASB: renin angiotensin aldosterone system blocker; STEMI: ST-segment myocardial infarction.

Table 3. Use of secondary cardiovascular prevention medications in five high risk groups.

Group	Medications during hospitalization					Medications at one year				
	Number of patients	DAPT %	BB %	RAASB %	Statins %	Number of patients*	DAPT %	BB %	RAASB %	Statins %
All patients	2426	99.9	79.8	62.3	97.8	2348	96.8	74.3	57.2	92.3
Women	500	99.2	78.6	63.8	94.4	494	89.3	81.2	68.6	93.1
Men	1926	99.4	73.7	55.3	94.2	1894	89.4	76.4	63.3	92.4
P value (women vs. men)		0.853	0.03	<0.001	0.95	-	0.987	0.03	0.03	0.663
Patients > 60-year old	1013	99.3	75.8	62.2	94.9	991	89.5	75.1	67.1	91.9
Patients ≤60-year old	1413	99.0	74.0	53.4	93.8	1399	89.8	71.3	62.0	92.4
P value (older vs. younger)		0.574	0.338	<0.0001	0.289	-	0.864	0.04	0.01	0.707
BMI≥25	1877	99.2	74.3	58.0	93.4	1800	98.7	79.4	66.4	94.5
BMI<25	549	98.7	76.3	53.7	95.1	532	98.9	77.3	62.8	93.0
P value (BMI≥25 vs. <25)		0.408	0.372	0.082	0.177	-	0<0.0001	0.326	0.134	0.234
DM	1300	99.1	74.8	62.2	93.6	1255	93.0	80.1	68.7	94.7
No DM	1126	99.1	74.6	51.1	94.8	1093	85.7	76.9	61.7	93.3
P value (DM vs. no DM)		0.829	0.947	<0.0001	0.242	-	<0.001	0.066	<0.0001	0.179
Heart failure	194	100	80.9	63.4	94.3	176	90.1	83.5	69.3	93.8
No HF	2232	99.0	74.2	56.5	94.1	2172	91.1	77.9	64.9	93.8
P value (HF vs. no HF)		0.314	0.077	0.112	0.90	-	0.757	0.101	0.273	0.871

*Number of patients at one year excludes all prior deaths and patients lost to follow up.
BB: beta blockers; BMI: body mass index (kg/m^2); DAPT: dual antiplatelet therapy; DM: diabetes mellitus; HF: heart failure; RAASB: renin angiotensin aldosterone system blockers.

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الالتزام بالمعايير الإرشادية واستخدام أدوية الوقاية الشريانية الثانوية لدى مرضى التداخلات الشريانية في الشرق الأوسط: نتائج من الدراسة الأردنية الأولى للتداخلات الشريانية

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الملخص

تبين من دراسة على عدد كبير من مرضى التداخلات الشريانية التاجية أن استخدام الأدوية التى يُوصى بها لمثل هؤلاء المرضى للوقاية الثانوية هي نسب عالية تضاهي تلك في باقي مناطق العالم.

مقدمة: لم يتم سابقاً دراسة مدى التزام مرضى القلب في الشرق الأوسط ممن يخضعون لعمليات التداخلات الشريانية التاجية بالأدوية الوقائية الثانوية. تم تحليل نتائج الدراسة الأردنية الأولى للتداخلات الشريانية لدراسة التزام مرضى القلب بأدوية القلب المؤصى بها عالمياً.

الطريقة: أُدخل في الدراسة مرضى متسلسلين من 12 مركزاً متقدماً في الأردن. تم تقييم المعلومات السريرية والمخبرية للمرضى عند الإدخال، وتم تقييم استخدام الأدوية الوقائية خلال الإدخال وبعد سنة.

النتائج: بلغ عدد المرضى في الدراسة 2426 مريضاً خضعوا جميعاً لعمليات التدخلات الشريانية. تبين أن استخدام الأدوية المميعة للدم المضادة للصفيحات بلغت نسبته خلال الإدخال 99.1% و 96.8% عند السنة الأولى. كما بلغت نسب استخدام الأدوية التى يوصى بها خلال الإدخال 74.8% لأدوية مثبطات بيتا و57.1% لمثبطات رينين انجيوتنسين و94.2% للستاتينات. وعند السنة الأولى بلغت النسب 74.3%، 57.2%، و92.3%، على التوالي. لم يتبين أن هذه النسب قد اختلفت لدى 5 مجموعات مفرطة الخطر بين هؤلاء المرضى (النساء، المسنين، مرضى السكري، مفرطي الوزن، ومرضى هبوط القلب).

الكلمات الدالة:الالتزام بالمعايير الارشادية،أدوية الوقاية الشريانية،التداخلات الشريانية.