

Patterns and determinants of treatment for coronary artery disease

A cross-sectional study in the Kingdom of Saudi Arabia

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ABSTRACT

الأهداف: تحديد الخصائص السريرية وخصائص تصوير الأوعية التاجية للمرضى المصابين بمرض الشريان التاجي (CAD) وأنماط وخصائص علاج CAD في المملكة العربية السعودية.

المنهجية: أجرينا دراسة مقطعية شملت 242 مريضاً في ثلاثة مستشفيات في المملكة العربية السعودية خلال الفترة من يونيو 2018م ويونيو 2019م. اشتملت الدراسة على جميع المرضى الذين تتراوح أعمارهم بين 18 عاماً وأكثر قمنا بتشخيصهم باستخدام CAD في تصوير الأوعية. قمنا بتنفيذ الانحدار اللوجستي متعدد الحدود للتأكد من محددات أنماط العلاج وطرق العلاج. قمنا كذلك باختيار المتغيرات المشتركة لهذا التحليل متعدد المتغيرات بناءً على الانحدارات أحادية المتغير.

النتائج: بلغ متوسط \pm الانحراف المعياري لمجتمع الدراسة 58.3 ± 11.8 عام، وكانت نسبة الذكور 66.1%. كان عامل الخطر الأكثر شيوعاً للقلب والأوعية الدموية هو مرض السكري (58.7%). ومن مشاكل المرضى أبلغنا عن الآفات التي تنطوي على الشريان الأمامي الأيسر النازل 68.6%، والشريان التاجي الأيسر 51.2%، والشريان التاجي اليميني 48.8%. كان العلاج الأكثر شيوعاً هو الأفضل طبياً (تعديلات نمط الحياة والعلاج الطبي) ، وقد وصف لـ 69.8% من المرضى. المرضى الذين تتراوح أعمارهم من 60 عاماً وأكبر والمصابين بالمرض الرئيسي الأيسر أو الفرع لديهم احتمالية أكبر للخضوع لعملية تطعيم مجازة الشريان التاجي (CABG). وعلى العكس من ذلك، كان المرضى الذين يعانون من آفات RCA أكثر عرضة للخضوع للتدخل التاجي عن طريق الجلد (PCI).

الخلاصة: كان عمر المريض وموقع التشريح لآفات تصلب الشرايين التاجية هما المحددان الرئيسيان للعلاج بـ CABG أو PCI.

Objectives: To determine the clinical and coronary angiographic characteristics of patients with coronary artery disease (CAD) and the patterns and determinants of CAD treatment in Kingdom of Saudi Arabia (KSA).

Methods: We conducted a cross-sectional study including 242 patients at 3 hospitals in KSA between June 2018 and June 2019. We included all patients aged ≥ 18 years diagnosed with CAD on angiography. We carried out a multinomial logistic regression to ascertain the determinants of treatment patterns and

treatment modalities. Covariates for this multivariate analysis were selected based on univariate regressions.

Results: The study population had a mean \pm standard deviation of 58.3 ± 11.8 years, and 66.1% were male. The most frequent cardiovascular risk factor was diabetes (58.7%). Lesions involving the left anterior descending were reported among 68.6%, left circumflex among 51.2%, and right coronary arteries (RCA) among 48.8% of our patients. The most common treatment was the best medical therapy (lifestyle modifications and medical management), prescribed to 69.8% of patients. Patients aged ≤ 60 years with the left main disease or disease of the ramus had a higher likelihood of undergoing coronary artery bypass grafting (CABG). Contrarily, patients with RCA lesions were more likely to undergo a percutaneous coronary intervention (PCI).

Conclusion: Patient age and anatomical localization of coronary atherosclerotic lesions were the main determinants of treatment with CABG or PCI.

Keywords: coronary artery disease, coronary artery bypass graft, percutaneous coronary intervention, Saudi Arabia

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In 2019, coronary artery disease (CAD) was the foremost reason for disability and mortality worldwide, responsible for 182 million disability-adjusted life years and nearly 9.1 million deaths.¹ In the Kingdom of Saudi Arabia (KSA), a literature review of CAD risk factors delineates that almost a quarter of all adults have hypertension and diabetes while more than half have hypercholesterolemia.²⁻⁴ Fueled by such increasingly prevalent patient factors in the KSA, the risk and subsequently the burden of cardiovascular disease (CVD) has considerably risen. The Global Burden of Disease reported that CAD was the foremost cause of mortality in the country in 2019, responsible for 23.1% of all deaths.¹ Despite the high burden of CAD in the KSA, there is limited data on the epidemiology of the disease in the country, especially its management.

Patients with CAD are usually managed with medical therapy alone or revascularization procedures, such as coronary artery bypass grafting (CABG) or percutaneous coronary intervention (PCI). The choice between treatment modalities is complex, which depends on patient factors, preferences, and invasive coronary angiographic findings. While the American Heart Association and the American College of Cardiology recommend different treatment modalities based on the type of coronary syndromes and the anatomical localization as determined by invasive coronary angiography,⁵ these recommendations are based on studies conducted in the Western world and may not be readily applicable to the Saudi population.

In general, revascularization is preferred over medical therapy in patients with acute coronary syndromes, symptomatic CAD despite maximal medical treatment, those unable to tolerate medical therapy, or those with angiographic findings suggestive of substantial luminal narrowing.⁶ Coronary artery bypass grafting is considered the gold standard therapeutic procedure in patients suffering from a 3-vessel disease or left main coronary artery involvement.⁷ It is also preferred in cases of single- or double-vessel disease wherein PCI cannot achieve complete revascularization. Percutaneous coronary intervention is usually the preferred modality of treatment in single-vessel afflictions besides specific types of double-vessel afflictions. It is also beneficial

in enhancing patient quality of life in those who are not fit for or refuse CABG. The final decision is often made based on the doctors' discretion and tailored to the individual patient.⁶

There is little evidence regarding CAD management post invasive coronary angiography specific to the Saudi population.⁵ Such data will enable Saudi cardiologists to follow a more population-specific evidence-based approach towards treating CAD. Hence, this study's objectives were to determine the clinical and coronary angiographic characteristics of patients with CAD and the patterns and determinants of CAD treatment in 3 major hospitals in KSA.

Methods. We conducted a multi-centric cross-sectional study between June 2018 and 2019 at King Khalid Hospital & Prince Sultan Centre for Healthcare, Al-Kharj; the Cardiovascular Medicine and Cardiovascular Surgery Departments, King Khalid Hospital, Riyadh; and Cardiology Department, Military Industries Corporation Hospital, Al-Kharj, KSA. We identified keywords regarding CAD epidemiology and treatment and performed a comprehensive literature review on PubMed and Google Scholar databases to find prior related research to guide the design and write-up of this research project. Our study obtained ethical approval by the Institutional Review Board of Prince Sattam Bin Abdulaziz University and was conducted according to the principles of the Helsinki Declaration. Prior to enrollment into the study, all participants provided written informed consent.

Convenient sampling was used to recruit patients between June 2018 and June 2019. Patients who presented to the study sites during the recruitment period were eligible if they were aged ≥ 18 years, current residents of the KSA, and diagnosed with CAD based on at least one identifiable coronary lesion on a coronary angiogram. Patients diagnosed with CAD via other non-invasive coronary artery imaging modalities and those whose electronic medical records had incomplete or missing data points were excluded.

We collected details on age, gender, and risk factors that pertain to CVDs, such as diabetes status, smoking history, hypertension, dyslipidemia, and any other comorbidities. Information from the coronary angiogram included indications such as ST-elevation myocardial infarction (STEMI), non-ST-elevation myocardial infarction (NSTEMI), atypical angina, and stable or unstable angina and the localization, number, and severity of coronary atherosclerotic plaques. We defined coronary artery stenosis as $\geq 50\%$ diameter stenosis of the left main coronary artery or

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≥70% diameter stenosis of at least one of the major epicardial coronary arteries.⁸ We gathered information on the treatment modalities, which included the best medical therapy (BMT) and surgical procedures, such as PCI and CABG. We defined BMT as the use of antianginal drugs (nitrate or β-blocker or calcium channel blocker) and statins in all patients, with an additional angiotensin-converting enzyme inhibitor or an angiotensin receptor blocker only in patients with either a left ventricular dysfunction (<50%), type 2 diabetes, chronic renal disease, hypertension, peripheral artery disease, or a history of a cerebrovascular accident. Best medical therapy was systematically associated with lifestyle modifications targeting weight loss, diet, and physical activity.⁹

Statistical analysis. Data were entered into and analyzed by IBM SPSS Statistics for Windows version 23.0 (IBM Corp, Armonk, NY, USA). As our continuous variables were normally distributed, we reported them as mean ± standard deviation (SD). Categorical variables are reported as frequencies and percentages. We constructed a multinomial logistic regression model to explore patient clinical and coronary angiographic characteristics that may potentially have an association with surgical procedures such as PCI and CABG. We did so by considering BMT as the reference category. The multinomial logistic regression was conducted in 2 steps: first, a univariate regression to identify statistically significant factors and second, a multivariate logistic regression for adjusted analysis. In the univariate analysis, all individual variables/factors were evaluated based on a conventional significance level <0.25. The multivariate analysis model was generated considering all variables deemed statistically significant by univariate analysis. All analyses were 2-tailed, set at 95% confidence intervals (CIs), with *p*-values of <0.05 deemed statistically significant.

Results. The study population consisted of 242 patients having a mean ±SD age of 58.3 ± 11.8 years, and 66.1% were men. The most frequent cardiovascular (CV) risk factors were diabetes (58.7%), hypertension (55.4%), dyslipidemia (30.6%), and current smoking (28.1%). History of CAD was reported in 15.7% of patients (Table 1). Most patients presented with acute coronary syndromes (59.8%), 32.2% had unstable angina, 19.8% STEMI, and 17.8% NSTEMI.

Among our patients, 68.6% had a left anterior descending artery (LAD) lesion, 51.2% right coronary artery (RCA) lesion, and 48.8% left circumflex artery (LCX) lesion. Multivessel disease was found in 57.4% of patients. In terms of coronary vessel dominance, 57.5%

Table 1 - Descriptive statistics of patient's demographic and clinical characteristics (N=242).

Characteristics	n	(%)
<i>Age (years) mean±SD</i>	58.3±11.83	
≤60	138	(57.0)
>60	104	(43.0)
<i>Gender</i>		
Female	82	(33.9)
Male	160	(66.1)
<i>Smoking status</i>		
Ex-smoker	15	(6.2)
Non-smoker	159	(65.7)
Smoker	68	(28.1)
<i>Indications</i>		
Atypical angina	67	(27.7)
NSTEMI	43	(17.8)
Stable angina	6	(2.5)
STEMI	48	(19.8)
Unstable angina	78	(32.2)
<i>Comorbidities*</i>		
Diabetes mellitus	142	(58.7)
Hypertension	134	(55.4)
Dyslipidemia	73	(30.2)
History of heart failure	35	(14.5)
History of ACS	31	(12.8)
Hypothyroidism	16	(6.6)
Renal disease	12	(5.0)
History of IHD	38	(15.7)
Severe aortic stenosis	11	(4.5)
Rheumatic heart disease	11	(4.5)
Others	12	(4.9)
<i>Number of comorbidities</i>		
No comorbidities	59	(24.4)
Single comorbidity	39	(16.1)
2 comorbidities	71	(29.3)
Multiple comorbidities	73	(30.2)

*Categories within this variable are not mutually exclusive. NSTEMI: non-ST-elevation myocardial infarction, STEMI: ST-elevation myocardial infarction, ACS: acute coronary syndrome, IHD: ischemic heart disease

of all patients had RCA dominance, whereas 32.6% of them had left coronary artery dominance (Table 2).

The management was conservative in most cases, with 69.8% who received BMT exclusively. Only 11.6% of patients underwent PCI, and 18.6% were managed with CABG (Table 3).

In univariable regression analysis, considering BMT as the reference treatment modality, factors associated with CABG were lesions in the left main artery, LAD, ramus, LCX, RCA, and multivessel diseases. In the multivariable analysis, patients <60 years of age (adjusted odds ratio [aOR]: 4.30, CI: 1.6-11.8, *p*=0.005),

Table 2 - Distribution of pattern of artery lesions (N=242).

Pattern of artery lesions	n	(%)
<i>Pattern of artery lesions*</i>		
LM lesion	23	9(5)
LAD lesion	166	(68.6)
Ramus lesion	19	(7.9)
LCX lesion	118	(48.8)
RCA lesion	124	(51.2)
<i>Multi vessel disease</i>		
Yes	139	(57.4)
No	103	(42.6)
<i>Dominant artery</i>		
Both	23	(9.5)
Left	79	(32.6)
Right	140	(57.9)

*Categories within variable are not mutually exclusive. LM: left main artery lesion, LAD: left anterior descending artery lesion, LCX: left circumflex artery lesion, RCA: right coronary artery lesion

with disease of the ramus (aOR: 6.90, CI: 1.8–26.8; $p=0.005$), or the left main artery (aOR: 4.50, CI: 1.5–16.6, $p=0.01$) were more likely to undergo CABG (Table 4). Factors associated with PCI in the univariable analysis included age ≤ 60 years, female gender, diabetes, hypertension, dyslipidemia, and lesion in the RCA. In the multivariable analysis, patients with a lesion in the RCA were more likely to undergo PCI (aOR: 14.6, CI: 2.3–93.1); $p=0.005$) as compared to those with a lesion in the LAD (aOR: 0.09, CI: 0.01–0.79) (Table 5).

Discussion. This study aimed to evaluate the patterns and determinants of different treatment modalities for CAD in 3 major hospitals in the KSA. The study revealed that diabetes, hypertension, dyslipidemia, and smoking are highly prevalent in patients with CAD in our settings. The LAD artery lesion was the most common lesion. The treatment of CAD was mostly conservative, with more than two-thirds of patients receiving only medical therapy. Age and the anatomical localization of the CAD lesions were the main factors associated with treatment with CABG or PCI. Most often the lesions of the ramus and the left main artery required CABG while the lesion of RCA required PCI.

Irrespective of age, the incidence of CAD is higher in men compared to women.^{10,11} Although STEMI is more common in men, women tend to have a worse prognosis after myocardial infarction.¹² Microvascular angina is more common in women.¹² It has been reported that CVDs account for 40% and 49% of all

Table 3 - Distribution and association management modalities with associated factors (N=242).

Associated factors	Management modalities		
	Best medical therapy	CABG	PCI
<i>Age (years)</i>			
≤ 60	105 (76.1)	23 (16.7)	10 (7.2)
>60	64 (61.5)	22 (2.2)	18 (17.3)
<i>Gender</i>			
Male	117 (73.1)	32 (20)	11 (6.9)
Female	52 (63.4)	13 (15.9)	17 (20.7)
<i>Smoking status</i>			
Current/ex-smoker	56 (67.9)	20 (24.7)	6 (7.4)
Non- smoker	113 (71.1)	25 (15.7)	21 (13.2)
<i>Diabetes mellitus</i>			
Yes	91 (64.1)	26 (18.3)	25 (17.6)
No	78 (78.0)	19 (19.0)	3 (3.0)
<i>Hypertension</i>			
Yes	89 (66.4)	23 (17.2)	22 (16.4)
No	80 (74.1)	22 (20.4)	6 (5.6)
<i>Dyslipidemia</i>			
Yes	45 (61.6)	12 (16.4)	16 (21.9)
No	124 (73.4)	33 (19.5)	12 (7.1)
<i>Diagnosis</i>			
Atypical angina	48 (71.6)	16 (23.9)	3 (4.5)
Stable angina	5 (83.3)	1 (16.7)	0 (0.0)
Unstable angina	52 (66.7)	10 (12.8)	16 (20.5)
NSTEMI	29 (67.4)	11 (25.6)	3 (7.0)
STEMI	35 (72.9)	7 (14.6)	6 (12.5)
<i>LM lesion</i>			
Yes	12 (52.2)	11(47.8)	0 (0.0)
No	157 (71.7)	34 (15.5)	28 (12.8)
<i>LAD lesion</i>			
Yes	116 (69.9)	43 (25.9)	7 (4.2)
No	53 (69.7)	2 (2.6)	21 (27.6)
<i>Ramus</i>			
Yes	6 (31.6)	13 (68.4)	0 (0.0)
No	163 (73.1)	32 (14.3)	28 (12.6)
<i>LCX</i>			
Yes	73 (61.9)	37 (31.4)	8 (6.8)
No	96 (77.4)	8 (6.5)	20 (16.1)
<i>RCA</i>			
Yes	65 (52.4)	35 (28.2)	24 (19.4)
No	104 (88.1)	10 (8.5)	4 (3.4)
<i>Dominant artery</i>			
Right	79 (56.4)	39 (27.9)	22 (15.7)
Left	73 (92.4)	4 (5.1)	2 (2.5)
Both	17 (73.9)	2 (8.7)	4 (17.4)
<i>MVD</i>			
Yes	85 (61.2)	44 (31.7)	10 (7.2)
No	84 (81.6)	1 (1.0)	18 (17.4)
Total	169 (69.8)	45 (18.6)	28 (11.6)

Values are presented as number and percentages (%). BMT: best medical therapy, PCI: percutaneous coronary intervention, CABG: coronary artery bypass grafting, NSTEMI: non-ST-elevation myocardial infarction, STEMI: ST-elevation myocardial infarction, LM: left main lesion, RCA: right coronary arteries, LAD: left anterior descending artery, LCX: left circumflex artery, MVD: coronary microvascular disease

Table 4 - Association between associated factors with management modalities (univariate regression analysis).

Associated factors	Best medical therapy	Univariate regression analysis Unadjusted OR (95% CI; <i>P</i> -value)	
		CABG	PCI
<i>Age (years)</i>			
≤60	Ref.	1.57(0.81-3.04); <i>p</i> =0.182*	2.95(1.28-6.79); <i>p</i> =0.011*
>60	Ref.	1	1
<i>Gender</i>			
Male	Ref.	1.09 (0.53-2.25); <i>p</i> =0.807	0.29 (0.13-0.66); <i>p</i> =0.003*
Female	Ref.	1	1
<i>Smoking status</i>			
Current/ex-smoker	Ref.	1.64 (0.84-3.21); <i>p</i> =0.146*	0.59 (0.22-1.54); <i>p</i> =0.278
Non- smoker	Ref.	1	1
<i>Diabetes mellitus</i>			
Yes	Ref.	1.17 (0.60-2.28); <i>p</i> =0.638	7.14 (2.08-24.56); <i>p</i> =0.002*
No	Ref.	1	1
<i>Hypertension</i>			
Yes	Ref.	0.94 (0.49-1.81); <i>p</i> =0.853	3.29 (1.27-8.54); <i>p</i> =0.014*
No	Ref.	1	1
<i>Dyslipidemia</i>			
Yes	Ref.	1.0 (0.48-2.11); <i>p</i> =0.996	3.67 (1.61-8.36); <i>p</i> =0.002*
No	Ref.	1	1
<i>Diagnosis</i>			
Atypical angina	Ref.	1.67 (0.62-4.48); <i>p</i> =0.312	0.37 (0.09-1.56); <i>p</i> =0.173*
Stable angina	Ref.	1.0 (0.10-9.93); <i>p</i> =1.000	-----
Unstable angina	Ref.	0.96 (0.33-2.77); <i>p</i> =0.942	1.79 (0.64-5.04); <i>p</i> =0.266
NSTEMI	Ref.	1.89 (0.65-5.52); <i>p</i> =0.240*	0.60 (0.14-2.63); <i>p</i> =0.50
STEMI	Ref.	1	1
<i>LM lesion</i>			
Yes	Ref.	4.23 (1.72-10.4); <i>p</i> =0.002*	-----
No	Ref.	1	-----
<i>LAD lesion</i>			
Yes	Ref.	9.82 (2.29-42.07); <i>p</i> =0.002*	0.15 (0.06-42.07); <i>p</i> =0.000*
No	Ref.	1	1
<i>Ramus</i>			
Yes	Ref.	11.04 (3.91-31.19); <i>p</i> =0.002*	-----
No	Ref.	1	1
<i>LCX</i>			
Yes	Ref.	6.08 (2.67-13.85); <i>p</i> =0.000*	0.53 (0.22-1.26); <i>p</i> =0.15*
No	Ref.	1	1
<i>RCA</i>			
Yes	Ref.	5.6(2.59-12.07); <i>p</i> =0.000*	9.60 (3.19-28.93); <i>p</i> =0.000*
No	Ref.	1	1
<i>Dominant artery</i>			
Right	Ref.	4.19 (0.92-19.1); <i>p</i> =0.063*	1.18 (0.36-3.88); <i>p</i> =0.781
Left	Ref.	0.47 (0.08-2.76); <i>p</i> =0.400	0.12 (0.02-0.69); <i>p</i> =0.018*
Both	Ref.	1	1
<i>MVD</i>			
Yes	Ref.	43.48(5.86-322.88); <i>p</i> =0.000*	0.55 (0.24-1.26); <i>p</i> =0.157*
No	Ref.	1	1

Significance levels: for unadjusted/univariate analysis <0.25, for multivariate analysis <0.05. Multinomial logistic regression used. The reference category is: "best medical therapy". OR: odds ratio (95% confidence interval). PCI: percutaneous coronary intervention, CABG: coronary artery bypass grafting, NSTEMI: non-ST-elevation myocardial infarction, STEMI: ST-elevation myocardial infarction, LM: left main lesion, RCA: right coronary arteries, LAD: left anterior descending artery, LCX: left circumflex artery, MVD: coronary microvascular disease, *statistically significance value

Table 5 - Association between associated factors with management modalities (multivariate regression analysis).

Associated factors	Multivariate regression analysis Adjusted OR (95% CI; <i>P</i> -value)		
	Best medical therapy	CABG	PCI
<i>Age groups</i>			
≤60 years	Ref.	4.27 (1.55-11.8); <i>p</i> =0.005*	1.26 (0.33-4.89); <i>p</i> :0.738
>60 years	Ref.	1	1
<i>Gender</i>			
Male	Ref.	-----	0.31 (0.07-1.39); <i>p</i> :0.126
Female	Ref.	-----	1
<i>Smoking status</i>			
Current/ex-smoker	Ref.	0.98 (0.33-2.87); <i>p</i> =0.965	-----
Non- smoker	Ref.	1	-----
<i>Diabetes mellitus</i>			
Yes	Ref.	-----	4.07 (0.81-20.4); <i>p</i> =0.089
No	Ref.	-----	1
<i>Hypertension</i>			
Yes	Ref.	-----	0.85 (0.19-3.68); <i>p</i> =0.824
No	Ref.	-----	1
<i>Dyslipidemia</i>			
Yes	Ref.	-----	1.42 (0.29-6.99); <i>p</i> =0.670
No	Ref.	-----	1
<i>Diagnosis</i>			
Atypical angina	Ref.	1.63 (0.41-6.63); <i>p</i> =0.490	1.14 (0.14-9.24); <i>p</i> =0.905
Stable angina	Ref.	1.57 (0.09-24.73); <i>p</i> =0.751	-----
Unstable angina	Ref.	1.23 (0.35-4.29); <i>p</i> =0.747	0.72 (0.10-5.22); <i>p</i> =0.748
NSTEMI	Ref.	0.894 (0.21-3.89); <i>p</i> =0.881	0.72 (0.09-5.93); <i>p</i> =0.761
STEMI	Ref.	1	1
<i>LM lesion</i>			
Yes	Ref.	4.94 (1.47-16.61); <i>p</i> =0.010*	-----
No	Ref.	1	-----
<i>LAD lesion</i>			
Yes	Ref.	0.83 (0.08-8.75); <i>p</i> =0.875	0.088 (0.01-0.79); <i>p</i> =0.030*
No	Ref.	1	1
<i>Ramus</i>			
Yes	Ref.	6.88 (1.77-26.79); <i>p</i> =0.005*	-----
No	Ref.	1	-----
<i>LCX</i>			
Yes	Ref.	1.71 (0.46-6.35); <i>p</i> =0.422	1.36 (0.22-8.25); <i>p</i> =0.739
No	Ref.	1	1
<i>RCA</i>			
Yes	Ref.	1.64 (0.59-4.55); <i>p</i> =0.342	14.6 (2.29-93.1); <i>p</i> =0.005*
No	Ref.	1	1
<i>Dominant artery</i>			
Right	Ref.	5.67 (0.91-35.4); <i>p</i> =0.063	0.33 (0.06-1.90); <i>p</i> =0.213
Left	Ref.	1.16 (0.12-10.98); <i>p</i> =0.900	0.12 (0.01-1.16); <i>p</i> =0.067
Both	Ref.	1	1
<i>MVD</i>			
Yes	Ref.	13.13 (0.60-285.7); <i>p</i> =0.101	0.95 (0.04-20.9); <i>p</i> =0.975
No	Ref.	1	1

Significance levels: for unadjusted/univariate analysis <0.25, for multivariate analysis <0.05.

Multinomial logistic regression used. The reference category is: "best medical therapy". OR: odd ratio (95% confidence interval). PCI: percutaneous coronary intervention, CABG: coronary artery bypass grafting,

NSTEMI: non-ST-elevation myocardial infarction, STEMI: ST-elevation myocardial infarction, LM: left main lesion, RCA: right coronary arteries, LAD: left anterior descending artery, LCX: left circumflex artery, MVD: coronary microvascular disease,

*statistically significance value

deaths in men and women, respectively.¹³ This gender difference in the burden of CAD can be attributed to some variations in risk profile, pathophysiological mechanisms, and diagnosis of CAD between men and women.¹⁴ Indeed, atypical presentation of the CAD, which is mainly due to microvascular angina and more common in women, is associated with poorer outcomes.¹³ Hence this form of CAD warrants special medical care in affected women.¹³

Clinical manifestation of CAD varies with the culprit vessel.¹⁵ Akin to the present study's findings, previous studies have also reported the LAD artery as the most common culprit vessel. The involvement of LAD leads to worse outcomes.¹⁶ On the contrary, a study conducted by Aldosari et al¹⁷ reported LCX as the most common artery involved in CAD, followed by the LAD, the right circumflex artery, and LM on coronary angiography in the Saudi population. This discrepancy needs to be further evaluated in larger studies.

The incidence of CAD and its complications increases with advanced age. Cardiac interventions, such as CABG or PCI, are therefore increased in old age. Pacaric et al¹⁸ evaluated 47 participants aged 30-75 years who underwent CABG and found that approximately half of the patients (49%) were >60 years old and 55% of them were males. Smoking, an established risk factor for CAD, also independently increases the risk of complications of cardiac surgery. The incidence of multiple comorbidities among the patients undergoing CABG has increased from that of previous years.¹⁹

Study limitations. The main limitation of the study was the relatively small sample. Despite the inclusion of patients from 3 facilities, our findings are not completely representative of the CAD population in the KSA. Variations in patients' profiles and physician practices can be observed across settings. Furthermore, some details were not available, including the severity of CAD lesions and the extent of CABG (double, triple, or quadruple bypass graft). Notwithstanding these limitations, this study provides crucial information on the risk profile and treatment choices for patients with CAD in the KSA. Furthermore, provided that only patients presenting to the hospital were included in the study, those in the population with very mild symptoms may have been missed out. Owing to this sampling bias, results from this study may not be extrapolated to the general population. Prospectively designed larger multicenter studies are required to better capture the epidemiology, treatment, and outcomes of the CAD in the country.

In conclusion, this study shows there exists a high prevalence of hypertension, diabetes, dyslipidemia, and

history of smoking among patients with CAD in our settings. This important finding highlights the need to tackle these CV risk factors for the primary prevention of CAD. Most patients who presented themselves with CAD in our settings were treated conservatively, and more than half of them were managed with BMT alone. Patients were less commonly managed with PCI or CABG. Patients' age and the anatomical localization of coronary atherosclerotic lesions were the main determinants of treatment with CABG or PCI. To the best of our knowledge, there is no study that delineates the association between patient factors and modality of CAD treatment-CABG or PCI, specific to the Saudi population. The strength of these associations is yet to be confirmed with further studies. Although optimal medical therapy is pivotal in all patients, there is a need to scale up the use of PCI to meet international recommendations and improve survival.

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