

Spontaneous Coronary Artery Dissection: Does Being Unemployed Matter? Insights from the GSCAD Registry

Amin Daoulah^{1*}, Salem M. Al-Faifi², William T. Hurley³, Abdulaziz Alasmari¹, Mohammed Ocheltree⁴, Rami H. Abushanab⁴, Hisham Hussein⁵, Ahmed A. Emam⁶, Vikram Grewal⁷, Zainab M. Jafary⁸, Ahmad S. Hersi⁹, Edward B. Devol¹⁰, Alawi A. Alsheikh-Ali¹¹, Ali A. Haneef¹², Amir Lotfi¹³ and G-SCAD Investigators

¹Department of Cardiovascular Medicine, King Faisal Specialist Hospital & Research Center, Jeddah, Kingdom of Saudi Arabia; ²Department of Internal Medicine, King Faisal Specialist Hospital & Research Center, Jeddah, Kingdom of Saudi Arabia; ³Emergency Medicine Department, Cleveland Clinic foundation, Cleveland, Ohio, OH 44195, USA; ⁴Department of Internal Medicine, King Abdulaziz University Hospital, Jeddah, Kingdom of Saudi Arabia; ⁵Department of Cardiology, Saud Al Baktain Cardiac Center, Dammam, Kingdom of Saudi Arabia; ⁶Department of Cardiology, Chest Disease Hospital, Kuwait; ⁷Baystate Medical Center, University of Massachusetts Medical School, Springfield, MA 01655, USA; ⁸Department of Cardiology, King Salman Heart Center, King Fahad Medical City, Riyadh, Kingdom of Saudi Arabia; ⁹Department of Cardiac Sciences College of Medicine, King Saud University, Riyadh, Kingdom of Saudi Arabia; ¹⁰Department of Biostatistics, Epidemiology & Scientific Computing, King Faisal Specialist Hospital & Research Center, Riyadh, Kingdom of Saudi Arabia; ¹¹College of Medicine, Mohammed Bin Rashid University of Medicine and Health Sciences, Dubai, United Arab Emirates; ¹²Department of Cardiac Sciences, King Abdulaziz Medical City, Jeddah, Kingdom of Saudi Arabia; ¹³Department of Cardiovascular Medicine, Baystate Medical Center, Tufts University School of Medicine, Springfield, MA, USA

Abstract: Background: Spontaneous coronary artery dissection (SCAD) has emerged as an important cause of acute coronary syndrome (ACS) and sudden cardiac death. Physical or emotional stressors are the most commonly reported triggers for SCAD. Unemployment has been identified as a source of emotional stress and is linked to poor mental and physical health.

Objective: To examine the association between employment status and in-hospital and follow-up adverse cardiovascular events in patients with SCAD.

Methods: We conducted a retrospective, multi-center, observational study of patients undergoing coronary angiography for ACS between January 2011 and December 2017. The total number of patients enrolled was 198,000. Patients were diagnosed with SCAD based on angiographic and intravascular imaging modalities whenever available. There were 83 patients identified with SCAD from 30 medical centers in 4 Arab gulf countries. In-hospital (myocardial infarction, percutaneous intervention, ventricular tachycardia/ventricular fibrillation, cardiogenic shock, death, internal cardioverter/defibrillator placement, dissection extension) and follow-up (myocardial infarction, de novo SCAD, death, spontaneous superior mesenteric artery dissection) cardiac events were compared among those who were employed and those who were not.

Results: The median age of patients in the study was 44 (37- 55) years. There were 42 (50.6%) female patients, and 41 (49.4) male patients. Of the cohort, 50 (60%) of the patients were employed and the remaining 33 (40%) were unemployed. 66% of all men were employed and 76% of all women were unemployed. After adjusting for gender unemployment was associated with worse in-hospital and follow-up cardiac events (adjusted OR 7.1, [1.3, 37.9]), $p = 0.021$.

Conclusion: Adverse cardiovascular events were significantly worse for patients with SCAD who were unemployed.

Keywords: SCAD, coronary angiography, unemployment, arabian gulf, events, gender.

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* Address correspondence to this author at the Section of Adult Cardiology, Cardiovascular Department, King Faisal Specialist Hospital & Research Center, Jeddah Kingdom of Saudi Arabia; Tel: +966505795656; E-mail: amindaoulah@yahoo.com

1. INTRODUCTION

Employment can contribute to a person's livelihood by ensuring a higher living standard [1]. Employment may improve one's health status by providing psychological stability [2], economic benefits [3], and improved relationships [4]. Conversely, unemployment has been identified as a source of emotional stress and is linked to poor mental and physical health [1]. Also, recent studies demonstrate a correlation between unemployment and the risk of coronary artery disease (CAD) and mortality [5-11]. The effect of unemployment on CAD is not uniform across the exposed population and may vary by geographical region, age-group, sex, ethnicity, income level, and family status [8]. Unemployment rates in Arab Gulf countries have been high in the last 10 years [12], and 39% of patients with CAD in Arab Gulf countries are unemployed [13]. In a western registry the unemployment rate was found to be 79% among all patients with CAD, and 87% in male patients with CAD [14]. In the Kingdom of Saudi Arabia, the unemployment rate is nearly 13%, with a rate of 6.6% for males and 32% for females [15]. A key objective of the Kingdom of Saudi Arabia Vision 2030 is to increase the employment rate of women and reduce the total unemployment rate to 7% [16]. This intervention has the potential to alter the association between employment and the incidence of CAD in the Kingdom. Spontaneous Coronary Artery Dissection (SCAD) is emerging as an important cause of the acute coronary syndrome, especially in young females without conventional coronary risk factors [17-22]. SCAD is defined as an epicardial coronary artery dissection that is noniatrogenic and nontraumatic [23]. The presentation of SCAD is similar to atherosclerotic acute coronary syndrome [19-21, 24-26]. The causes of SCAD are hypothesized to be multifactorial with contributions from underlying arteriopathies, genetic factors, hormonal influences, and systemic inflammatory diseases. These are often compounded by environmental precipitants and stressors [27]. Extreme emotional stress is among the most commonly reported triggers for SCAD [20], more often reported in females than males [18, 28]. Adverse cardiovascular events after SCAD are relatively common and identification of triggers for such is warranted [17, 19, 20, 23-25, 29-31]. The present study aimed to investigate in-hospital and follow-up events in patients with SCAD, stratified by employment status, in four Arab Gulf countries.

2. METHODS

2.1. Study Population and Data Collection

The study was a retrospective, multi-center, observational study of patients undergoing coronary angiography for ACS between January 2011 and December 2017. The total number of patients enrolled was 198,000. All patients with angiographic findings of atherosclerotic plaque rupture or plaque erosion and occlusive thrombus were excluded. Of the remaining 299 patients, 216 had additional exclusion criteria. Excluded were those patients with coronary artery dissection due to blunt trauma, surgical instruments or catheters (153), atherosclerotic coronary plaque dissection (48), and

cases with a diagnostic disagreement between the primary and principal cardiologists (15). The remaining 83 patients were diagnosed with SCAD. Thirty centers were represented, including 25 tertiary referral locations and 5 regional hospitals. Study locations were spread across four Arab Gulf countries: The Kingdom of Saudi Arabia (68 SCAD from 25 centers), The United Arab Emirates (8 SCAD from 2 centers), Kuwait (4 SCAD from 2 centers), and Bahrain (3 SCAD from 1 center). The diagnosis of SCAD was based on angiographic and intravascular imaging whenever available, for ambiguous lesions and according to physician discretion. Coronary angiograms were reviewed by the primary cardiologist from each center and confirmed by the principal cardiologist from King Faisal Specialist Hospital and Research Center (Jeddah branch), and if SCAD was confirmed, findings were classified as Type 1, Type 2, or Type 3 angiographic SCAD [32, 33]. Type 1 angiographic SCAD appears as the classic contrast dye staining of the arterial wall with multiple radiolucent lumen with or without the presence of dye hang-up or slow contrast clearing from the lumen. Type 2 angiographic SCAD appears as diffuse (typically 20 to 30 mm) and smooth narrowing that can vary in severity. Type 3 angiographic SCAD mimics atherosclerosis with focal or tubular stenosis. The number of dissected coronary arteries, location, stenosis severity and lesion length were recorded. Verbal consent for study entry was obtained *via* a phone call to each patient. No patients declined to participate in this registry. The study protocol was approved by the Institutional Review Board of King Faisal Specialist Hospital and Research Center and each of the participating hospitals. In the present analysis, we examined employment status and in-hospital and follow-up events in patients with SCAD. The patients were divided into two groups: those who reported unemployment and those who reported being employed (private, government, or self-employed). All patients remained unemployed or employed throughout the study and follow-up period. No patients reported a change in employment status.

2.2. Clinical Information

Variables included demographic characteristics, atherosclerotic risk factors, potential predisposing and precipitating stressors, marital and socioeconomic status, mental health history, gynecological history, presence of Fibromuscular Dysplasia (FMD), and systemic inflammatory conditions. Routine laboratory studies were obtained during hospitalization. Cardiologists provided an analysis of telemetry and 12-lead electrocardiogram data. For each patient with confirmed SCAD, transthoracic echocardiogram and coronary angiography reports were obtained. Management strategies and in-hospital events were compared between those employed and those unemployed. Our stress questionnaire was simplified as described by Doulah *et al.* [34]. In-hospital cardiac events were identified as those that were not present on the initial evaluation and occurred after being hospitalized. These included: Ventricular Tachycardia/Ventricular Fibrillation (VT/VF), cardiogenic shock, death, Implantable Cardioverter Defibrillator (ICD) implantation, and dissection ex-

tension. Follow-up events were those that occurred post-discharge from the hospital. They included MI, de novo SCAD, death, and spontaneous superior mesenteric artery dissection. Telephone follow-ups were conducted for all patients, as were full reviews of treating physician reports.

2.3. Definitions

Ventricular Arrhythmia (VA) was defined as sustained Ventricular Tachycardia (VT) or Ventricular Fibrillation (VF) assessed by electrocardiogram on admission and during hospitalization. Any episode of VT lasting longer than 30 seconds was considered sustained VT.

Recurrent ventricular arrhythmia was defined as an episode of VA that occurred within four days of hospitalization.

Cardiogenic shock was defined as hypotension with hypoperfusion that occurred during hospitalization post-acute intervention and requiring inotropes support.

De novo coronary artery dissection was defined as a new dissection in different epicardial vessels, with a resolution of the prior dissection in the originally affected vessels.

Extension of the dissection was defined as a continuation of an already-established dissection, either spontaneously or iatrogenically.

2.4. Statistical Analysis

Categorical data were summarized with absolute numbers and percentages. Numeric data were summarized with median and 25th- 75th quartiles. Comparison between different groups was performed using the Chi-square test or Fisher's exact (if the expected frequency is less than 5) for categorical variables and independent sample *t*-test or Mann-Whitney U test for continuous variables. A Cox proportional hazard model was used to estimate the hazard ratios and its associated 95% confidence intervals, using the sex difference. A Kaplan-Meier analysis was used to plot the cumulative survival and differences between curves were assessed by the log-rank test. All analyses were performed using (S-TATA) software, Version (14.2) (StataCorp; College Station, Texas, USA). A *p*-value of less than 0.05 was considered statistically significant.

3. RESULTS

3.1. Baseline Characteristics of SCAD Patients According to Employment Status

Over a period of six years, eighty-three patients were retrospectively identified. The median follow-up time was 18.8 months (interquartile range: 9.06-40.1 months). As shown in (Table 1), fifty (60%) patients were employed (government, private, and self-employed). The remaining 33 (40%) patients with SCAD were unemployed. Of the 50 patients who were employed, the majority were working in the private sector 31 (62%), and the rest were self-employed 4 (8%) or in the government sector 15 (30%). The median age of patients in the study was 44 (37- 55) years. When comparing those

employed and those unemployed, the age difference was not statistically significant ($p = 0.36$). In the 42 (50.6%) female patients, 76% were unemployed and 24% were employed ($p < 0.01$). The majority of the study participants were Arab 84.34%. When comparing those employed and unemployed, the difference in Arab ethnicity was statistically significant ($p < 0.01$). Employed patients were more likely to be married (44/50, 88%), and less likely to be divorced (3/50, 6%) or widowed 2% (1/50, 2%). For those unemployed, 57.6% (19/33) were married, 24% (8/33) were divorced, and 15% (5/33) were widowed, ($p < 0.01$).

Most patients (74%) had a monthly income of less than 10,000 SAR per month (66% of employed and 88% of unemployed patients). A monthly income greater than 10,000 SAR was reported by 34% of employed and 12% of unemployed patients ($p = 0.04$). Completion of secondary education was reported by 72% of patients (64% of employed and 85% of unemployed) and 28% reported completion of post-secondary education (36% of employed and 15% of unemployed, $p = 0.05$). Cardiac risk factors including diabetes mellitus, hypertension, and dyslipidemia were reported in 25%, 31%, and 39% of the cohort's respectively. However, no significant difference was found between employed and unemployed patients with regards to cardiac risk factors ($p = 0.77$, $p = 1.00$, and $p = 0.25$, respectively). Smoking was reported in 45% of patients (54% of employed and 30% of unemployed patients, $p = 0.04$). Reported anxiety, migraine, depression, and stress were not significantly different between employed and unemployed patients ($p = 0.10$, $p = 0.29$, $p = 0.21$, and $p = 0.51$, respectively).

3.2. Hospital Presentation and Angiographic Findings

As shown in (Table 2), acute ST segment elevation myocardial infarction (STEMI) was present in 48% of the patients, and 47% presented with non-ST-elevation acute coronary syndrome (NST-ACS). Acute STEMI was more common in the unemployed and NST-ACS was more common in the employed ($p = 0.01$). The median LV ejection fraction was 45% (40- 55%). There was no statistically significant difference between the two groups with regards to LV ejection fraction ($p = 0.45$). A reduced LV ejection fraction of less than 35% was found in 14 patients (17%). There was no significant difference between employed and unemployed patients in elevation of cardiac enzymes or elevation of White Blood Cell count (WBC). In terms of coronary vessel distribution, 12% of the patients had Left Main (LM) involvement, 43% of the patients had left anterior descending artery (LAD) involvement, 21.7% of the patients had right coronary artery (RCA) involvement, 9.6% of the patients had left circumflex artery involvement, and 9.6% of the patients had multi-vessel spontaneous coronary artery dissection. Branch vessel involvement was seen in 3.6% of the patients. There was no statically significant difference between the two groups with regards to coronary vessel distribution ($p = 0.66$). Type I SCAD was present in 52% of patients, type II SCAD in 42%, and type III SCAD in 3.6%. Two (2.4%) patients were felt to have multiple types of dissections. Most commonly, patients had TIMI-3 coronary grade

Table 1. Baseline characteristics of patients with scad according to their employment status.

	All Patients (n=83)	Employed (n=50) Government=15 Private=31 Self-Employed=4	Unemployed (n=33)	P-value
Demographics	-	-	-	-
Age, yrs	44 (37- 55)	42 (37-52)	49 (34-60)	0.36
Female gender	42 (50.6%)	17 (34%)	25 (75.75%)	< 0.01
BMI (kg/m ²)	27 (24.8- 30)	27 (25-30)	27 (25-33)	0.33
Arabic ethnicity	70 (84.34%)	37 (74%)	33 (100%)	<0.01
Marital status	-	-	-	<0.01
Divorced	11 (13.25%)	3 (6%)	8 (24.24%)	-
Married	63 (75.9%)	44 (88%)	19 (57.57%)	-
Single	3 (3.61%)	2 (4%)	1 (3.03%)	-
Widowed	6 (7.23%)	1(2%)	5 (15.15%)	-
Socio-economic factors	-	-	-	-
Secondary education	60 (72.29%)	32 (64%)	28 (84.84%)	0.05
Post-secondary education	23 (27.71%)	18 (36%)	5 (15.15%)	
Monthly income ≥10 SAR/- month	21 (25.30%)	17 (34%)	4 (12.12%)	0.04
Monthly income <10 SAR/- month	62 (73.70%)	33 (66%)	29 (87.87%)	
Smoker	37 (44.58%)	27 (54%)	10 (30.30%)	0.04
Comorbidities	-	-	-	-
Diabetes Mellitus	-	-	-	0.77
Insulin dependent diabetes mellitus	4 (4.82%)	3 (6%)	1 (3.03%)	-
Non-insulin dependent dia- betes mellitus	17 (20.48%)	9 (18%)	8 (24.24%)	-
Arterial hypertension	26 (31.33%)	16 (32%)	10 (30.30%)	1.00
Dyslipidaemia	32 (38.55%)	22 (44%)	10 (30.30%)	0.25
Cerebral vascular accident	1 (1.20%)	1 (2%)	0 (0.00%)	1.00
Anxiety	28 (33.73%)	13 (26%)	15 (45.45%)	0.10
Depression	12 (14.46%)	5 (10%)	7 (21.21%)	0.21
Migraine	19 (22.89%)	9 (18%)	10 (30.30%)	0.29
Hypothyroid	6 (7.23%)	2 (4%)	4 (12.12%)	0.21
Stress factor	-	-	-	0.51
None	34 (40.96%)	22 (44%)	12 (36.36%)	-
Emotional stress	33 (39.76%)	16 (32%)	17 (51.51%)	-
Physical stress	9 (10.84%)	6 (12%)	3 (9.09%)	-
Combined (Physical & Emotio- nal) stress	7 (8.43%)	6 (12%)	1 (3.03%)	-

flow in the affected artery (49%), followed by TIMI-2 flow (25%), with no statically significant difference between employed and unemployed patients ($p = 0.50$ and $p = 0.65$, respectively). Maximal stenosis severity of 80% (50- 95) and maximal lesion length of 25mm (18- 36) were similar in both groups ($p = 0.45$ and $p = 0.08$, respectively).

3.3. Management Strategy

As shown in (Table 3), the management of SCAD was not statistically different between the employed and unemployed groups ($p = 0.26$). Forty percent of patients had only

medical treatment. Over half of the patients underwent coronary revascularization, including percutaneous coronary intervention (53%) and coronary artery bypass grafting (7%). Medications prescribed at discharge and follow-up are shown (Table 3). Both groups received similar discharge medications. All patients in the study were prescribed aspirin. Most patients (91.5%) were prescribed a P2Y12 inhibitor (17 Ticagrelor, 3 Prasugrel and 55 Clopidogrel), 90% received beta-blocker therapy and 85% received statin therapy. By the median follow up time of 18.8 months (interquartile range: 9.06- 40.1 months), there was a major decrease in a P2Y12 inhibitor use (62%). This decrease was similar in

Table 2. Hospital presentation and angiographic findings.

	All Patients (n=83)	Employed (n=50) Government=15 Private=31 Self-Employed=4	Unemployed (n=33)	P-value
Hospital presentation	-	-	-	-
Ventricular arrhythmia	10 (12.05%)	4 (8%)	6 (18.18%)	0.19
Acute coronary syndrome	-	-	-	0.01
Angina	3 (3.61%)	2(4%)	1(3.03%)	-
ST-elevation myocardial infarction	41 (48%)	22(44%)	19(57.57%)	-
Non-ST-elevation acute coronary syndrome	39 (46.99%)	26(52%)	13(39.39%)	-
2-D Echocardiogram on admission	-	-	-	-
Left ventricular ejection fraction (%) Median (IQR)	0.45 (0.4-0.55)	0.45 (0.40-0.55)	0.45 90.38-0.55)	0.45
LV EF < 0.35	14 (16.87%)	6(12%)	8(24.24%)	0.23
Lab test on admission	-	-	-	-
White Blood Cell Count (g/L) Median (IQR)	10 (6.45-12)	10 (7-11)	10 (6-12)	0.68
Troponin (ng/L) Median (IQR)	2.69 (0.05- 20)	1.3 (0.1-10.0)	9.3 (0.0-24.4)	0.22
Creatine Kinase (U/L) Median (IQR)	265 (108.5- 737)	265 (110-567)	275 (72-900)	0.84
Creatine Kinase Mycardial Band (µg/L) Median (IQR)	33 (5.85- 84.5)	33 (7-72)	33 (4-127)	0.88
Angiographic characteristics of the SCAD lesions	-	-	-	-
Coronary artery territory involved	-	-	-	0.66
Left main	10 (12.05%)	7 (14%)	3 (9.09%)	-
Left anterior descending	36 (43.37%)	21(42%)	15(45.45%)	-
Left circumflex artery	8 (9.64%)	5(10%)	3(9.09%)	-
Right coronary artery	18 (21.69%)	9(18%)	9(27.27%)	-
Multi-vessel	8 (9.64%)	5 (10%)	3 (9.09%)	-
Branch vessel	3 (3.61%)	3 (6%)	0 (00%)	-
Lesion characteristics	-	-	-	0.50
Type 1	43 (51.81%)	24(48%)	19(57.57%)	-
Type 2	35 (42.17%)	24(48%)	11(33.33%)	-
Type 3	3 (3.61%)	1(2%)	2(6.06%)	-
Multi-Type	2 (2.41%)	1(2%)	1(3.03%)	-
Thrombolysis in Myocardial Infarction (TIMI) grade flow	-	-	-	0.65
TIMI 0	8 (9.64%)	5(10%)	3(9.09%)	-
TIMI 1	13 (15.68%)	7(14%)	6(18.18%)	-
TIMI 2	21 (25.30%)	15(30%)	6(18.18%)	-
TIMI 3	41 (49.40%)	23(46%)	18(54.54%)	-
Max stenosis severity (%)	80 (50- 95)	80 (50-95)	90 (60-95)	0.45
Max dissection length (mm)	25 (18- 36)	28 (20-41)	20 (14-30)	0.08

Table 3. Management strategy.

	All Patients (n=83)	Employed (n=50) Government=15 Private=31 Self-Employed=4	Unemployed (n=33)	P-value
Intervention	-	-	-	0.26
Medical management only	33 (39.76%)	22(44%)	11(33.33%)	-
Percutaneous coronary intervention	44 (53.01%)	23(46%)	21(63.63%)	-
Coronary artery bypass grafting	6 (7.23%)	5(10%)	1(3.03%)	-
Discharge medications [Total No (82)]	Total No (82)	Total No (50)	Total No (32)	-
Aspirin	82 (100%)	50(100%)	32(100%)	1.00
P2Y12 inhibitor	75 (91.46%)	44(88%)	31(96.87%)	0.14
Beta Blocker	74 (90.24%)	46(92%)	28(87.5%)	1.00
Calcium Channel Blocker	9 (10.97%)	7(14%)	2(6.25%)	0.31
Statin	70 (85.36%)	45(90%)	25(78.12%)	0.36
Angiotensin-converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB)	54 (65.85%)	35(70%)	19(59.37%)	0.64
Nitroglycerin	27 (32.92%)	15(30%)	12(37.5%)	0.63
Follow-up medication [Total No (81)]	Total No (81)	Total No (49)	Total No (32)	-
Aspirin	79 (97.53%)	47(95.91%)	32(100%)	0.52
P2Y12 inhibitor	50 (61.72%)	33(67.34%)	17(%)	0.25
Beta Blockers	76 (93.82%)	46(93.87%)	30(93.75%)	1.00
Calcium Channel Blocker	11 (13.58%)	5(10.20%)	6(18.75%)	0.33
Statins	64 (79%)	39(79.59%)	25(87%)	1.00
Angiotensin-converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB)	53 (65.43%)	31(63.26%)	22(68.75%)	0.64
Nitroglycerin	13 (16%)	9(18.36%)	4(12.5%)	0.55

the employed and unemployed groups. ACEI or ARB was used in 66% of cases and continued into the follow-up period. Calcium channel blockers and nitroglycerin were used in a minority of patients.

3.4. Events

Detailed information regarding In-hospital events is displayed in (Fig. 1). There were 8 composite in-hospital events, 6 in the unemployed group, and 2 in the employed group. In the unemployed group, 4 patients had recurrent ventricular arrhythmia and cardiogenic shock. One patient died. The remaining 3 patients received IV amiodarone, inotropic support, and intra-aortic balloon pumps, and survived until discharge. The other 2 patients in the unemployed group had NSTEMI-ACS secondary to extension of the dissection. One patient had a retrograde extension of the dissection in a diagonal branch during balloon angioplasty of the LAD and was treated with PCI. The second patient had an extension of the dissection to an obtuse marginal branch during the stenting of the left circumflex artery and was treated

medically. In the employed group, there were two in-hospital events. One patient underwent an Implantable Cardioverter Defibrillator (ICD) placement for recurrent ventricular arrhythmia and low LVEF (less than 35%). The other patient had a spontaneous extension of the dissection in the posterolateral branch 24 hours post coronary angiography and was treated with PCI. There was no statistically significant difference between the two groups in regards to composite in-hospital events (6 (18.18%) vs. 2 (4%), $p = 0.10$). Follow-up events are displayed in (Fig. 2).

The composite follow-up events were statistically significant when comparing unemployed *versus* employed groups (5 (15.62%) vs. 1 (2%), $p = 0.03$). In the unemployed group, recurrent myocardial infarction occurred in all 5 patients, 4 of which were secondary to de novo coronary artery dissection. Three were treated medically and one underwent PCI. In the employed group, one patient died within one year of discharge from an unknown cause. In the employed group, there was no de novo coronary artery dissection as compared to four patients in the unemployed group, (4 (12.5%)

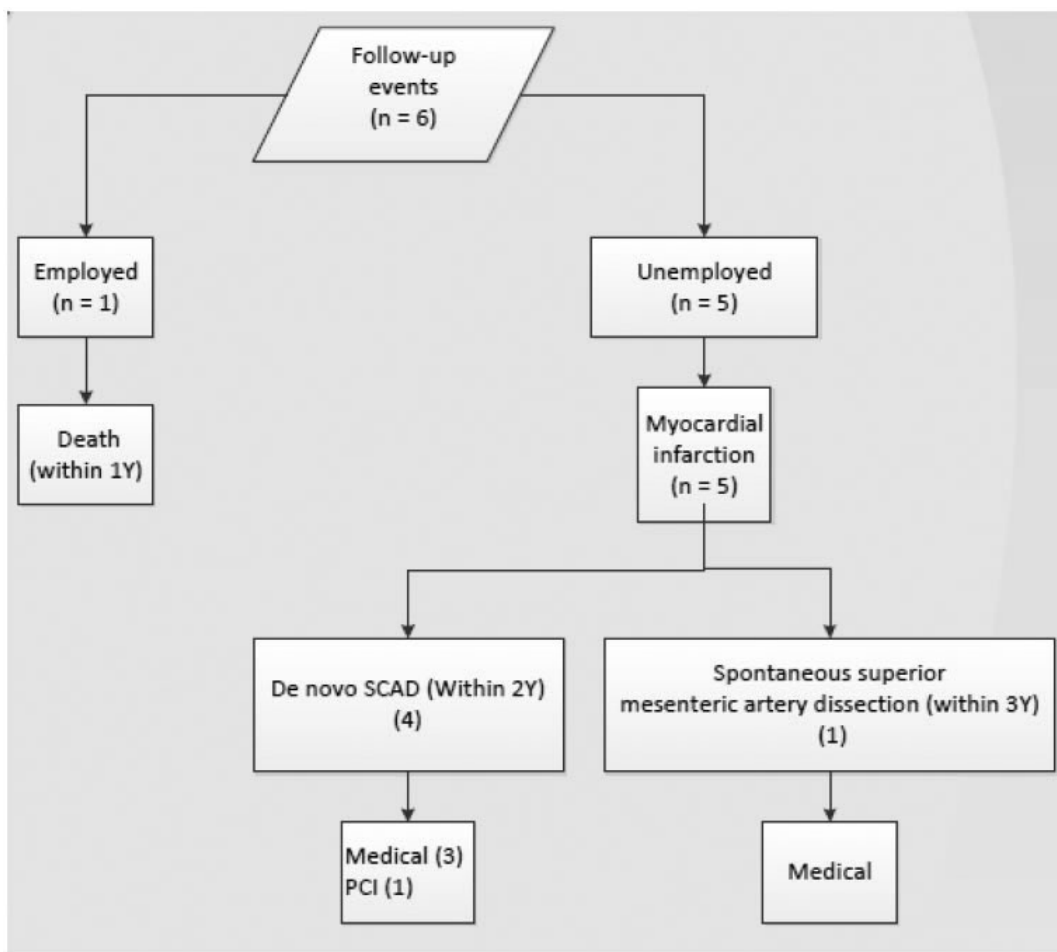


Fig. (2). Flow diagram of SCAD patients who had developed events during follow up. (A higher resolution / colour version of this figure is available in the electronic copy of the article).

Table 4. Association between unemployment and gender on all events (in-hospital and follow-up) in univariate and multivariate logistic regression.

-	Univariate OR (95% CI)		Multivariate Or (95% Ci) Adjusted For The Other Factor	
	OR (95% CI)	P-value	OR (95% CI)	P-value
Unemployment	10.4 (2.1– 51.6)	0.001	7.1 (1.3– 37.9)	0.021
Female	6.1 (1.2– 29.8)	0.026	3.1 (0.6 – 16.9)	0.197

ployment, especially in women [51]. These associations may add to the stress of unemployment and its potential negative impacts [52]. These effects may be even greater in a society with disparate access to resources, especially for women [53-55]. Interventions to manage these factors in patients with SCAD, either occupationally or therapeutically, may help reduce future adverse cardiac events and possibly improve prognosis. One potential countermeasure could be employment resources, which could provide recovery from stress by possibly reversing these mechanisms [56, 57].

This type of outreach would be consistent with Vision 2030 tenets [16]. In the previous study, Daoulah *et al.* [34]

compared the Arab Gulf countries to western cohorts in relationship to SCAD [35]. Potential explanations for the differences between the Arab and western data would include differences in genetics, lifestyle, culture, and medical services utilization between the two populations [58].

5. STRENGTHS

This study provides information about patients with SCAD in a unique population, from the Arab Gulf countries. Also, the study drew patients from a large number of centers in that region. Finally, the study examines the association between employment status and in-hospital and follow-up adverse cardiovascular events in SCAD patients.

6. LIMITATIONS

The study is potentially limited by selection, referral, measurement, and attrition biases. Additionally, the retrospective analysis may have underestimated the prevalence of SCAD in the Arab Gulf region. For those who described themselves as unemployed (throughout the study period), the impact of specific circumstances of their unemployment was not investigated or recorded.

CONCLUSION

SCAD patients with unemployment are associated with worse in-hospital and follow-up events as compared to those employed. Attention to the employment status in patients with cardiovascular disease can improve outcomes beyond traditional effective therapies, and increase the quality of life for these patients. Larger epidemiological studies are needed, taking into consideration the confounding factors and supported by the appropriate sample size to confirm our findings globally.

COMPLETE LIST OF AUTHORS WHO CONTRIBUTED DETAILED CLINICAL DATA

Jairam K. Aithal, MD, Burjeel Hospital, *Abu Dhabi*, UAE; *Tarek Farghali, MD*, Ibrahim Bin Hamad Obidullah Hospital, *Ras Al khaimah*, UAE; *Mirvat Alasnag, MD*, King Fahd Armed Forces Hospital, *Jeddah*, Saudi Arabia; *Adel Khalifa Hamad, MD*, Mohammed bin Khalifa Al Khalifa Cardiac Centre Bahrain Defence Force Hospital, *Riffa*, Bahrain; *Mamdouh Morshid, MD*, King Abdullah Medical City, *Makkah*, Saudi Arabia; *Yosri M. A. Morsi, MD*, Prince Abdullah Bin Musaed Cardiac Centre, *Arar*, Saudi Arabia; *Ziad Dahdouh, MD*, King Faisal Specialist Hospital & Research Center, *Riyadh*, Saudi Arabia; *Osama ElSayed, MD*, King Faisal Specialist Hospital & Research Center, *Jeddah*, Saudi Arabia; *Mohamed Nabil Alama, MD*, King Abdulaziz University Hospital, *Jeddah*, Saudi Arabia; *Nader Alasousi, MD*, Sabah Alahmad Cardiac Center, *Amiri Hospital*, Kuwait; *Khalid Tammam, MD*, International medical Center, *Jeddah*, Saudi Arabia; *Mohammed Almansori, MD*, Imam Abdulrahman Bin Faisal University, *Alkhubar*, Saudi Arabia; *Mohamed A. Ghani, MD*, Madinah Cardiac Center, *Madinah*, Saudi Arabia; *Wael A. Refaat, MD*, Prince Sultan Cardiac Center, *Al Hassa*, Saudi Arabia; *Akram Eldesoky, MD*, Prince Sultan Cardiac Center, *Al Qassim*, Saudi Arabia; *Mohammed Balghith, MD*, King Saud Bin Abdulaziz University for Health Science, *Riyadh*, Saudi Arabia; *Muhammad Adil Soofi, MD*, King Salman Heart Center, King Fahad Medical City, *Riyadh*, Saudi Arabia; *Ali A. Youssef, MD*, Saud Al Babtain Cardiac Center, *Dammam*, Saudi Arabia; *Fahad Baslaib, MD*, Rashid Hospital, *Dubai*, UAE; *Abdullah Alkhushail, MD*, Prince Sultan Cardiac Center, *Riyadh*, Saudi Arabia; *Mohammed Qutub, MD*, King Abdulaziz University *Jeddah*, Saudi Arabia; *Najeeb Jaha, MD*, King Abdullah Medical City, *Makkah*, Saudi Arabia; *Abdullah Al Abdulgader, MD*, Prince Sultan Cardiac Center, *Al Hassa*, Saudi Arabia; *Adel Ali Almasswary, MD*, Aseer Central Hospital, *Abha*, Saudi Arabia; *Taher Hassan, MD*, Bugshan hospi-

tal, *Jeddah*, Saudi Arabia; *Hamidullah Kazim, MD*, AlHada Military Hospital, *Taif*, Saudi Arabia; *Mosaad Abushabana, MD*, Dubai Hospital, *Dubai*, UAE; *Wael Aboushokka, MD*, AlQassimi hospital, *Sharjah*, UAE; *Sayed Abdou, MD*, Saud Albabtain Cardiac Center, *Dammam*, Saudi Arabia; *Amira Ali Taha Ibrahim, MD*, Burjeel Hospital, *Abu Dhabi*, UAE; *Ibrahim Abdulhabeeb, MD*, Cardiac Center Aljouf Region, *Sakaka*, Saudi Arabia; *Tahir Mohamed, MD*, King Faisal Specialist Hospital and Research Centre, *Riyadh*, Saudi Arabia; *Ahmad Alhamami, MD*, King Faisal Specialist Hospital and Research Centre, *Riyadh*, Saudi Arabia; *Mamdouh Haddara, MD*, King Faisal Specialist Hospital & Research Center, *Riyadh*, Saudi Arabia; *Mirza Javed Iqbal, MD*, Prince Abdullah Bin Musaed Cardiac Centre, *Arar*, Saudi Arabia; *Abdelmaksoud Ahmed Elgandy, MD*, Erfan and Bagedo general hospital, *Jeddah*, Saudi Arabia; *Hisham M Husain, MD*, Saud Al Babtain Cardiac Center, *Dammam*, Saudi Arabia.

ABBREVIATIONS AND ACRONYMS

NST-ACS	= Non-ST-Elevation Acute Coronary Syndrome
STEMI	= ST-Elevation Myocardial Infarction
SCAD	= Spontaneous Coronary Artery Dissection
VA	= Ventricular Arrhythmia
VT	= Ventricular Tachycardia
VF	= Ventricular Fibrillation
PCI	= Percutaneous Coronary Intervention
CABG	= Coronary Artery Bypass Grafting
CAD	= Coronary Artery Disease
EF	= Ejection Fraction
WBC	= White Blood Cell Count
CK	= Creatine Kinase
CKMB	= Creatine Kinase Muscle/Brain
TIMI	= Thrombolysis in Myocardial Infarction
F	= Female
M	= Male
ICD	= Implantable Cardioverter Defibrillator
LAD	= Left Anterior Descending Coronary Artery
LM	= Left Main Coronary Artery
LCX	= Left Circumflex Coronary Artery
RCA	= Right Coronary Artery
IC	= Intracoronary
CA	= Coronary Angiogram
ACS	= Acute Coronary Syndrome
IVUS	= Intravascular Ultrasound

OCT	= Optical Coherence Tomography
CS	= Cardiogenic Shock
CP	= Clinical Presentation
AM	= Acute Management
HE	= Hospital Event

AUTHOR CONTRIBUTIONS

All authors contributed to study design, development, data collection, and analysis of results.

A.D. produced the initial draft of the manuscript.

A.D. reviewed the manuscript and provided critical revision and final editing.

Statistician for this study: Prof Edward Bentz Devol.

E-mail address: edevol@kfshrc.edu.sa

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the King Faisal Specialist Hospital and Research Center Institutional Review Board, RC-J/31/39, Saudia Arabia.

HUMAN AND ANIMAL RIGHTS

Not applicable.

CONSENT FOR PUBLICATION

Consent to participate in this study was not required due to the design of our study. However, verbal consent was obtained *via* a phone call from each patient, if the patient agreed to participate in the study it will be documented in their medical record file. If they declined, they were excluded from the study.

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this study are available from the corresponding author, [Amin Daoulah], upon reasonable request.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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