Atrial Fibrillation as a Predictor of In-Hospital Outcome in Patients with Acute Coronary Syndrome Treated by Primary Percutaneous Coronary Intervention

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Objectives: to study the relation between atrial fibrillation (AF) and in-hospital outcome in patients with acute coronary syndrome (ACS) who were treated by primary percutaneous coronary intervention (PCI).

Methods: This study was conducted on 80 patients admitted with ACS and treated with primary PCI at cardiovascular medicine department Tanta university hospitals starting from January 2020 till January 2021. The primary end points are all cause mortality and major adverse cardiovascular events (MACE) including a composite of death, nonfatal re-infarction, target vessel revascularization (TVR), new onset congestive heart failure, contrast induced nephropathy (CIN), or stroke during hospitalization. Patients was divided into 2 groups: Group 1: consisted of 40

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consecutive AF-patients treated by primary PCI. Group 2: consisted of 40 consecutive sinus rhythm-patients treated by primary PCI.

Results: Patients in AF group showed significantly older age, lower systolic and diastolic blood pressure, higher heart rate, higher Killip class II-IV, more inferior STEMI presentation, higher CK-MB, more RCA as infarction related artery, more moderate to sever mitral regurgitation, more patient developed congestive heart failure during hospitalization, and higher overall MACE during hospitalization.

Univariate and multivariate regression analysis were performed to investigate the possible predictors of AF in the study population. In univariate regression analysis, older age, higher CKMB level, higher degree of mitral regurgitation, enlarged left atrium, and RCA as infarction related artery were correlated with AF. In the multivariate regression analysis, using model adjusted for aforementioned parameters, older age, higher CK-MB level, enlarged left atrium diameter, and RCA as infarction related artery independently predicted AF.

Univariate and multivariate regression analyses were performed to investigate the possible predictors of overall in-hospital MACE in the study population. In univariate regression analysis, smoking, Killip II-IV, high creatinine level, lower ejection fraction, higher end systolic diameter, and AF were correlated with MACE. In the multivariate regression analysis, using model adjusted for aforementioned parameters, Killip II-IV, higher creatinine level, and AF independently predicted MACE.

Conclusion: Patients older in age, with higher CK-MB level, enlarged left atrial diameter, and RCA as infarction related artery had higher incidence of AF during ACS. Patient with AF who presented with ACS had a higher incidence of heart failure during hospitalization. The independent predictors of MACE in our study were AF, Killip II-IV, and higher creatinine level.

1. INTRODUCTION

Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia [1]. The prevalence of AF is increasing, reflective of increasing numbers of elderly patients and the pervasiveness of comorbid illness [1-5]. Because there is overlap in risk factors for AF and coronary artery disease (CAD), patients with AF often have coexistent CAD and are treated with percutaneous coronary intervention (PCI) [2].

The incidence of AF in acute coronary syndromes (ACS) ranges from 2 - 23%, [3] the risk of new-onset AF is increased by 60 - 77% in myocardial infarction patients, and AF per se may be associated with an increased risk of ST-segment elevation myocardial infarction (STEMI) or non-STEMI ACS [6].

AF paroxysms can precipitate an acute coronary syndrome (ACS) by increasing tachycardia-related myocardial oxygen demand [7]. AF itself can be induced by ACS-related cardiac injury and atrial remodeling [7]. Following ACS, patients with AF, who are often older and have a worse baseline risk profile, are reported to experience poorer outcomes [6].

However, existing data on an independent association of AF with worse ACS outcomes are conflicting and based on small to medium-sized studies.

2. PATIENTS AND METHODS

2.1 Study Design

This is a prospective study that was conducted on 80 patients admitted with ACS and treated with primary PCI at cardiovascular medicine department Tanta university hospitals.

All patients were subjected to detailed history taking, full clinical examination, 12 lead electro-cardiogram, laboratory investigation, echocardiography and primary PCI strategy.

Patients was divided into 2 groups: Group 1: consisted of 40 consecutive AF-patients treated by primary PCI. Group 2: consisted of 40 consecutive sinus rhythm-patients treated by primary PCI.

The primary end points are all cause mortality and major adverse cardiovascular events (MACE) including a composite of death, nonfatal re-infarction, target vessel revascularization

(TVR), new onset congestive heart failure, CIN, or stroke during hospitalization.

Patients in each group were matched to other groups regarding different demographic, clinical and laboratory parameters.

2.2 Inclusion Criteria

Patients presenting by ACS and treated with primary PCI.

2.3 Exclusion Criteria

Included Patients with prior myocardial infarction, Patients who previously underwent coronary artery bypass graft (CABG) or percutaneous coronary intervention (PCI), Patient with atrial arrhythmia other than AF, Patient less than 18 years old, Patients with renal failure, Patient with malignancy.

2.4 Duration of the Study

This study was done in a period of one year from January 2020 till January 2021.

2.5 Statistical Analysis

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp) Qualitative data were described using number and percent. The Kolmogorov-Smirnov test was used to verify the normality of distribution Quantitative data were described using range (minimum and maximum), mean, standard deviation, median and interquartile range (IQR). Significance of the obtained results was judged at the 5% level [8,9].

3. RESULTS

3.1 Patient Demographics

Regarding the gender: group 1 included 12 males (30%) and 28 females (70%), group 2 included 8 males (20 %) and 32 females (80 %); There was no statistically significant difference between the two groups (P value =0.302) (Table 1). Regarding the age: In group 1, the age of the patients ranged from 52.0 – 78.0 years with a mean age of 64.30 ± 7.09. In group 2 it ranged from 31.0 – 78.0 years with a mean age of 59.40 ± 10.46; There was statistically significant difference between the two groups as the patients in group 1 were older (P value =0.017) (Table 1).

3.2 Prevalence of Risk Factors

Regarding Diabetes mellitus: In group 1, 19 patients were diabetics (47.5%), while in group 2, 24 patients were diabetics (60%); There was no statistically significant difference between the studied groups (P value = 0.262). (Table 2). Regarding systemic hypertension: In group 1, 17 patients were found to be hypertensive (42.5%). In group 2, 22 patients were hypertensive (55%); There was no statistically significant difference between the studied groups (P value = 0.263). (Table 2). Regarding Smoking: In group 1, 16 patients were smokers (40 %) while in group 2, 14 patients were smokers (35 %); There was no statistically significant difference between the studied groups (P value = 0.644) (Table 2). Regarding dyslipidemia: In group 1, 5 patients were dyslipidemic (12.5 %). In group 2, 6 patients were dyslipidemic (15 %); There was no statistically significant difference between the studied groups (P value = 0.745) (Table 2). And regarding the family history of coronary artery disease: In group 1, 13 patients had positive family history (32.5%), while in group 2, 14 patients had positive family history (35%); There was no statistically significant difference between the overall incidence of family history of coronary artery disease in the studied groups (P value = 0.813) (Table 2).

3.3 Vital Signs

Regarding the Systolic blood pressure In group 1, the systolic blood pressure ranged from 70.0 – 180.0 mmHg with a mean of 116.0 ± 28.36. In group 2, it ranged from 90.0 – 180.0 mmHg with a mean of 132.8 ± 25.01; There was a statistically significant difference between the two groups with patients in group 1 presented with lower systolic blood pressure (P value =0.006) (Table 3). Regarding the diastolic blood pressure; In group 1, the diastolic blood pressure ranged from 40.0 – 110.0 mmHg with a mean of 71.50 ± 17.33. In group 2, it ranged from 60.0 – 100.0 mmHg with a mean of 84.25 ± 12.79; There was a statistically significant difference between the two groups with patients in group 1 presented with lower diastolic blood pressure (P value <0.001) (Table 3). And regarding the heart rate; In group 1, the heart rate ranged from 80.0 – 160.0 bpm with a mean of 108.5 ± 22.25. In group 2, it ranged from 60.0 – 130.0 bpm with a mean of 94.75 ± 23.34; There was statistically significant difference between the two groups as patients in group 1 presented with higher heart rate (P value =0.009) (Table 3).

Table 1. Comparison between the two studied groups according to demographic data

	Group I (AF) (n = 40)		Group II (sinus rhuthm) (n = 40)		Test of Sig.	p
	No.	%	No.	%		
Sex						
Male	12	30.0	8	20.0	χ²=	0.302
Female	28	70.0	32	80.0	1.067	
Age (years)						
Min. – Max.	52.0 – 78.0		31.0 – 78.0		t=	0.017*
Mean ± SD.	64.30 ± 7.09		59.40 ± 10.46		2.453*	
Median (IQR)	65.0(61.0 – 67.0)		58.0(53.0 – 67.0)			

IQR: Inter quartile range   *SD: Standard deviation*
χ²: Chi square test   *t: Student t-test*
p: p value for comparing between the studied groups

Table 2. Comparison between the two studied groups according to risk factors

Risk factors	Group I (AF) (n = 40)		Group II (sinus rhuthm) (n = 40)		χ²	p
	No.	%	No.	%		
Diabetes	19	47.5	24	60.0	1.257	0.262
Hypertension	17	42.5	22	55.0	1.251	0.263
Smoking	16	40.0	14	35.0	0.213	0.644
Dyslipidemia	5	12.5	6	15.0	0.105	0.745
Family history of CAD	13	32.5	14	35.0	0.056	0.813

χ²: Chi square test
p: p value for comparing between the studied groups

Table 3. Comparison between the two studied groups according to vital sings

Vital sings	Group I (AF) (n = 40)	Group II (sinus rhuthm) (n = 40)	Test of Sig.	p
Systolic (mmHg)				
Min. – Max.	70.0 – 180.0	90.0 – 180.0	t=	0.006*
Mean ± SD.	116.0 ± 28.36	132.8 ± 25.01	2.802*	
Median (IQR)	110.0(100.0 – 125.0)	140.0(120.0 – 150.0)		
Diastolic (mmHg)				
Min. – Max.	40.0 – 110.0	60.0 – 100.0	t=	<0.001*
Mean ± SD.	71.50 ± 17.33	84.25 ± 12.79	3.744*	
Median (IQR)	70.0(60.0 – 80.0)	90.0(80.0 – 90.0)		
Pulse (bpm)				
Min. – Max.	80.0 – 160.0	60.0 – 130.0	t=	0.009*
Mean ± SD.	108.5 ± 22.25	94.75 ± 23.34	2.697*	
Median (IQR)	105.0(90.0 – 120.0)	100.0(77.5 – 110.0)		

IQR: Inter quartile range   *SD: Standard deviation*
t: Student t-test   *U: Mann Whitney test*
p: p value for comparing between the studied groups
*: Statistically significant at p ≤ 0.05

3.4 Clinical Presentation

Regarding Symptoms duration: In group 1, it ranged from 1.0 – 6.0 hours with a mean of 3.45 ± 1.54. In group 2, it ranged from 1.0 – 6.0 hours with a mean duration of 3.75 ± 1.43; There was no statistically significant difference between the two groups (P value =0.372) (Table 4). Regarding Killip class: In group 1, 20 patients presented with Killip class II-IV (50%), while in group 2, 11 patients presented with Killip class of II-IV (27.5%); There was statistically significant

Table 4. Comparison between the two studied groups according to clinical presentation

	Group I (AF) (n = 40)		Group II (sinus rhuthm) (n = 40)		Test of sig.	p
	No.	%	No.	%		
Killip class						
I	20	50.0	29	72.5	χ^2=	0.039[*]
II-IV	20	50.0	11	27.5	4.266	
Symptoms duration (hours)						
Min. Max.	1.0 – 6.0		1.0 – 6.0		U=	0.372
Mean ± SD.	3.45 ± 1.54		3.75 ± 1.43		709.0	
Median (IQR)	3.0(2.0 – 5.0)		4.0(2.5 – 5.0)			
STEMI or NSTEMI						
NSTEMI	3	7.5	9	22.5	χ^2=	0.060
STEMI	**37**	**92.5**	**31**	**77.5**	3.529	
STEMI location						
Anterior	12	37.5	17	54.8	χ^2=	^{MC}p=
Inferior	25	62.5	12	38.7	5.213	0.047[*]
Lateral	0	0.0	2	6.5		

IQR: Inter quartile range; SD: Standard deviation
χ^2*: Chi square test MC: Monte Carlo; U: Mann Whitney test*
*: Statistically significant at p ≤ 0.05

difference between the two groups as more AF patients had worse Killip class (P value = 0.039) (Table 4). Regarding ACS type: In group 1, 37 patients presented with STEMI (92.5 %) and 3 patients presented with NSTEMI (7.5 %) . while in group 2, 31 patients presented with STEMI (77.5 %) and 9 patients presented with NSTEMI (22.5 %), and no patients presented with unstable angina in both groups; There was no statistically significant difference between the studied groups (P value = 0.060) (Table 4). And regarding the STEMI location; In group 1, 12 patients presented with anterior STEMI (37.5%), 25 patients presented with inferior STEMI (62.5%) and no patients presented with lateral STEMI. In group 2, 17 patients presented with anterior STEMI (54.8%), 12 patients presented with inferior STEMI (38.7%) and 2 patients presented with lateral STEMI (6.5.%); There was statistically significant difference between the two groups as the incidence of inferior STEMI was higher in group 1 (P value =0.047) (Table 4).

3.5 Laboratory Parameters

Regarding the haemoglobin level, In group 1, The hemoglobin ranged from 10.0 – 15.0 gm/dl with a mean of 12.98 ± 1.29. In group 2, The hemoglobin ranged from 10.0 – 15.0 gm/dl with a mean of 12.75 ± 1.50; There was no statistically significant difference between the studied groups (P value = 0.474) (Table 5). Regarding the platelets count In group 1, it ranged from 90.0 – 342.0 (x103/mm3) with a mean of 242.5 ± 69.33.

In group 2, it ranged from 102.0 – 410.0 (x103/mm3) with a mean of 226.3 ± 67.55; There was no statistically significant difference between the studied groups (P value = 0.293). (Table 5). Regarding the high density lipo-protein (HDL), In group 1, it ranged from 31.0 – 67.0 mg/dl with a mean of 42.90 ± 11.59. In group 2, it ranged from 30.0 – 62.0 mg/dl with a mean of 39.95 ± 9.39; There was no statistically significant difference between the studied groups (P value = 0.217) (Table 5). Regarding the low density lipoprotein (LDL), In group 1, it ranged from 69.0 – 190.0 mg/dl with a mean of 144.6 ± 38.22. In group 2, it ranged from 114.0 – 230.0 mg/dl with a mean of 147.9 ± 25.30; There was no statistically significant difference between the studied groups (P value = 0.758) (Table 5). Regarding the triglycerides, In group 1, it ranged from 124.0 – 230.0 mg/dl with a mean of 173.7 ± 28.07. In group 2, it ranged from 122.0 – 235.0 mg/dl with a mean of 173.6 ± 29.23; There was no statistically significant difference between the studied groups (P value = 0.987) (Table 5). Regarding creatinine: In group 1, it ranged from 1.0 – 2.0 mg/dl with a mean of 1.40 ± 0.35. In group 2, it ranged from 0.8 – 2.3 mg/dl with a mean of 1.35 ± 0.40; There was no statistically significant difference between the studied groups (P value = 0.571) (Table 5). Regarding CK-MB: In group 1, it ranged from 22.0 – 378.0 U/L with a mean of 126.3 ± 88.87. In group 2, it ranged from 20.0 – 260.0 U/L with a mean of 72.10 ± 78.80; There was a statistically significant difference between the studied groups as the patients in

group 1 had higher CK-MB level (P value < 0.001) (Table 5).

3.6 Angiographic Findings

Regarding Infarction related artery (IRA): In group 1, the IRA was the LAD (left anterior descending artery) in 15 patients (37.5%), RCA (right coronary artery) in 21 patients (52.5%) and LCX (left circumflex artery) in 4 patients (10%). In group 2, the IRA was the LAD in 22 patients (55%), RCA in 10 patients (25%) and LCX in 8 patients (20%); There was a statistically significant difference between the two groups with patients in group 1 had higher incidence of RCA as IRA (P value =0.038) (Table 6). Regarding the number of diseased vessels: In group 1, 24 patients had a multi-vessel disease

(60%). In group 2, 21 patients had a multi-vessel disease (52%); There was no statistically significant difference between the studied groups (P value = 0.499) (Table 6). Regarding Type of intervention: In group 1, 4 patients had balloon angioplasty (10%) and 36 had DES (drug eluted stent) deployed (90%). In group 2, 3 patients had balloon angioplasty (7.5%) and 37 had DES deployed (92.5%). No BMS (bare metal stent) was deployed in both groups; There was no statistically significant difference between the studied groups (P value = 1.000) (Table 6). Regarding Final TIMI (thrombolysis in myocardial infarction) flow: In group 1, 5 patients had a final TIMI flow <3 (12.5%). In group 2, 9 patients had TIMI flow <3 (22.5 %); There was no statistically significant difference between the studied groups (P value = 0.239) (Table 6).

Table 5. Comparison between the two studied groups according to laboratory investigations

Laboratory investigations	Group I (AF) (n = 40)	Group II (sinus rhuthm) (n = 40)	Test of sig.	p
Hemoglobin (gm/dl)				
Min. – Max.	10.0 – 15.0	10.0 – 15.0	t=	0.474
Mean ± SD.	12.98 ± 1.29	12.75 ± 1.50	0.720	
Median (IQR)	13.0(12.0 – 14.0)	13.0(12.0 – 14.0)		
Platelets (no./mm^3)				
Min. – Max.	90.0 – 342.0	102.0 – 410.0	t=	0.293
Mean ± SD.	242.5 ± 69.33	226.3 ± 67.55	1.058	
Median (IQR)	248.5(200.0 – 293.0)	223.0(185.5 – 252.5)		
HDL (mg/dl)				
Min. – Max.	31.0 – 67.0	30.0 – 62.0	U=	0.217
Mean ± SD.	42.90 ± 11.59	39.95 ± 9.39	672.0	
Median (IQR)	40.0(35.0 – 45.0)	38.50(31.5 – 45.5)		
LDL (mg/dl)				
Min. – Max.	69.0 – 190.0	114.0 – 230.0	U=	0.758
Mean ± SD.	144.6 ± 38.22	147.9 ± 25.30	768.0	
Median (IQR)	148.0(121.0 – 180.0)	143.5(135.0 – 154.5)		
Triglycerides (mg/dl)				
Min. – Max.	124.0 – 230.0	122.0 – 235.0	t=	0.987
Mean ± SD.	173.7 ± 28.07	173.6 ± 29.23	0.015	
Median (IQR)	174.0(157.0 – 189.0)	177.0(155.0 – 185.0)		
Creatinine (mg/dl)				
Min. – Max.	1.0 – 2.0	0.80 – 2.30	t=	0.571
Mean ± SD.	1.40 ± 0.35	1.35 ± 0.40	0.570	
Median (IQR)	1.30(1.0 – 1.8)	1.30(1.0 – 1.6)		
CK-MB (U/L)				
Min. – Max.	22.0 – 387.0	20.0 – 260.0	U=	<0.001[*]
Mean ± SD.	126.3 ± 88.87	72.10 ± 78.80	428.0[*]	
Median (IQR)	121.0(55.5 – 171.5)	26.50(24.0 – 120.0)		

IQR: Inter quartile range; SD: Standard deviation
t: Student t-test; U: Mann Whitney test
p: p value for comparing between the studied groups
*: Statistically significant at p ≤ 0.05

Table 6. Comparison between the two studied groups according to angiographic and procedural characteristics

	Group I (AF) (n = 40)		Group II (sinus rhuthm) (n = 40)		χ^2	p
	No.	%	No.	%		
Infarction related artery					6.561*	0.038*
LAD	15	37.5	22	55.0		
RCA	21	52.5	10	25.0		
LCX	4	10.0	8	20.0		
Number of diseased vessels					0.457	0.499
Single vessel	16	40.0	19	47.5		
Multivessel	24	60.0	21	52.5		
Type of intervention					0.157	FEp=
Ballon angioplasty	4	10.0	3	7.5		1.000
BMS	0	0.0	0	0.0		
DES	36	90.0	37	92.5		
Final TIMI Flow					1.385	0.239
<3	5	12.5	9	22.5		
3	35	87.5	31	77.5		

χ^2: Chi square test; FE: Fisher Exact
p: p value for comparing between the studied groups
*: Statistically significant at p ≤ 0.05

Table 7. Comparison between the two studied groups according to echocardiography

Echocardiography	Group I (AF) (n = 40)	Group II (sinus rhuthm) (n = 40)	Test of Sig.	p
Ejection fraction (%)				
Min. – Max.	35.0 – 66.0	35.0 – 66.0	t=	0.080
Mean ± SD.	48.05 ± 8.48	51.35 ± 8.16	1.774	
Median (IQR)	48.0(40.0 – 55.0)	49.0(45.5 – 60.0)		
ESD (mm)				
Min. – Max.	27.0 – 52.0	27.0 – 54.0	t=	0.213
Mean ± SD.	38.42 ± 7.58	40.45 ± 6.83	1.255	
Median (IQR)	37.0(32.0 – 46.0)	41.0(35.0 – 45.5)		
EDD(mm)				
Min. – Max.	41.0 – 68.0	41.0 – 67.0	t=	0.093
Mean ± SD.	53.30 ± 7.59	56.10 ± 7.14	1.700	
Median (IQR)	55.0(47.0 – 60.0)	58.0(49.5 – 61.5)		
Left atrium (mm)				
Min. – Max.	38.0 – 58.0	37.0 – 51.0	U=	0.056
Mean ± SD.	45.125 ± 5.88	42.45 ± 3.95	601.0	
Median (IQR)	45.0(40.0 – 49.0)	42.0(39.0 – 45.5)		
Mitral regurgitation				
Mild	20 (50.0%)	30 (75.0%)	χ^2=	0.021*
Moderate – sever	20 (50.0%)	10 (25.0%)	5.333*	

IQR: Inter quartile range; SD: Standard deviation
χ^2: Chi square test; t: Student t-test; U: Mann Whitney test
p: p value for comparing between the studied groups

3.7 Echocardiograhy

Regarding Ejection fraction: In group 1, it ranged from 35.0 – 66.0 % with a mean of 48.05 ± 8.48. In group 2, it ranged from 35.0 – 66.0 % with a mean of 51.35 ± 8.16; There was no statistically significant difference between the studied groups (P value = 0.080) (Table 7). Regarding ESD (end systolic diameter): In group 1, it ranged from 27.0 – 52.0 mm with a mean of 38.42 ± 7.58. In group

2, it ranged from 27.0 – 54.0 mm with a mean of 40.45 ± 6.83; There was no statistically significant difference between the studied groups (P value = 0.213) (Table 7). Regarding EDD (end diastolic diameter): In group 1, it ranged from 41.0 – 68.0 mm with a mean of 53.30 ± 7.59. In group 2, it ranged from 41.0 – 67.0 mm with a mean of 56.10 ± 7.14; There was no statistically significant difference between the studied groups (P value = 0.093) (Table 7). Regarding Left atrium diameter: In group 1, it ranged from 38.0 – 58.0 mm with a mean of 45.125 ± 5.88. In group 2, it ranged from 37.0 – 51.0 mm with a mean of 42.45 ± 3.95; There was no statistically significant difference between the studied groups (P value = 0.056) (Table 7). Regarding Mitral regurgitation (MR): In group 1, 20 patients had moderate to severe MR (50 %). In group 2, 10 patients had moderate to severe MR (25 %); There was a statistically significant difference between the studied groups as moderate to severe MR was more common in group 1 (P value = 0.021) (Table 7).

3.8 In Hospital Major Adverse Cardiac Events (MACE)

Regarding the death: 7 patients of the study population died during the hospital stay (8.75 %). In group 1, 4 patients died during the hospital stay (10%). In group 2, 3 patients died during the hospital stay (7.5%); There was no statistically significant difference between the studied groups (P value = 1.000) (Table 8). Regarding Re-infarction: None of the patients of the study population suffered from re-infarction during the hospital stay (0%) (Table 8). Regarding Congestive heart failure (CHF): 12 patients in our study suffered from CHF during the hospital stay (15%). In group 1, 10 patienst suffered from CHF

during the hospital stay (25%). In group 2, 2 patients suffered from CHF during the hospital stay (5%); There was a statistically significant difference between the studied groups with the incidence of in-hospital CHF increased in group 1, (P value = 0.012) (Table 8). Regarding target vessel re-vascularization (TVR): None of the patients of the study population had TVR during the hospital stay (0%) (Table 8). Regarding CIN: 12 patients of the study population suffered from CIN during the hospital stay (15 %). In group 1, 7 patients suffered from CIN during the hospital stay (17.5%). In groupe 2, 5 patients suffered from CIN during the hospital stay (12.5%); There was no statistically significant difference between the studied groups (P value = 0.531) (Table 8). Regarding stroke: 3 patients of the study population suffered from stroke during the hospital stay (3.75 %). In group 1, 2 patients suffered from stroke during the hospital stay (5%). In groupe 2, 1 patient suffered from stroke during the hospital stay (2.5%); There was no statistically significant difference between the studied groups (P value = 1.000) (Table 8).Regarding cardiogenic shock: 12 patients of the study population suffered from cardiogenic shock during the hospital stay (15 %). In group 1, 7 patients cardiogenic shock during the hospital stay (17.5%). In group 2, 5 patients cardiogenic shock during the hospital stay (12.5%); There was no statistically significant difference between the studied groups (P value = 0.531) (Table 8). Regarding overall in-hospital MACE: 25 patients in our study suffered from MACE (31.25%). In group 1, 17 patients suffered from MACE (42.5%). In group 2, 8 patients suffered from MACE (20%); There was a statistically significant difference between the groups with the incidence of MACE increased in group 1 (P value = 0.030) (Table 8).

Table 8. Comparison between the two studied groups according to in hospital follow up

In hospitalfollow up	Group I (AF) (n = 40)		Group II (sinus rhuthm) (n = 40)		χ^2	P
	No.	%	No.	%		
Death	4	10.0	3	7.5	0.157	^{FE}p=1.000
Reinfarction	0	0.0	0	0.0	-	-
CHF	10	25.0	2	5.0	6.275*	0.012*
TVR	0	0.0	0	0.0	-	-
CIN	7	17.5	5	12.5	0.392	0.531
Stroke	2	5.0	1	2.5	0.346	^{FE}p=1.000
Cardiogenic shock	7	17.5	5	12.5	0.392	0.531
MACE	17	42.5	8	20.0	4.713*	0.030*

χ^2: Chi square test; FE: Fisher Exact
p: p value for comparing between the studied groups

Table 9. Univariate and multivariate Logistic regression analysis for the risk factors and predictors of AF

.	Univariate		#Multivariate	
	p	**OR (95%C.I)**	**p**	**OR (95%C.I)**
Sex (female)	0.304	0.583(0.209 – 1.631)		
Age (years)	**0.022**[*]	1.067(1.009 – 1.129)	0.007[*]	1.119(1.030 – 1.215)
Diabetes	**0.263**	0.603(0.249 – 1.463)		
Hypertension	**0.265**	0.605(0.250 – 1.463)		
Smoking	**0.644**	1.238(0.500 – 3.066)		
Dyslipidemia	**0.746**	0.810(0.226 – 2.903)		
Family history of CAD	**0.813**	0.894(0.354 – 2.260)		
Killip class	**0.633**	1.256(0.492 – 3.209)		
Symptoms duration (hours)	**0.363**	0.870(0.644 – 1.175)		
STEMI	**0.072**	0.279(0.069 – 1.122)		
Infarction related artery				
LAD	**0.118**	0.491(0.201 – 1.199)		
RCA	**0.013**[*]	3.316(1.286 – 8.550)	0.012[*]	5.354(1.437 – 19.952)
LCX	**0.218**	0.444(0.122 – 1.617)		
Number of diseased vessels (Multivessel)	**0.499**	1.357(0.559 – 3.292)		
Hemoglobin (gm/dl)	**0.469**	1.125(0.818 – 1.549)		
Platelets (no./mm3)	**0.291**	1.0(1.0 – 1.0)		
HDL (mg/dl)	**0.215**	1.028(0.984 – 1.073)		
LDL (mg/dl)	**0.646**	0.997(0.983 – 1.011)		
Triglycerides (mg/dl)	**0.987**	1.0(0.985 – 1.016)		
Creatinine (mg/dl)	**0.565**	1.419(0.430 – 4.667)		
CK-MB (U/L)	**0.009**[*]	1.008(1.002 – 1.014)	0.010[*]	1.011(1.003 – 1.019)
Ejection fraction (%)	**0.083**	0.953(0.902 – 1.006)		
ESD (mm)	**0.211**	1.040(0.978 – 1.107)		
EDD(mm)	**0.095**	1.054(0.991 – 1.120)		
Left atrium (mm)	**0.025**[*]	1.116(1.014 – 1.229)	0.029[*]	1.199(1.019 – 1.411)
Mitral regurgitation	**0.023**[*]	3.0(1.164 – 7.732)	0.379	1.918(0.449 – 8.188)

OR: Odd`s ratio   C.I: Confidence interval   LL: Lower limit   UL: Upper Limit
#: All variables with p<0.05 was included in the multivariate
*: Statistically significant at p ≤ 0.05

Table 10. Univariate and multivariate Logistic regression analysis for the risk factors and predictors of MACE in total sample (n= 80)

	Univariate		#Multivariate	
	P	**OR (95%C.I)**	**p**	**OR (95%C.I)**
Sex (female)	0.889	1.081(0.360 – 3.249)		
Age (years)	**0.974**	0.999(0.949 – 1.052)		
Diabetes	**0.089**	2.370(0.878 – 6.399)		
Hypertension	**0.383**	1.527(0.590 – 3.955)		
Smoking	**0.024**[*]	3.102(0.163 – 8.273)	0.238	2.777(0.510 – 15.125)
History dyslipidemia	**0.324**	0.444(0.089 – 2.228)		
Systolic (mmHg)	**0.145**	0.987(0.969 – 1.005)		
Diastolic (mmHg)	**0.203**	0.981(0.952 – 1.010)		
Pulse (bpm)	**0.336**	1.010(0.990 – 1.031)		
Random blood sugar (mg/dl)	**0.115**	1.004(0.999 – 1.010)		
Killip class	**<0.001**[*]	8.0(2.755 – 23.231)	0.009[*]	10.151(1.786 – 57.683)
Symptoms duration (hours)	**0.328**	1.177(0.849 – 1.632)		
STEMI	**0.866**	1.119(0.303 – 4.130)		

	Univariate		#Multivariate	
	P	**OR (95%C.I)**	**p**	**OR (95%C.I)**
Infarction related artery				
LAD	**0.786**	0.876(0.339 – 2.268)		
RCA	**0.104**	2.227(0.848 – 5.850)		
LCX	**0.096**	0.167(0.020 – 1.370)		
Number of diseased vessels (Multivessel)	**0.157**	2.049(0.759 – 5.530)		
Type of intervention (BMS)	**0.492**	1.739(0.359 – 8.426)		
Final TIMI Flow (3)	**0.103**	0.375(0.115 – 1.220)		
Hemoglobin (gm/dl)	**0.147**	1.313(0.908 – 1.897)		
Platelets (no./mm3)	**0.204**	1.0(1.0 – 1.0)		
HDL (mg/dl)	**0.884**	1.0(0.960 – 1.049)		
LDL (mg/dl)	**0.364**	0.993(0.978 – 1.008)		
Creatinine (mg/dl)	**<0.001***	27.233(5.287 – 140.258)	**0.001***	0.959(0.921 – 0.999)
Ejection fraction (%)	**0.004***	0.900(0.838 – 0.967)	0.270	0.916(0.784 – 1.070)
ESD (mm)	**0.019***	1.088(1.014 – 1.168)	0.127	0.868(0.724 – 1.041)
EDD(mm)	**0.278**	1.037(0.971 – 1.108)		
Left atrium (mm)	**0.683**	0.981(0.893 – 1.077)		
Mitral regurgitation	**0.852**	0.911(0.341 – 2.430)		
AF group	**0.033***	2.957(1.091 – 8.009)	**0.034***	5.845(1.147 – 29.784)

OR: Odd`s ratio   C.I: Confidence interval
#: All variables with p<0.05 was included in the multivariate
*: Statistically significant at p ≤ 0.05

3.9 Univariate and Multivariate Regression Analysis

Univariate and multivariate regression analysis were performed to investigate the possible predictors of AF in the study population. In univariate regression analysis, older age, higher CKMB level, higher degree of mitral regurgitation, enlarged left atrium, and RCA as infarction related artery were correlated with AF. (Table 9). In the multivariate regression analysis, using model adjusted for aforementioned parameters, older age, higher CK-MB level, enlarged left atrium diameter, and RCA as infarction related artery independently predicted AF (Table 9).

Univariate and multivariate regression analyses were performed to investigate the possible predictors of overall in-hospital MACE in the study population. In univariate regression analysis, smoking, Killip II-IV, high creatinine level, lower ejection fraction, higher end systolic diameter, and AF were correlated with MACE (Table 10). In the multivariate regression analysis, using model adjusted for aforementioned parameters, Killip II-IV, higher creatinine level, and AF independently predicted MACE (Table 10).

4. DISCUSSION

Our study aim was to study the relation between atrial fibrillation (AF) and in-hospital outcome in patients with acute coronary syndrome (ACS) who were treated by primary percutaneous coronary intervention (PCI).

It was conducted on 80 ACS patients, and the study sample was divided into two groups according to rhythm; group 1 included 40 consecutive AF-patients treated by primary PCI., group 2 with 40 consecutive Sinus rhythm-patients treated by primary PCI.

Patients in each group were matched to other group regarding different demographic, clinical and laboratory parameters.

In our study univariate regression analysis showed that, older age,higher CKMB level, higher degree of mitral regurgitation, enlarged left atrium, and RCA as infarction related artery were correlated with AF.

Regarding the demographic data (age and sex) in our study the age was significantly higher in the AF group, similar to the study conducted by Vukmirović, Mihailo et al. [10] on 600 patients with both STEMI and NSTEMI, the study

conducted by Kinjo, Kunihiro et al. [11] on 3614 consecutive patients who were registered in the Osaka Acute Coronary Insufficiency Study (OACIS) from April 1998 to March 2002, and the study conducted by Crenshaw, B S et al. [12] on 40891 STEMI patients.

It is well established that incidence of AF increases with age [13]. age-related structural changes in atrial tissues and physiologic changes in ion currents coupled with alterations in impulse initiation and conduction provide the electrophysiologic substrate for the initiation and propagation of AF [14].

In our study the sex showed non statistically significant difference between the two groups similar to the study conducted by Vukmirović, Mihailo et al. [10] and the study conducted by Kinjo, Kunihiro et al. [11] , and in contrast to the study conducted by González-Pacheco, Héctor et al. [15] on 6705 consecutive patients with ACS admitted to a coronary care unit (CCU), including 3094 with ST segment elevation myocardial infarction (STEMI) and 3611 with non-ST-elevation acute coronary syndrome (NSTE-ACS) which showed greater number of women in AF group.

Regarding the risk factors (family history of coronary artery disease, history of hypertension, diabetes, history of dyslipidemia or smoking).

In our study there was no statistically significant difference between the two groups similar to the study conducted by Vukmirović, Mihailo et al. [10] and in contrast to the study conducted Crenshaw, B S et al. [12] in which hypertension, no smoking, diabetes mellitus was present in a significantly higher number of patients in the AF group. the study conducted by Kinjo, Kunihiro et al. [11] showed no significance of hypertension or diabetes but the smoking was significantly lower in AF group.

Regarding the vital sings (presenting systolic blood pressure, presenting diastolic blood pressure, and presenting pulse)

In our study systolic and diastolic blood pressure were significantly lower in AF group similar to the study conducted by Kinjo, Kunihiro et al. [11] and in contrast to the study conducted by Bahouth, Fadel et al. [16] on 1920 patients admitted with AMI which showed higher systolic blood pressure in AF patients.

Also in our study heart rate was significantly higher in AF group similar to the study conducted by Vukmirović, Mihailo et al. [10] and the study conducted by Crenshaw, B S et al. [12].

Regarding the clinical presentation (Killip class, symptoms duration, ACS type, and STEMI location)

In our study more AF patients presented with killip class II-IV similar to the studies conducted by Vukmirović, Mihailo et al.. [10] and Kinjo, Kunihiro et al.. [11] which showed significantly higher number of patients presented with Killip class II-IV.

Also in our study significantly more patients presented with inferior STEMI in AF group similar to the study conducted by Kyriakidis, M et al.. [17] on 266 patients and in contrast to the study conducted by Vukmirović, Mihailo et al.. [10] in which STEMI location was not statistically significant in AF patients and the study conducted by Rathore, S S et al. [18] on 106780 patients in which more patients presented with anterior STEMI in AF group.

Regarding the laboratory parameters (hemoglobin, platelets, HDL, LDL, triglycerides, creatinine, and CK-MB)

In our study hemoglobin was not statistically significant in contrast to the studies conducted by Podolecki, Tomasz et al. [19] on 4099 patients and the study conducted by Braga, Carlos Galvão et al. [20] on 1373 which showed lower hemoglobin level in AF group.

Also in our study LDL was not statistically significant in contrast to the study conducted by Xue, Yuzhou et al. [21] on 1164 patients which showed significantly lower level of LDL in AF group.

Also in our study CK-MB was significantly higher in AF group similar to the study conducted by Pedersen, O D et al. [22] on 6676 patients and in contrast to study conducted by Siu, Chung-Wah et al. [23] on 504 patients which showed no statistically significance to CK-MB.

Higher CK-MB level in AF group may be explained be higher heart rate or more atrial tissue damage which itself may precipitate AF.

Regarding the angiographic and procedural characteristics (infarction related artery, number

of diseased vessel, type of intervention, and final TIMI flow)

In our study RCA was commonly IRA in AF group similar to study conducted By Crenshaw, B S et al. [12] and in contrast to the study conducted by Rhyou, Hyo-In et al. [24] on 527 patients which showed no significance to IRA .

AF may be related to left atria1 ischemia or infarction. In addition, as the sinus node artery originates from the right coronary artery in 55% and from the AV nodal artery in almost 90% of cases, one could not ignore their potential role in the genesis of atria1 arrhythmias during RV infarction. Bouts of tachycardia can be precipitated by sinus node ischemia and dysfunction, making AF, atrial ectopic activity, and junctional rhythms more likely, similar to sick sinus syndrome [25].

As regard number of diseased vessel in our study, it was not statistically significant in contrast to the studies conducted by Crenshaw, B S et al. [12] and Kinjo, Kunihiro et al.. [11] which showed more diseased vessels in AF group.

Also in our study the final TIMI flow was not statistically significant in contrast to the studies conducted by Crenshaw, B S et al. [12] and Kinjo, Kunihiro et al. [11] which showed poorer reperfusion in AF group.

Regarding the echocardiographic data (ejection fraction, ESD, EDD, left atrial diameter, and degree of mitral regurgitation)

In our study moderate to severe MR was significantly common in AF group similar to the studies conducted by Vukmirović, Mihailo et al. 10 and Braga, Carlos Galvão et al. [20].

In our study ejection fraction was lower in AF group but was not statistically significant in contrast to the studies conducted by Vukmirović, Mihailo et al. [10] and Braga, Carlos Galvão et al. [20] which showed lower ejection fraction in AF patients.

Also in our study left atrial dimeter was more enlarged in AF group but was not statistically significant in contrast to the studies conducted by Vukmirović, Mihailo et al. [10] and Braga, Carlos Galvão et al. [20] which showed more left atrial enlargement in AF patients.

The role of left atrial enlargement as a risk factor for subsequent AF has been reported in patients with and without valve disease. In patients with degenerative mitral regurgitation in sinus rhythm at diagnosis, left atrial enlargement precedes and predisposes to the development of AF. In the study conducted by Bahouth, Fadel et al. [16], left atrial enlargement was an independent predictor of AF, although differences in left atrial size between patients with and without AF were small. The larger left atrial size in the AF group may represent a pre-existing predisposing factor and may also be partly due to an acute left atrial dilation in patients with reduced left ventricular systolic function or FMR [16].

Regarding the in-hospital MACE (death, reinfarction, congestive heart failure, TVR, CIN, stroke, and cardiogenic shock)

In our study statistically significant more patients suffered from congestive heart failure in AF group similar to the study conducted by Crenshaw, B S et al. [12] and Kinjo, Kunihiro et al. [11].

Also in our study there was no significance for death, CIN, stroke, or cardiogenic shock in AF group in contrast to the study conducted by Crenshaw, B S et al. [12] and Kinjo, Kunihiro et al. [11] which showed that death, stroke, and cardiogenic shock were more common in AF group.

The study conducted by Pizzetti, F et al. [26] on 17944 patients showed that in-hospital death and clinical congestive heart failure occurred more often in patients with atrial fibrillation than in those without. No significant differences were shown between the two groups as regard reinfarction and recurrent ischemia. In hospital stroke rate was very low, and not significantly affected by atrial fibrillation [26].

In the multivariate regression analysis older age, higher CK-MB level, enlarged left atrium diameter, and RCA as infarction related artery independently predicted AF.

The study conducted by Vukmirović, Mihailo et al. [10] showed thatthe strongest predictor of AF develop during the hospital period was older age, particularly more than 70 years, followed by the enlarged diameter of LA, presentation of moderate to severe MR and increased BMI as well as BNP. The other parameters such as heart rate above more than 80 bpm on admission,

Killip class and LV-EF, and hsCRP after adjustment by logistic regression model were not independent predictors of this rhythm disorder [10].

In the study conducted by Crenshaw, B S et al. [12] the most important predictor of developing atrial fibrillation was age. Other significant predictors (in decreasing order) included peak CK level, Killip class, heart rate, and systolic blood pressure. Although significant, previous hypertension and inferior location of infarction were less important in the multivariable analysis.

In the study conducted by Kinjo, Kunihiro et al. [11] independent predictors of AF after acute myocardial infarction were older age, heart rate ≥100 beats/min, and Killip class IV.

Regarding univariate and multivariate analysis of MACE in our study univariate regression analysis showed that smoking, Killip II-IV, high creatinine level, lower ejection fraction, higher end systolic diameter, and AF were correlated with MACE.In the multivariate regression analysis Killip II-IV, higher creatinine level, and AF independently predicted MACE. In the study conducted by González-Pacheco, Héctor et al. [15] the multivariate regression analysis showed that systolic blood pressure ≤100 mmHg, Killip class ≥2, renal dysfunction, age ≥65 years, heart rate ≥100 beats/min, LVEF ≤40%, and AF independently associated with in-hospital mortality. The study conducted by Vukmirović, Mihailo et al. [10] demonstrated a positive association between AF in patients with AMI and complications developed during the hospital course such as HF and cardiogenic shock, but after adjustment for clinical and echo variables the risk associated with AF was attenuated and not statistically significant [10].

5. CONCLUSION

Patients older in age, with higher CK-MB level, enlarged left atrial diameter, and RCA as infarction related artery had higher incidence of AF during ACS. Patient with AF who presented with ACS had a higher incidence of heart failure during hospitalization.The independent predictors of MACE in our study were AF, Killip II-IV, and higher creatinine level.

6. STUDY LIMITATION

This was a single-center experience and represents a limited number of patients. There was only in-hospital follow-up and longer follow-up periods may show different results. we were unable to determine the precise timing of the onset and duration of AF. Patients with AF on admission included patients with chronic AF and those who developed AF early in their infarction. Certain patient management issues remain ill-defined. Because we did not have detailed information about the use of antiarrhythmic therapy, the relation between these agents and patient outcomes could not be evaluated. Similar questions about elective cardioversion, anticoagulation and medications used for rate control need to be addressed.

DISCLAIMER

The Products Used For This Research Are Commonly And Predominantly Use Products In Our Area Of Research And Country. There Is Absolutely No Conflict Of Interest Between The Authors And Producers Of The Products Because We Do Not Intend To Use These Products As An Avenue For Any Litigation But For The Advancement Of Knowledge. Also, The Research Was Not Funded By The Producing Company Rather It Was Funded By Personal Efforts Of The Authors.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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