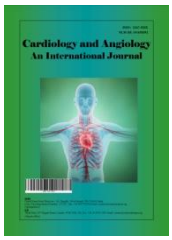

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Impact of Atrial Fibrillation on in-Hospital and Short-Term Outcomes of Patients with Acute Coronary Syndrome

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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

Background: Atrial fibrillation (AF) is an irregular and often rapid heart rate that can increase the risk of stroke, heart failure and other heart-related complications. The acute coronary syndrome is a potential risk factor for atrial fibrillation. The aim of this work was to evaluate the impact of atrial fibrillation on in-hospital and short-term outcomes of patients with acute coronary syndrome.
Methods: This prospective cohort study was carried out on 80 patients with acute coronary syndrome with or without AF. Patients were classified into 3 groups: group I (50 patients) with acute coronary syndrome without AF, group II (15 patients) with acute coronary syndrome with new onset AF and group III (15 patients) with acute coronary syndrome with pre-existing AF. All patients were subjected to laboratory investigations (CBC, kidney functions and liver function tests) and twelve-lead surface ECG.
Results: ACEI, warfarin, amiodarone and PCI were significantly different among studied groups. ACEI was significantly lower in group 3 when compared to group 1. Warfarin, amiodarone, HF and AKI were significantly higher in group 2 and group 3 compared to group 1. PCI was significantly higher in group 1 and group 2 compared to group 3.
Conclusions: New-onset and pre-existing AF remained associated with an increased risk of in-hospital complications as heart failure and acute renal failure compared to patients presented with acute coronary syndrome without AF. Anticoagulation as warfarin and antiarrhythmic drugs as amiodarone were largely used in patients with AF during hospitalization.

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Keywords: Atrial fibrillation; acute coronary syndrome; in-hospital.

1. INTRODUCTION

Atrial fibrillation is an irregular and often rapid heart rate that can increase the risk of stroke, heart failure and other heart-related complications. “Atrial fibrillation is one of the most common cardiovascular diseases worldwide, and the global burden of atrial fibrillation is increasing. The acute coronary syndrome is a potent risk factor for atrial fibrillation, with atrial fibrillation occurring in up to 1 in every 5 patients hospitalized with an acute coronary syndrome” [1].

“Atrial fibrillation, permanent or paroxysmal, is common in patients with acute coronary syndrome. The associated mechanisms for the development of atrial fibrillation in these patients includes ischemia and reduced atrial blood flow, increased left ventricle end-diastolic pressure and left atrial pressure, diastolic dysfunction and disorders of the autonomic nervous system. Recently, inflammation and neurohormonal activation mechanisms appear to be associated with the development of atrial fibrillation in patients with acute myocardial infarction” [2].

“The incidence of atrial fibrillation in acute coronary syndromes ranges from 2% to 23%. Recently, a downward trend in the incidence of atrial fibrillation in patients with acute coronary syndromes has been observed and this could be explained by the widespread use of thrombolytic therapy and percutaneous coronary interventions (PCI). The primary clinical prognostic markers of risk for atrial fibrillation in patients with acute coronary syndromes are advanced age, tachycardia on admission and advanced heart failure” [3].

“Despite a decrease in the proportion of ST-segment elevation myocardial infarctions (STEMI) over the past 10 years, 29% of ACS episodes are STEMI events. The incidence of non-STEMI has increased, particularly following the introduction of highly sensitive troponin. Although mortality has decreased over the past two decades, 30-day mortality remains significant at 8%” [4-7]. The aim of this study was to evaluate the impact of atrial fibrillation on in-hospital and short-term outcomes of patients with acute coronary syndrome.

2. PATIENTS AND METHODS

This prospective analytic controlled (cohort) study was conducted in Cardiology Department, Tanta university hospital on 80 patients with acute coronary syndrome with or without atrial fibrillation. Patient refusal, with advanced liver disease, with advanced kidney disease or on dialysis and with malignancy or on chemotherapy were excluded.

Patients were classified into 3 groups: group I (50 patients) with acute coronary syndrome without AF, group II (15 patients) with acute coronary syndrome with new onset AF and group III (15 patients) with acute coronary syndrome with pre-existing AF.

All patients were subjected to: Complete history taking, clinical examination, Laboratory investigations (CBC, kidney functions and liver function tests),

Twelve-lead surface ECG: New-onset AF was defined as AF > 1 h in duration, as noted by bedside telemetry or AF < 1 h in duration, but captured on electrocardiogram or AF initiating pharmacological therapy or electrical cardioversion, that started after or at the same time as the acute coronary syndrome diagnosis.

All acute coronary syndrome events were assigned to 1 of 3 categories using pre-established criteria: ST – segment elevation myocardial infarction, non-ST – segment elevation myocardial infarction, and unstable angina.

“We used the third universal definition of STEMI as a new ST-segment elevation at the J point >0.2 mv in precordial leads or < 0.1 mv in inferior leads in two contiguous leads or new left bundle branch block, for over 30 minutes, in a clinical setting consistent with acute myocardial infarction” [8].

Transthoracic ECG assessment: Conventional 2D ECG (Left ventricular internal dimensions and cardiac functions).

EF calculated from the end-diastolic and end-systolic volumes of the left ventricle. The formula for calculating EF is: EF= (EDV - ESV / EDV) x 100.where EF is ejection fraction, EDV is end-diastolic volume, and ESV is end-systolic volume. “Note that the difference between the end-diastolic volume and end-systolic volume is the stroke volume” [9].

Wall motion abnormalities, valvular structures and functions: using 2D echo, doppler and color doppler, pericardial abnormalities: using 2D echo, Doppler and color doppler and coronary angiography: data were collected from angiography performed during hospital stay which included diagnostic coronary angiography or percutaneous coronary intervention.

2.1 Statistical Analysis

Statistical presentation and analysis of the present study was conducted, using the mean, standard deviation and chi-square test by SPSS V.22. Mean value: the sum of all observations. Standard Deviation [SD] measures the degree of scatter of individual varieties around their mean. Analysis of variance [ANOVA] tests (f): According to the computer program SPSS for Windows. ANOVA test was used for comparison among more than two means. Chi-square the hypothesis that the row and column variables are independent, without indicating strength or direction of the relationship. Pearson chi-square and likelihood-ratio chi-square. Fisher's exact test and Yates' corrected chi-square are computed for 2x2 tables. Chi-square test: For comparison between two groups as regards qualitative data. In all tests P value was considered significant if <0.05.

3. RESULTS

There was no statistically significant difference between the three studied groups according to sex and history of smoking, DM, MI, HF, PCI and angina Table 1..

There was no statistical significant difference between the three studied groups as regard to age, BMI, SBP, DBP and EF. Pulse was significantly different among the groups, was significantly higher in group 2 and group 3 than group 1 (P1= 0.001) (P2=0.002) respectively.

ACEI, warfarin, amiodarone and PCI were significantly different among studied groups (P< 0.05). ACEI usage was significantly lower in group 3 when compared to group 1(P2=0.001). Warfarin and amiodarone usage were significantly higher in group 2 and group 3 compared to group 1(P=0.001). PCI was significantly higher in group 1 and group 2 compared to group 3 (P2:0.001, P3:0.003)**.** HF and AKI were significantly different among studied groups (P=0.001, P=0.002) respectively and significantly higher in group 2 and group 3 compared to group 1(P=0.002).

There was no significant difference between the three studied groups according to 3-month post discharge death and re-infarction as a complication Table 4.

HF and AKI were significantly different among studied groups as regard univariate analysis according to MACE (P=0.001, P=0.032) respectively and HF was significantly different among studied groups as regard multivariate analysis according to MACE (P=0.029) Table 5.

4. DISCUSSION

“Atrial fibrillation (AF) is an electrical complication, commonly observed in acute myocardial infarction (AMI) patients, with an incidence ranging from 6% to 19%” [10].

In the present study there was no significance difference between SBP and DBP of studied “patients without AF compared with those new-onsets and pre-existing AF and these results were in concordance with” Feistritzer et al. [11] who studied the prognostic impact of AF in acute myocardial infarction and cardiogenic shock.

In contrary to these findings, McManus et al. [12] found significant correlation between SBP and DBP of studied patients without AF compared with those new-onset and pre-existing AF, patients with any type AF were more likely than patients who remained free of AF to have lower systolic and diastolic blood pressure and this didn’t agree with our result.

In the present study there was no significance difference between history of myocardial infarction of studied patients without AF compared with those new-onset and pre-existing AF and these results were in concordance with Feistritzer et al. [11].

In contrary to these findings, McManus et al. [12] found significant difference between history of myocardial infarction of studied patients with pre-existing AF compared with those without AF, patients with pre-existing AF more likely to have previous history of myocardial infarction and this didn’t agree with our results.

Table 1. Comparisons between the three studied groups as regard to sex and history of smoking, DM, MI, HF, PCI and angina

Sex		**Without AF (group 1)**	**With new onset AF (group 2)**	**Preexisting AF (group 3)**	**Total**	**X^2**	**P-value**		
Male		32(64.0%)	6(40.0%)	9(60.0%)	31(56.4%)	2.754	0.252	P1	0.098
Female		18(36.0%)	9(60.0%)	6(40.0%)	24(43.6%)			P2	0.778
Total		50(100.0%)	15(100.0%)	15(100.0%)	55(100.0%)			P3	0.273
History		Without AF (Group1)	With new onset AF (Group2)	Preexisting AF (Group3)		X^2	P-value		
Smoking	Yes	32(64.0%)	7(46.7%)	9(60.0%)		1.443	0.486	P1	0.229
								P2	0.778
								P3	0.464
DM	Yes	26(52.0%)	7(46.7%)	5(33.3%)		1.617	0.445	P1	0.717
								P2	0.204
								P3	0.456
MI	Yes	4(8.0%)	3(20.0%)	3(20.0%)		2.469	0.291	P1	0.189
								P2	0.189
								P3	1.0
HF	Yes	4(8.0%)	0(.0%)	3(20.0%)		3.851	0.146	P1	0.258
								P2	0.189
								P3	0.068
PCI	Yes	4(8.0%)	1(6.7%)	2(13.3%)		0.511	0.774	P1	0.865
								P2	0.531
								P3	0.543
ANGINA	Yes	46(92.0%)	15(100.0%)	15(100.0%)		2.526	0.283	P1	0.258
								P2	0.258
								P3	-

*DM: diabetes mellites': myocardial infarction. PCI: percutaneous coronary intervention P1: Without AF & with new-onset AF & P2: Without AF & Pre-existing AF & P3: With new-onset AF & Pre-existing AF, *Statistically significant if P value < .05*

Table 2. Comparison between the three studied groups as regard to age, BMI, SBP, DBP, pulse, EF

		Mean± S. D	F. test	p. value		
Age	without AF (Group1)	59.76±10.00	0.730	0.485	P1	0.240
	with new onset AF (Group2)	63.27±8.84			P2	0.612
	Pre-existing AF (Group3)	61.27±11.65			P3	0.588
BMI	without AF (Group1)	31.16±4.51	0.710	0.495	P1	0.468
	with new onset AF (Group2)	30.20±4.35			P2	0.281
	Pre-existing AF (Group3)	29.73±4.61			P3	0.776
Systolic blood pressure	without AF (Group1)	135.60±25.83	0.119	0.888	P1	0.788
	with new onset AF (Group2)	133.67±24.53			P2	0.739
	Pre-existing AF (Group3)	138.00±19.44			P3	0.628
Diastolic blood pressure	without AF (Group1)	81.20±14.24	0.137	0.872	P1	0.839
	with new onset AF (Group2)	80.33±16.95			P2	0.674
	Pre-existing AF (Group3)	83.00±13.07			P3	0.615
Pulse	without AF (Group1)	92.92±19.91	9.533	0.001*	P1	0.001*
	with new onset AF (Group2)	121.67±36.53			P2	0.002*
	Pre-existing AF (Group3)	119.33±37.84			P3	0.816
EF	without AF (Group1)	45.16±11.43	1.622	0.204	P1	0.096
	with new onset AF (Group2)	39.67±8.34			P2	0.316
	Pre-existing AF (Group3)	41.87±12.56			P3	0.588

*BMI: body mass index, EF: ejection fraction.AF: atrial fibrillation, P1: Without AF & with new-onset AF & P2: Without AF & Pre-existing AF & P3: With new-onset AF & Pre-existing AF, *Statistically significant if P value < .05. Data are represented as mean± SD*

Table 3. Comparison between the three studied groups as regard to in-hospital management and outcomes

Treatment		Without AF (Group1)	With new onset AF (Group2)	Preexisting AF (Group3)	X^2	P-value		
Aspirin	Yes	50(100.0%)	15(100.0%)	14(93.3%)	4.388	0.111	P1	-
							P2	0.066
							P3	0.309
ACEI	Yes	50(100.0%)	15(100.0%)	12(86.7%)	8.457	0.015*	P1	-
							P2	0.001*
							P3	0.068
Clopidogrel	Yes	50(100.0%)	15(100.0%)	14(93.3%)	4.388	0.111	P1	-
							P2	0.066
							P3	0.309
Lmwh	Yes	50(100.0%)	15(100.0%)	14(93.3%)	4.388	0.111	P1	-
							P2	0.066
							P3	0.309
Warfarin	Yes	0(0.0%)	14(93.3%)	12(80.0%)	64.805	0.001*	P1	0.001*
							P2	0.001*
							P3	0.283
Amiodarone	Yes	0(0.0%)	7(46.7%)	4(26.7%)	23.786	0.001*	P1	0.001*
							P2	0.001*
							P3	0.927
Statin	Yes	50(100.0%)	15(100.0%)	14(93.3%)	4.388	0.111	P1	-
							P2	0.066
							P3	0.309
PCI	Yes	36(72.0%)	7(46.7%)	0(0.0%)	24.434	0.001*	P1	0.069
							P2	0.001*
							P3	0.003*
Thrombolytics	Yes	4(8.0%)	1(6.7%)	4(26.7%)	4.415	0.110	P1	0.865
							P2	0.054
							P3	0.142
In-hospital complications								
HF	Yes	22(44.0%)	15(100.0%)	12(80.0%)	17.978	0.001*	P1	0.001*
							P2	0.014*
							P3	0.068
Stroke	Yes	0(0.0%)	1(6.7%)	1(6.7%)	3.419	0.181	P1	0.066

Treatment		Without AF (Group1)	With new onset AF (Group2)	Preexisting AF (Group3)	X^2	P-value		
							P2	0.066
							P3	1.0
Shock	Yes	4(8.0%)	2(13.3%)	2(13.3%)	0.593	0.744	P1	0.531
							P2	0.531
							P3	1.0
Acute kidney injury	Yes	2(4.0%)	5(33.3%)	5(33.3%)	12.649	0.002*	P1	0.002*
							P2	0.002*
							P3	1.0
In-hospital death	Yes	1(4.0%)	2(13.3%)	2(13.3%)	4.112	0.128	P1	0.067
							P2	0.067
							P3	1.0
Bleeding	Yes	0(0.0%)	0(0.0%)	1(6.7%)	4.388	0.111	P1	-
							P2	0.066
							P3	0.309

*AF: atrial fibrillation. ACEI: angiotensin convertase inhibitor. PCI: percutaneous coronary intervention. LMWH: low molecular weight heparin..P1: Without AF & With new-onset AF & P2: Without AF & Pre-existing AF & P3: With new-onset AF & Pre-existing AF, *Statistically significant if P value < .05. HF: heart failure. AKI: acute kidney injury*

Table 4. Comparison between the three studied groups as regard to 3-month post discharge outcomes

Post-discharge Complications		Without AF (Group1)	With new onset AF (Group2)	Pre-existing AF (Group3)	X^2	P-value		
Post-discharge death	Yes	0(0.0%)	0(0.0%)	1(6.7%)	4.388	0.111	P1	-
							P2	0.066
							P3	0.309
Re-infarction	Yes	2(4.0%)	2(13.3%)	1(6.7%_	1.718	0.423	P1	0.187
							P2	0.666
							P3	0.543

Data are represented by number (%), AF: atrial fibrillation

Table 5. Comparison between the three studied groups as regard to univariate and multivariate analysis according to MACE

	Univariate		Multivariate	
	OR (95% CI)	**P value**	**OR (95% CI)**	**P value**
HF	0.627 (0.297 – 0.869)	0.001*	0.367 (0.108 – 0.749)	0.029*
Stroke	0.528 (0.198 – 2.536)	0.107		
Shock	0.439 (0.218 – 5.419)	0.213		
Acute kidney injury	0.641 (0.241 – 0.861)	0.032*	0.759 (0.521 – 3.627)	0.327
In-hospital death	0.841 (0.547 – 3.562)	0.297		
Bleeding	0.743 (0.397 – 4.521)	0.308		

*HF: heart failure MACE: major adverse cardiac events., * Statistically significant if P value < .05.*

In the present study there was significant difference between HF as a complication of studied patients without AF compared with those with new-onset AF and also significant difference between patients without AF compared with those with pre-existing AF and these results were in concordance with Nagai et al. [13] who studied prognosis of new-onset atrial fibrillation in patients with acute coronary syndrome. The study involved ACS patients. Their study high lightened the outcome of AF on heart failure as patients with new-onset AF were more complicated with HF than patients without AF. However there was no statistically difference between pre-existing AF and patients without AF as regard to HF as a complication.

Moreover, Hersi et al. [14] **"**who studied prognostic significance of prevalent and incident atrial fibrillation among patients hospitalized with acute coronary syndrome." The study enrolled patients with ACS. Their study high lightened the outcome of AF on heart failure as patients with any type of AF were more complicated with HF than patients without AF.

Furthermore Dai et al. [15] a total of 24,658 patients were included in this study and involved in analysis. Their study found that patients with any type of AF were more complicated with HF than patients without AF.

Finally, Guimaraes et al. [16]"who studied new onset atrial fibrillation in acute coronary syndrome: early vs late onset." The study analysed patients with ACS enrolled in a national multicentre registry from October 2010 to January 2019.their study found that patients with AF were more likely to developed HF than patients without AF.

In the present study there was no significance difference between stroke as a complication of studied patients without AF compared with those new-onset and pre-existing AF. And these results were in concordance with Almendro-Delia et al. [17], Feistritzer et al. [11].

In contrary to our results, Salam et al. [18], Hersi et al [14] and Dai et al. [15] found significant difference between stroke as a complication of studied patients without AF compared with those new-onset and pre-existing AF, patients with AF more likely to develop stroke as a complication.

"In the present study there was no significance difference between cardiogenic shock as a complication of studied patients without AF compared with those new-onset and pre-existing AF and these results were in discordance with" Almendro-Delia et al. [17], Hersi et al. [14] as patients with any type of AF more likely to develop cardiogenic shock as a complication.

Moreover, González-Pacheco et al. [3] who studied Clinical features and in-hospital mortality associated with different types of atrial fibrillation in patients with acute coronary syndrome with and without ST elevation also found significant difference between cardiogenic shock as a complication of studied patients with AF compared with those without AF and this again didn't agree with our results.

In the present study there was significant difference between acute kidney failure as a complication of studied patients without AF compared with those new-onset and pre-existing AF and these results were in concordance with McManus et al. [12] who studied new-onset and pre-existing AF in acute coronary syndrome, showed that patients with pre-existing or new onset AF (compared to patients without AF). The study population consisted of patients hospitalized with an acute coronary syndrome. The study found that patients with any type of AF were more complicated with AKI than patients without AF.

Moreover, Feistritzer et al. [11] ”who studied the prognostic impact of AF in acute myocardial infarction and cardiogenic shock. In a sub analysis of the CULPRIT-SHOCK trial (Culprit Lesion Only PCI versus Multivessel PCI in Cardiogenic Shock), patients were grouped according to the presence of AF during index hospital stay. The primary end point was all-cause death at 30 days, and the key secondary end point was all-cause death at 1 year.” Their result high lightened that patients with AF had AKI as a complication more than patients without AF.

In the present study there was no significant difference between bleeding as a complication of studied patients without AF compared with those new-onset and pre-existing AF and these results were in concordance with Almendro-Delia et al. [17], Hersi et al. [14] and also Dai et al. [15].

In contrary to these findings Lau et al. [19] and also Feistritzer et al. [11] found significant difference between bleeding as a complication of studied patients without AF compared with those new-onset and pre-existing Apartments with AF more likely to develop bleeding as a complication.

In the present study there was no significant difference between in-hospital death as an outcome of studied patients without AF compared with those new-onset and pre-existing AF and these results were in concordance with Feistritzer et al. [11].

In contrary to our results, McManus et al. [12], Hersi et al. [14], Salam et al. [18] and also Dai et al. [15] found significant difference between in-hospital death as an outcome of studied patients without AF compared with any type of Apartments with AF more likely to developed in-hospital death.

In the present study there was no significant difference between re-infarction as a complication of studied patients without AF compared with those new-onset and pre-existing AF. and these results were in concordance with Feistritzer et al. [11] and also Hersi et al. [14]. However, Dai et al. [15] and Almendro-Delia et al. [17] found significant difference between re-infarction as a complication of studied patients without AF compared with those new-onsets and pre-existing AF, patients with AF more likely to developer-infarction.

In the present study there was no significant difference between 3-month post discharge death as an outcome of studied patients without AF compared with those new-onset and pre-existing AF and these results were in discordance also Hersi et al. [14] who found patients with AF more likely to developed post discharge death at 30-days and 1-year.

Also, Braga et al. [20] found significant mortality with new-onset AF patients 6-months post discharge.

Our study has some limitations; at first, silent episodes of AF could not be analyzed in the sinus rhythm group. Second, the prognostic impact of the applied treatment strategy (rhythm versus rate control) was not assessed by the present study. Third, the timing of AF in relation to myocardial injury or receipt of cardiac medications and coronary reperfusion was not recorded as well as the duration and the type of AF.

5. CONCLUSIONS

New-onset and pre-existing atrial fibrillation (AF) remained associated with an increased risk of in-hospital complications as heart failure and acute renal failure compared to patients presented with acute coronary syndrome without AF. Anticoagulation as warfarin and antiarrhythmic drugs as amiodarone were largely used in patients with AF during hospitalization.

CONSENT AND ETHICAL APPROVAL

Informed consent was taken from all patients for the study participation which is performed with the approval of the ethics committee, faculty of medicine, Tanta university.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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