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ORIGINAL ARTICLE

Contemporary retrospective analysis of acute coronary syndrome. An Egyptian study

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KEYWORDS

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Abstract *Background:* Cardiovascular disease is the leading cause of death in Egypt and worldwide, placing great strain on the world's health systems. This is one of the few Egyptian registries dealing with patients with acute coronary syndrome admitted in critical care department, Cairo University.

Methods: This is a retrospective non-controlled cohort study of patients with acute coronary syndrome admitted from January 2010 to December 2012. Retrospective analysis of these patients data were retrieved through reviewing written paper and electronic database.

Results: A total number of 503 patients were enrolled in our study. The mean age was 57.2 ± 10.4 years. Their pain duration was 14 ± 24.4 h. Average length of stay was (7 ± 4.4 days). Primary percutaneous coronary intervention (PCI) was done to 154 patients (30.6%), while we had 105 elective PCI procedures (20.9%). Major adverse cardiac events (MACE) were higher in patients with higher age (60 years vs 56.7 years *P* value 0.021), STEMI (25.7% vs. 18% in UA/NSTEMI *P* value 0.002), higher CKMB levels (157iu/l vs 89iu/l *P* value0.019), and higher Killip class upon presentation (class III-IV 64.9% vs 2.2% class I-II $p < 0.001$). Patients with UA/NSTEMI who were treated conservatively developed statistically significant higher incidence of MACE as compared to those treated interventionally (23.4% vs. 13.5% *P* value 0.031). Patients with STEMI who were treated without intervention have significant higher incidence of MACE than those who were treated interventionally (15.4% vs. 5.5% $p = 0.46$).

Conclusion: 1. Higher incidence of MACE was observed in the higher age group, higher levels of cardiac biomarkers, and higher Killip class. 2. Outcome was affected by early interventional treatment in all patient groups.

1. Introduction

Effective treatment of acute coronary syndrome (ACS) requires a highly functioning health care delivery system, driven by valid, reliable measurement for continuous improvement. Registries have been used to identify concrete practices associated with improved patient outcomes, identify

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prevalence of substandard or dangerous treatment patterns and quantifying racial and socioeconomic disparities in both treatment patterns and health outcomes. Systematic collection of data on health outcomes is a fundamental first step toward strengthening hospital care, and might be especially helpful in low and middle income countries (LMICs), where resource constraints are a major concern. Registries provide both evidence for the design and prioritization of improvement strategies and a means to evaluate the effects of strategies after implementation. Any study should describe the challenges and opportunities identified through the ACS course with a focus on the lessons learned through the process of registry development and operationalization [1,2].

2. Aim of the work

The aim of the work was to determine our local performance in the management of acute coronary syndrome patients either treated by conservative or invasive strategy and to find out clinical or procedural risk factors that could result in poor outcome in terms of high major adverse cardiac events and mortality rates.

3. Patients and methods

The material of the registry included 503 patients who were admitted to the Critical Care Department, Cairo University with ACS between January 2010 and December 2012. Patient data were retrieved through reviewing written papers and electronic database i.e. patients' files, and reviewing PCI reports. Data collection was focused on patients' demographics, risk factors for CAD, percutaneous coronary intervention indications, baseline clinical status and Killip class [3] & associated medical conditions, angiographic & PCI procedure details, angiographic & clinical Success of PCI procedure, in-hospital MACE (Major Adverse Cardiovascular Events), Risk factors associated with poor outcomes for in-hospital complications and MACE. Inclusion criteria were: all patients diagnosed to have ACS [A spectrum of clinical conditions characterized by acute chest pain or myocardial ischemia. ACS includes myocardial infarction with ST-segment Elevation (STEMI), myocardial infarction in the absence of ST-Segment Elevation (NSTEMI) and unstable angina]. An initial clinical subdivision of ACS is made on the presence or absence of ECG ST-segment Elevation. All clinical events were reviewed and documented. The clinical end points were the in hospital MACE defined as the composite of death, myocardial infarction [ST elevation MI (STEMI) and non ST elevation MI (NSTEMI)], need for Revascularization: PCI or CABG for previously vascularized patients.

3.1. Statistical methods

Data were verified and coded prior to analysis; all quantitative data were expressed as mean ± SD. All qualitative data were expressed as frequency tables. Chi-Square test was used to confirm the presence of association between different categorical data. Student- t test was used to compare between quantitative data.

To better understand the predictors of mortality, two analyses of multiple logistic regression models were performed: one to identify demographic factors and associated in-hospital interventions, and another to identify the influence of major complications on death. P value < 0.05 was considered significant. Analysis has been performed using SPSS (statistical package for social science).

4. Results

4.1. Baseline demographic,clinical and laboratory data (Table 1)

A total number of 503 patients were enrolled in our registry. The study included 381 males (75.7%), 122 females (24.3%) with a mean age 57.2 ± 10.4 years. Their mean chest pain duration was 14 ± 24.4 h. Average length of stay was 7 ± 4.4 days. Of the total number of patients, 301 patients were diagnosed as UA/NSTEMI (60%) [171 patients (34%) had UA and 130 patients (26%) had NSTEMI] and 202 patients as STEMI cases (40%).

Hypertension was the most prevalent risk factor (57.3%), followed by smoking (52.1%) then diabetes (49.9%) and dyslipidemia(23.7%).We did not find any statistically significant difference between the two study groups (STEMI&UA/NSTEMI) regarding the prevalence of Diabetes mellitus (p 0.27), family history of CAD (p 0.52) or dyslipidemia (p 0.32) yet there was a statistically significant difference between the 2 groups as regards the prevalence of Hypertension ($p < 0.001$),incidence of smoking ($p < 0.001$) & past history of CAD ($p < 0.001$).

Concerning the baseline hemodynamic parameters, we found a statistically significant lower mean systolic blood pressure (SBP), lower mean diastolic blood pressure (DBP), lower mean arterial pressure (MAP) in the STEMI group when compared to UA/NSTEMI group, yet there was no statistically significant difference between the two groups regarding mean HR. There was a statistically significant higher Killip class in STEMI group compared to UA/NSTEMI group. (1.5 ± 1.1 vs. 1.4 ± 0.8 p value 0.033).

4.2. Procedural data (Table 2)

Out of the 503 patients included in our registry, 259 (51.5%) patients were managed interventionally and 244 (48.5%) patients were managed conservatively. Of those patients who were treated conservatively, thirty-nine patients were admitted with STEMI (16%) and 205 patients with UA/NSTEMI (84%).The thirty-nine STEMI patients didn't have interventional treatment during their icu stay due to one of the following causes: Successful thrombolytic therapy, delayed presentation, or death shortly after presentation. Thrombolytic therapy was used in 20 patients; seven out of them were diagnosed as thrombolytic therapy failed cases, so they were subjected to early coronary intervention. Primary intervention was done in the 1st day while delayed interventions were done within 7.1 ± 0.7 days. Seventy patients were planned for CABG (13.9%). There were 905 vessels with1216 affected segments in the studied patients & not all lesions were subjected to PCI trial. Untreated segments were either of small calibers,

Table 1 Baseline demographic, clinical and laboratory data.

	UA/NSTEMI (301 pts.)		STEMI (202 pts.)		*P* value
	Number	Percentage	Number	Percentage	
Sex					< 0.001
Female	96	32%	26	13%	
Male	205	68%	176	87%	
Family history of CAD	90	30%	60	30%	0.522
Smoking	132	44%	130	64%	< 0.001
Diabetes	150	50%	81	40%	0.27
Hypertension	222	74%	66	33%	< 0.001
Dyslipidemia	72	24%	44	22%	0.327
Past history of CAD	173	57.5%	74	36.6%	< 0.001
	Mean	SD	Mean	SD	
Chest Pain duration	15.0	25.9	12.3	22.0	0.219
SBP	137.7	29.6	124.1	25.4	< .001
DBP	82.8	15.9	75.6	15.9	< .001
MAP	100.6	20.7	91.8	18.4	< .001
HR	84.8	17.1	85.0	19.9	0.896
Killip class	1.4	.8	1.5	1.1	0.033
CPK (u/l)	421.4	592.9	2122.2	1297.2	< .001
CKMB (u/l)	48.7	57.9	295.6	276.2	< .001
Troponin	0.5	0.5	1.0	.0	< .001
Cardiac enzymes peaking (hours after presentation)	14.1	10.4	8.3	5.8	< .001

surgically bypassed in post-CABG patients, located in distal segments or with less than 50–60% stenosis and with no evidence of active ischemia in ECG or Echocardiography, so the targeted lesions in this study were 308 lesions in 303 vessels. Single vessel disease was present in 90 patients (34.8%), two vessel disease was present in 92 patients (35.5%) while multivessel disease was present in 77 patients (29.7%). The most prevalent diseased segment was proximal LAD (14.9%), followed by Mid LAD (13.9%) then proximal RCA (11.9%).

Out of the total number of studied patients, 211 patients (41.9%) received 235 bare metal stents (BMS) stents (143 patients had primary PCI, 68 patients had elective PCI). Forty patients (8%) received 52 drug eluting stents (DES) (7 patients had primary PCI, 33 patients had elective PCI). There were 8 patients (1.2%) who received both BMS & DES stents (18 stents). There was a statistically significant higher incidence of BMS implantation in primary PCI (in STEMI) and early invasive strategy (in NSTEMI) while in elective PCI there was a statistically significant higher incidence of DES implantation (p value < 0.001) .ICU stay was nearly similar in the BMS & DES groups.

4.3. Post-procedure complication and immediate outcome (Table 3)

- Restoring TIMI flow III after the PCI procedure was achieved in 98.4% of the included patients in our registry. Procedural complications were analyzed, taking into account that not all patients were subjected to cardiac intervention i.e. 259 out of 503 patients. Procedural complications occurred in 6.9%. Clinical success of PCI procedure was defined as accomplishing PCI procedure with no in-hospital MACE. Clinical success was achieved in 70.1% of cases underwent PCI.

4.4. IV-Outcome data (Table 4)

4.4.1. Major adverse cardiac events (MACE)

Patients with MACE were significantly older than those without MACE, (59.7 ± 9.5 years vs 56.7 ± 10 years *P* value 0.021). Using univariate regression analysis, each year increase in age increases odds of experiencing MACE by 3%, (*P* value 0.021). Patients with UA/NSTEMI who were treated conservatively developed statistically significant higher incidence of MACE compared to those treated interventionally (23.4% vs. 13.5% *P* value 0.031). Patients with STEMI who were treated without intervention have statistically significant higher incidence of MACE than those who were treated interventionally (15.4% vs. 5.5% *P* value 0.046).

Patients who experienced in hospital MACE had higher baseline levels of CK-MB, compared to those free of MACE, (157.7 ± 229 u/l vs. 89.5 ± 116.6 u/l *P* value 0.019). Regarding those who underwent PCI, patients who experienced procedural complications had higher in hospital MACE rates than those who were free of any procedural complications, (66.7% vs 16.1 *P* value < 0.001).

4.4.2. Mortality

Patients who experienced STEMI had higher mortality rates compared to NSTEMI/UA, (16.8% vs. 4.3% *P* value 0.003). Patients with poor clinical status as assessed by Killip class (class III–IV) had significantly higher mortality rates than those with lower Killip class (I–II). (64.9% vs 2.2% p value < 0.001).

Irrespective of the clinical diagnosis on admission, patients who died were older but the age difference was not statistically significant (59.98 ± 7.9 years vs 56.9 ± 10.5 years *P*-value

Table 2 Procedural data.

Parameter	Value
All patients subjected to PCI	259 patients (51.5%)
Primary PCI	154 patients (30.6%)
Elective PCI	105 patients (20.9%)
Number of diseased vessels	
Single vessel disease	90 patients (34.8%)
Two vessel disease	92 patients (35.5%)
Multivessel disease	77 patients (29.7%)
The diseased vessel segment	
Proximal LAD	14.9%
Mid LAD	13.9%
Proximal RCA	11.9%
Mid RCA	9.5%
Proximal LCX	8.9%
Mid LCX	4.8%
Distal RCA	3.2%
Ostial LAD	2.4%
Distal LAD	1.9%
Major side branch (diagonal, OM, PL, PDA)	28.6%
Types of stents	
Bare metal stents (BMS)	211 patients (81.5%)
Drug eluting stents (DES)	40 patients (15.4%)
Both (BMS & DES)	8 patients (3.1%)
Bare metal stents	211 patients
Primary PCI	143 patients (67.8%)
Elective PCI	68 patients (32.2%)
Drug eluting stents	40 patients
Primary PCI	7 patients (17.5%)
Elective PCI	33 patients (82.5%)
ICU stay	
BMS group	7 ± 3.8 days
DES group	6.9 ± 2.9 days

Table 3 Post-procedure complications & immediate outcome.

Parameter	Value
Angiographic success	98.4%
TIMI 0	0.4%
TIMI 1	0.4%
TIMI 2	0.8%
TIMI 3	98.4%
Clinical success	70.1%
Procedural complication	6.9%
Coronary dissection	0.8%
Distal embolization	0.8%
Failed PCI	2.3%
No reflow	1.5%
Acute stent thrombosis	1.1%
Dye induced nephropathy	0.4%
Major adverse cardiac event	29.9%
Death	38 patients (14.7%)
MI	3 patients (1.2%)
Unstable angina	2 patients (0.8%)
Cardiogenic shock	31 patients (12%)
Fatal ventricular dysrhythmias	1 patient (0.4%)
Target vessel revascularization	2 patients (0.8%)

Table 4 outcome (MACE & Mortality) data.

Parameter	MACE	No MACE	*P* value
Age (years)	59.7 ± 9.5	56.7 ± 10.4	0.021
CK-MB(u/l)	157 ± 229	89 ± 116.6	0.019
Procedural complications	66.7%	33.3%	<.001
No complications	16.1%	83.9%	
Parameter	**Survivors**	**Non-survivors**	***P* value**
Age (years)	56.9 ± 10.5	59.98 ± 7.9	0.054
ACS			
STEMI	83.2%	16.8%	0.003
UA/NSTEMI	95.7%	4.3%	
Killip class			
1–2	97.8%	2.2%	<0.001
3–4	35.1%	64.9%	
MAP (mmHg)	99.2 ± 18.8	75.7 ± 21.5	<0.001
EF %	56	46.5	<0.001

0.054). Non survivors had statistically significant lower admission MAP compared to those who survived. (75.7 mmHg vs 99.2 mmHg – *P* value < 0.001). Also non survivors had statistically significant lower ejection fraction (EF) when compared to those who survived. (46.5% vs 56.0% – *P* value < 0.001). Using multivariate analysis to determine predictors of mortality, it showed that the best predictors were MAP, diagnosis of STEMI and Killip class > 2. Each unit increase in MAP decreased odds of mortality, rendering this state 4% less likely, while Killip class above 2 increased odds of mortality and rendering this state 73.4 times more likely. Also, diagnosis of STEMI increased odds of mortality and rendering this state 2.8 times more likely than UA/NSTEMI.

5. Discussion

In the current registry, the mean age of the studied patients was 57.2 ± 10.4 years; this was lower than that stated by Granger et al. (GRACE registry), who found that the mean age was 66.3 years. Also Puymirat, E & co-workers found that the mean age in their registry (Euro Heart survey) was 66 ± 13 years, Chin et al., found that mean age was 64 years in the ACTION Registry – Get With The Guidelines (GWTG), and similarly Daida et al., found that the mean age was 67 years in the PACIFIC Registry [4–7]. This age discrepancy between our registry and the previously mentioned registries could be explained by the higher prevalence of risk factors of CAD among Egyptian population especially Diabetes mellitus.

Hypertension was the most common risk factor encountered in our registry (57.2%). This result was concordant with Ibrahim, who concluded that hypertension is common among Egyptian population and that 26.3% of adult Egyptians had high blood pressure in the years from 1991 to 1993. He stated that more than 50% of individuals older than 60 years suffered from hypertension [8]. In our registry, 45.9% of patients were diabetics and this was significantly higher than that encountered in GRACE (23.3%) [4], ACTION (29.5%)[6], EHS

(24%)[5], PACIFIC (35%) [7] registries. Our results go hand in hand with the postulation by Shaw et al. who stated that between 2010 and 2030, there will be 69% increase in the number of adults with diabetes in developing countries and 20% increase in developed countries. Egypt will have at least 8.6 million adults with diabetes [9]. This would explain the higher prevalence of diabetes in our registry compared to the international registries.

In the current registry, 76.2% of the STEMI group had primary intervention on the day of admission. We had significantly higher rate of primary PCI than the GRACE registry in which Fox et al. found that 40% of STEMI population underwent PCI of which 18% was primary PCI [10], the EHS in which Puymirat et al. found that 50% had primary PCI [5], GULF registry in which Zubaid found that primary PCI was done in only 7%.[11].

Among patients who underwent PCI, angiographic success was achieved in 98.4%, procedural complications occurred in 6.9% and clinical success was achieved in 70.1% of cases. Patients who experienced procedural complications had higher in hospital MACE rates than those who were free of any procedural complications (66.7% vs 16.1% P value < 0.001). Our Angiographic success rate was concordant with Shaikh et al., who found that PCI success rate was 97%, Prashanth et al. who stated that the angiographic success rate was 98% [12,13].

We also agree with Pride et al., who found that the occurrence of procedural complications was associated with worse clinical outcome. ($P < 0.001$). [14] The reported success rate in our registry was higher than that encountered by Buller et al. in the Occluded Artery Trial, they stated that the incidence of successful PCI procedures was 87%. We disagree with them as they stated that PCI failure didn't significantly affect outcome, this difference may be due to recruitment of stable myocardial infarction survivors with persistent infarct-related artery occlusion identified during days 3 to 28 post MI in their trial compared to inclusion of only acute coronary syndrome patients (STEMI or UA/NSTEMI in our registry) [15].

In our registry, we found that overall mortality rate was 7.6% (38 out of 503 included patients). Higher mortality was associated with STEMI compared to UA/NSTEMI (16.8% vs. 4.3%, P value $= 0.003$), higher Killip class (64.9% in Killip class III/IV vs 2.2% in Killip class I/II P value < 0.001), lower MAP at presentation (75.7 vs 99.2 mmHg P value < 0.001) & lower EF (46.5 vs 56% P value < 0.001). Mortality was also higher in older patients but this was statistically insignificant (59.9 vs 56.9 P value $= 0.054$). Granger et al., collected data from the GRACE found eight predictors of mortality which were age, Killip class, systolic blood pressure (SBP), ST segment deviation, cardiac arrest during presentation, high serum creatinine level, positive initial cardiac enzyme finding and heart rate. Their overall mortality was 4.5% [4]. In contrast to our registry; they found that age was a strong predictor of mortality. This difference may be due to relatively young patient population in our registry compared to their registry (57 years vs 66 years). Granger et al., found that mortality was higher in patients with ST deviation [4] while we found that only ST elevation is the ECG change that was associated with higher mortality, this difference may be attributed to the relatively small number of patients presented with ST depression (NSTEMI) in our registry compared to their registry (26% vs. 33%), and higher incidence of ST elevation(STEMI) in our registry compared to their registry (40% vs. 35.3%).

6. Conclusion

Higher prevalence of risk factors for CAD could possibly explain younger age of our subjects in comparison to other registries. Primary PCI is the reperfusion strategy of choice in STEMI patients in our center. Our success rate of PCI procedures matches the international rates. MACE was higher in older patients, patients with higher initial cardiac CK-MB, those who developed procedural complication; those who treated conservatively. Predictors of mortality were diagnosis of STEMI, higher Killip class and lower MAP.

Recommendation

Despite being a single center retrospective study, understanding the findings of this study may help in mapping our inconsistencies and improving the planning of a larger multicentric prospective randomized controlled study for better description of the Egyptian profile of those patients with acute coronary syndrome in order to improve their public level of care.

Disclosure

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