

In-hospital mortality of acute coronary syndrome in elderly patients

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ABSTRACT

الأهداف: تحليل تنبؤات الوفاة لدى المرضى المسنين الذين تم تشخيصهم بمتلازمة الشريان التاجي الحادة (ACS).

المنهجية: أجريت دراسة قائمة على السجل في الفترة ما بين يناير 2016 ويناير 2018 في المنطقة الوسطى من المملكة العربية السعودية أدرجنا بأثر رجعي جميع المرضى المسنين (أكبر من 75 عام) مع تشخيص واضح لل ACS. تم الإبلاغ عن البيانات الديموغرافية ومعلومات تخطيط صدى القلب والأوعية الدموية.

النتائج: اشتملت الدراسة على 179 مريضاً، 129 (72%) كانوا من الذكور. وكان متوسط العمر 79 ± 4.7 سنوات. تم تشخيص 102 (57%) من المرضى الذين يعانون من احتشاء ارتفاع عضلة القلب ST- شريحة (STEMI). من بين 125 (70%) خضعوا لتصوير الأوعية التاجية الغازية، وجدنا أن 43 (24%) كان مرض وعائي واحد (1VD)، 29 (16.2%) كان 2 مرض (2VD)، و 41 (22.9%) لديهم 3 أمراض أوعية الدموية (3VD) أو التضيق الرئيسي الأيسر. أثناء دخول المستشفى 21 (11.7%) من المرضى توفوا، أظهر تحليل الاختبار t أن المرضى الذين توفوا كانوا أكبر سناً بشكل ملحوظ (82 ± 6.7 مقابل 79 ± 4.2 سنة، $p=0.003$)، كان لديهم جزء طرد أقل (30.2 ± 10.7 مقابل 36.5 ± 1.1 ، $p=0.017$)؛ كان معدل انتشاره STEMI أعلى في مجموعة الوفاة 90.5% مقابل 52.5% ($p=0.018$ vs. 38.1%)، $p=0.001$). الأهم من ذلك، لم PCI لا تختلف اختلافاً كبيراً بين مجموعات الموت والبقاء على قيد الحياة (40% مقابل 53.8%)، $p=0.177$). أظهر تحليل الانحدار متعدد المتغيرات أن تنبؤات الوفاة كانت: العمر (نسبة الخطورة [HR]، 1.214؛ فاصل الثقة 95% [CI] 1.122–1.384؛ $p < 0.0001$)، والتنبيب (HR، 10.106؛ 95% CI، 9.844–10.792؛ $p > 0.0001$)، وأثار الكرياتينين (HR، 1.005؛ 95% CI، 1.002–1.013؛ $p=0.04$)؛ تنبأ في وفاة المستشفى.

الخلاصة: يمكن أن يتنبأ أن التقدم بالعمر والتهوية الميكانيكية وCK-MB المرتفعة بشكل كبير بالوفيات في المرضى المسنين (البالغ من العمر 75 عاماً وأكثر) الذين تم تشخيصهم بال ACS؛ ومع ذلك، لم تظهر PCI أي فوائد لتحسين الوفيات.

Objectives: To analyze predictors of death in elderly patients diagnosed with acute coronary syndrome (ACS).

Methods: A record-based study carried out between January 2016 and January 2018 at The central province in Saudi Arabia. All elderly patients (>75 years) with definite diagnosis of ACS were retrospectively included. Demographic data, echocardiographic, and angiographic parameters were reported.

Results: A total of 179 patients were enrolled, 129 (72%) were male. The mean age was 79 ± 4.7 years.

Approximately 102 (57%) patients were diagnosed with ST-segment elevation myocardial infarction (STEMI). Of all 125 (70%) underwent invasive coronary angiography, we found that 43 (24%) had significant single vessel disease (1VD), 29 (16.2%) had 2 vessel disease (2VD), and 41 (22.9%) had 3 vessel disease (3VD) or left main stenosis. During hospitalization 21 (11.7%) patients died, t-test analysis showed patients who died were significantly older (82 ± 6.7 versus [vs.] 79 ± 4.2 years, $p=0.003$). In addition we found that ejection fraction was lower in death group ($30.2\% \pm 10.7$) vs. ($36.5\% \pm 1.1$) in survivors, $p=0.017$; STEMI was more common in death group (90.5%) vs. (52.5%) in survivors, $p=0.001$; similarly, the prevalence of 3VD was higher in death group (38.1%) vs. (20.9%) in survivors, $p=0.018$). Importantly, PCI was not significantly different between death and survival groups (40% vs. 53.8%, $p=0.177$). A multivariate regression analysis demonstrated that predictors of death were: age (hazard ratio [HR], 1.214; 95% confidence interval [CI], 1.122–1.384; $p < 0.0001$), intubation (HR, 10.106; 95% CI, 9.844–10.792; $p < 0.0001$), and raised creatinine kinase-MB (CK-MB) (HR, 1.005; 95% CI, 1.002–1.013; $p=0.04$) predicted in hospital death.

Conclusion: Older age, mechanical ventilation and raised CK-MB can significantly predict death in elderly patients (>75-year-old) diagnosed with ACS; nevertheless, PCI showed no survival benefits.

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Coronary artery disease (CAD) is considered as one of the most common health issues in different age groups. In addition, it has been more frequently encountered in older individuals, due to increased life expectancy and the adoption of sedentary lifestyles.^{1,2} Over the past years, World Health Organization reported that the mortality of CAD in Saudi Arabia is approximately 24% of total deaths and ranked Saudi Arabia as the 34th in the world.¹ Acute coronary syndrome (ACS) is a common clinical presentation of CAD which is associated with significant hospitalizations and emergency visits worldwide each year.³

Multiple studies reported that older age as a significant predictor of in-hospital death and poor clinical outcomes in patients diagnosed with ACS, due to the higher prevalence of CAD risk factors and its related complications.⁴⁻⁷ Although patients older than 65 years encountered approximately 60% of hospitalization for ACS, the exact incidence rate of ACS in patients older than 75-year is not well-known. Importantly, guidelines directed therapy for ACS is suboptimal in elderly patients; nevertheless, they have more risk of medical and procedures complications.⁵ elderly patients (>75 years) with ACS were under-represented and account less than 10% of all subjects included in clinical trials.⁸ Of note, in Saudi Arabia there is no study investigated in-hospital mortality of ACS in patients older than 75 years; thus, the aim of this study is to analyze mortality and the outcome of invasive procedures compared to medical treatment in this age group.

Methods. A record-based historical prospective study between January 2016 and January 2018 The central province in Saudi Arabia. All elderly individuals aged more than 75 years old with a definitive diagnosis of ACS including unstable angina, non ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI) in a tertiary care cardiac center in the central region of Saudi Arabia were selected. We reported the demographic data of the patients such as age, gender, risk factors, symptoms at time of presentation, electrocardiogram findings, laboratory investigations, coronary angiographic data, percutaneous coronary interventions (PCI) data, echocardiographic parameters, hospital stay, and final diagnosis and in hospital mortality. The institutional

and regional ethical committee approved the study protocol.

Statistical analysis. A 2-sample t-test was used for normally distributed continuous variables between patients who died and survived patients. To compare the outcome between interventional versus (vs.) non-interventional groups, Chi-square test was run for categorical variables, and Mann-Whitney test was used to compare length of stay between the groups. A p value <0.05 was considered statistically significant. All statistical analyses were performed by IBM SPSS for Windows, version 19.0 (SPSS Inc., Chicago, IL, USA).

Results. A total of 179 patients were included in the study with mean age 79 ± 4.7 years, 129 (72%) were male. They presented with ACS either STEMI (57%) or NSTEMI (77%). Approximately 62% of the patients were diabetic, 63 were hypertensive, nearly 13% were dyslipidemic, 6% were smoker, and 1% family history of CAD. There was no significant gender differences regarding diabetes (76 [60%] for men vs. 35 [70%] for women, $p=0.7$) and in hypertension (73 [57%] for men vs. 41 [82%] for women, $p=0.1$).

As regard to coronary angiography, 43 patients (24%) had single vessel disease (1VD), 29 patients (16.2%) had 2VD and 41 patients (22%) had left main or 3VD. Of those presented with STEMI, 93 patients had PCI for culprit lesion. Other clinical characteristics shown in Table 1.

In-hospital death. During hospitalization 21 (11.7%) died. The t-test analysis showed that patients who died were significantly older (82 ± 6.7 vs. 79 ± 4.2 , $p=0.003$), higher prevalence of STEMI (90.5% vs. 52.5%, $p=0.001$), lower Ejection fraction (EF) (30.2 ± 10.7 vs. 36.5 ± 1.1 , $p=0.017$), more of those with 3VD (38.1% vs. 20.9%, $p=0.018$). Importantly, PCI was performed in (40.0%) of death group and (53.8%) of survivors which was statistically non-significant ($p=0.177$). Other difference between groups seen in Table 1.

We ran a univariate regression including all variables that significantly associated with death and we found that age, creatinine kinase-MB (CKMB), creatinine and mechanical ventilation was significant predictors of death (Table 2). However, multivariate regression showed age, CKMB and mechanical ventilation were significantly predictors of in-hospital death Table 2.

Discussion. With the spread and improvement of medical services, the number of elderly individuals in the community has significantly increased.⁹ At the same time, percentage of elderly patients presented with ACS is increasingly year-by-year.¹⁰ In contrast to younger

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Table 1 - The baseline characteristic of elderly patients.

Variables	All patients	Death	No death	P-value
Number of patients	179 (100)	21 (11.7)	158 (88.3)	-
Gender - men	129 (72.1)	14 (66.7)	115 (72.8)	0.362
Age (years), mean± SD	79±4.7	82±6.7	79±4.2	0.003
Diabetes mellitus,	111 (62.0)	9 (42.9)	102 (64.6)	0.048
Hypertension,	114 (63.7)	14 (66.7)	100 (63.3)	0.483
Dyslipidemia,	23 (12.8)	0	23 (14.6)	0.046
Family history of coronary artery disease,	1 (0.6)	0	1 (0.6)	0.883
Current smoking,	11 (6.1)	1 (4.8)	10 (6.3)	0.622
ST-segment elevation myocardial infarction	102 (57.0)	19 (90.5)	83 (52.5)	
Non ST-segment elevation myocardial infarction	77 (43.0)	2 (9.5)	75 (47.5)	0.001
Percutaneous coronary interventions	93 (52.2)	8 (40.0)	85 (53.8)	0.177
Ejection fraction mean± SD	35.8±11.2	30.2±10.7	36.5±1.1	0.017
1VD	43 (24.0)	1 (4.8)	42 (26.6)	
2VD	29 (16.2)	3 (14.3)	26 (16.5)	0.018
LM/3VD	41 (22.9)	8 (38.1)	33 (20.9)	
Significant valvular disease	59 (34.1)	12 (63.2)	47 (30.5)	0.006
Creatinine kinase-MB, mean± SD	79±123	186±242	67±97	0.001
Intubation	16 (8.9)	13 (61.9)	3 (1.9)	0.001
Cardio shock	26 (14.5)	20 (95.2)	6 (3.8)	0.001
Complete heart block	5 (2.8)	3 (15.0)	2 (1.3)	0.011
White blood cell, mean± SD	17±9	14±5	18.1±10	0.870
Hemoglobin, mean± SD	12.4±2	12.5±3	12±2	0.846
Creatinine, mean± SD	108±56	156±74	102±51	0.001
Length of stay, mean± SD	5.3±5	4.2±6	5.4±5	0.075

Values are presented as numbers and percentage (%). LM - left main coronary artery, VD - vessel disease

Table 1 - Univariate binary regression of variables associated with higher mortality and multivariate binary regression including variables with *p* value <0.1.

Variable	Univariate binary regression for death				Multivariate binary regression for death			
	95% CI for EXP (B)			P-value	95% CI for EXP (B)			P-value
	EXP(B)	Lower	Upper		EXP (B)	Lower	Upper	
Age (years)	1.258	1.055	1.500	0.010	1.214	1.122	1.384	0.000
Diabetes mellitus	4.394	0.275	70.277	0.295	-	-	-	-
STEMI	1.374	0.129	14.658	0.793	-	-	-	-
Ejection fraction	0.970	0.844	1.115	0.670	-	-	-	-
Sig-VHD	0.182	0.022	1.468	0.110	-	-	-	-
Creatinine kinase-MB	1.007	1.000	1.014	0.036	1.005	1.002	1.013	0.04
Intubation	10.005	9.023	10.109	0.001	10.106	9.844	10.792	0.000
Complete heart block	0.090	0.001	9.491	0.311	-	-	-	-
CR	1.031	1.002	1.060	0.034	0.988	0.968	1.009	0.262

STEMI - ST-segment elevation myocardial infarction, VHD - valvular heart disease, EXB - exponentiation, CR - increase serum creatinine levels

patients, elderly usually present with atypical symptoms, have more endothelial dysfunction, extensive CAD, and more non-cardiac morbidities.¹¹

According to our knowledge, the data about in-hospital mortality of elderly presented with ACS in Saudi Arabia is insufficient. The current study demonstrated that elderly patients presented with ACS had approximately 12% of in-hospital death. In

addition, we found that the most meaning predictors of in-hospital mortality were advanced age and elevated cardiac enzymes at the time of presentation. On the other hand, PCI had no effect on the mortality rate.¹² These results are similar to a previous study of Bauer et al¹¹ who investigated risk of mortality in elderly undergone PCI and stated that age is a strong predictor of in hospital death. In addition, they found that patients

≥75-year-old has a 3-fold mortality when compared to a younger age group. Moreover, our results were similar to that of Rahman et al,¹³ who found that the higher levels of CKMB and other cardiac biomarkers were associated with a worse outcome and an increase in mortality rate.

In the present study, we found that hemodynamic instability and respiratory failure that required mechanical ventilation were important predictors of in-hospital death that was reported by previous studies.¹¹ Hemodynamic instability and respiratory failure may occur at time of presentation or during hospitalization due to either pump failure, mechanical complications or a consequence of concomitant respiratory diseases.¹⁴

Moreover we found that early revascularization with PCI had no significant impact on mortality. Our results were different from the Global Use of Strategies to Open Occluded Coronary Arteries in Acute Coronary Syndrome (GUSTO IIb) trial that showed PCI leads to significant reduction in death among patients more than 70 years old. This difference can be explained by the older age of the included patients in our study and the new advancement of adherent medical treatment.¹⁵ Although there are no age limits for coronary arteries revascularization, PCI still considered a challenge in elderly individuals due to the extensive and complexity of coronary lesions, higher contrast induced nephropathy, vascular, and bleeding complications.¹⁶⁻¹⁸

In the same context, Bruer et al¹¹ reported that patients older than 75 years undergoing PCI for ACS or stable angina had high rate of procedure related complications.

Study limitations. It is a single center study, based on a retrospective review of patients' data. Our results concern with in-hospital death predictors in elderly patients managed in a tertiary care center; thus, our findings can not be generalized on primary non-PCI capable hospitals. Lastly, relatively low number population involved can limit the conclusiveness of our results.

In conclusion, the mortality rate is approximately 12% in patients older than 75 years. Age, high cardiac enzymes at time of presentation, and need to mechanical ventilation support are significant predictors for in-hospital mortality. Importantly, no survival benefits was shown with primary or early PCI in elderly presented with ACS. The decision of performing PCI should take in consideration age of the patient as well as associated comorbid diseases and hemodynamic state.

Further randomized prospective studies are required to assess revascularizations versus optimal medical management of ACS in this group of patients.

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