Predictors of In-Hospital Mortality in Patients with Acute Coronary Syndrome in Hasan Sadikin Hospital, Bandung, Indonesia: A Retrospective Cohort Study

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ABSTRACT

Background: *Acute coronary syndrome (ACS) is a world health problem with a high mortality rate and is expected to continue to rise in number. The high ACS mortality rate in the hospital is influenced by demographic characteristics, cardiovascular risk factors, clinical presentation, and management. This study aimed to determine the predictors of ACS death at Dr. Hasan Sadikin Hospital Bandung as the highest referral center in West Java.* ***Methods:*** *This study is a retrospective cohort study on all ACS patients undergoing treatment at Dr. Hasan Sadikin Hospital Bandung from January 2018 to December 2019. Multivariate analysis was performed using a logistic regression test with the backward method to assess predictors of patient outcomes.* ***Results:*** *This study involved 919 patients with the in-hospital mortality rate was 10.6%. Multivariate analysis showed that age >65 years was a demographic factor that play a role as a predictor of mortality mortality (AOR 2.143; 95% CI = 1.079-4.256; p = 0.030). Clinical presentation of cardiac arrest arrest (AOR 48.700; 95% CI =14.289-165.980; p<0.001), SBP <90 mmHg (AOR: 4.972; 95% CI =1.730-14.293; p=0.003, heart rate >100 beats per minute (AOR 4.285; 95% CI =2.209-8.310; p<0,001), cardiogenic shock (AOR: 5.433; 95% CI= 2.257-13.074; p<0.001). Cardiovascular management can reduce the risk of in-hospital mortality. Multivariate analysis showed statins (AOR 0.155; 95% CI=0.040-0.594; p=0.007), beta blockers (AOR 0.304; 95% CI=0.162-0.570; p<0,001) and Percutaneous Coronary Intervention (AOR 0.352; 95% CI=0.184-0.673; p=0.002) significantly reduce in-hospital mortality. Interestingly, smoking is associated with a lower mortality rate (OR 0.387; p <0.001).* ***Conclusion:*** *Clinical presentation of cardiac arrest has the highest risk of death, the sequence is cardiogenic shock, heart rate >100 beats per minute, and age >65 years. Administration of statins, beta-blockers, PCI, and smoking are factors that reduce the risk of death.*

Keywords**:** *Hospital death, predictor, acute coronary syndrome.*

INTRODUCTION

Acute coronary syndrome (ACS) is a worldwide health problem with a high mortality rate and its prevalence is expected to continue to increase. The World Health Organization (WHO) states that cardiovascular disease is a global cause of death worldwide.[1]

The high ACS mortality rate in the hospital is influenced by many factors, such as demographic factors, history of cardiovascular risk factors, clinical presentation, and the results of investigations and management in the hospital.[2-4]

Several studies have shown that the mortality rates in ACS patients vary among countries around the world.[5,6] There was no national data on the incidence and mortality of ACS in Indonesia. Research on predictors of mortality in Dr. Hasan Sadikin Hospital Bandung, which is the highest referral center hospital in West Java, has never been done. This study aimed to analyze the data regarding the mortality predictor of hospital care in ACS patients at Dr. Hasan Sadikin Hospital Bandung. Hence, hopefully the results of our study can substantially fill the gap of data regarding predictor of mortality in ACS patients in Indonesia.

METHODS

This is a retrospective cohort study on ACS patients who underwent treatment at Dr. Hasan Sadikin Hospital Bandung from the period of January 2018 to December 2019. All ACS patients such as unstable angina pectoris (UAP), ST-elevation myocardial infarction (STEMI), and Non-ST Elevation Myocardial Infarction (NSTEMI) were included. The inclusion criteria of this study were medical records from male and female subjects aged ≥18 years and diagnosed with ACS. Incomplete medical records, ACS triggered or associated with comorbid accidents, trauma, surgery, or procedures were excluded from the study

Data such as identity, history, physical examination, ECG, laboratory, medical therapy during hospital care, revascularization measures, complications during treatment, final diagnosis, and discharge status were included. Hospital deaths are deaths due to all causes of death, both cardiovascular and non-cardiovascular deaths.

Ethics approval and consent to participate was assigned by Medical Research Ethics Committee Dr. Hasan Sadikin Hospital.

Statistical Analysis

The normality test was carried out on numerical data. Data with normal distribution are expressed as means. Data with an abnormal distribution are expressed in medians with minimum and maximum percentages. Bivariate analysis using unpaired T-test or Mann-Whitney analysis. Variables with a p-value less than 0.25 in the bivariate analysis were included in the logistic regression analysis. Multivariate logistic regression analysis was performed by using the backward method. The analysis was continued with the main interpretation of the predictive conceptual framework to determine which variables were related to the dependent variable. Significance was determined based on a p-value <0.05. Statistical analyses were performed using IBM SPSS Statistics for Windows Operating System, version 24.0 software (IBM Corp., Armonk, N.Y., USA).

RESULTS

This study involved 919 patients, with 76% of the study subjects being male with a mean age of 59 ± 11 years. The ACS mortality rate in the hospital was 10.6%. The most common cardiovascular risk factors found were smoking (71.4%), followed by hypertension (64.6%), diabetes mellitus (22.4%), dyslipidemia (19.4%). The percentage of cardiac arrest upon arrival at the hospital was 3.5%. Management of revascularization was not entirely carried out on study subjects. A total of 469 study subjects received revascularization therapy (PCI), consisting of 319 patients with a diagnosis of STEMI (59.6%) and 150 patients with a diagnosis of NSTEMI/UAP (39.1%), while 412 patients (44.8%) %) did not receive revascularization therapy (**Table 1**).

Death in care occurred more frequently in female subjects as much as 16.3% (OR 1.996; p=0.002), old age >75 years (OR 7.069; p <0.001). Smoking is a cardiovascular risk factor associated with a lower mortality rate (OR 0.387; p <0.001). Other cardiovascular risk factors were not statistically significant for the risk of death during treatment (p>0.05) (**Table 1**).

Clinical presentation of cardiac arrest (OR 49.051; p <0.001), SBP <90 mmHg (OR 14.476; p <0.001), heart rate > 100 beats per minute (OR 7.717; p <0.001), clinical class of cardiogenic shock (OR 16.752; p <0.001) on arrival at the emergency room were associated with high mortality rates. ECG with ST segment elevation (OR 2.023; p = 0.003), abnormal renal function with a creatinine value >2.0 mg / dL (OR 5.507; p <0.001), troponin-I ≥9.0 ng / dL (OR 2.027; p <0.028) and a random blood glucose ≥200 mg / dL (OR 4.080; 95% CI =

2.175-7.656; p <0.001) were also associated with higher mortality during treatment. Management of revascularization and hospital-administered drugs, such as dual antiplatelets (OR 0.111; p <0.001), anticoagulants (OR 0.524; p = 0.022), ACE-inhibitors (OR 0.184; p <0.001), beta blockers (OR 0.170; p <0.001) and statins (OR 0.089; p <0.001) were associated with lower hospital mortality (**Table 1**).

Table 1. Baseline characteristic of study population.

Variables	Total n=919	Death n=98	Alive n=821	Crude OR (95% CI)	p-value
Demographic factors					
Sex. n (%)					
Female	221 (24.0)	36 (16.3)	185 (83.7)	1.996 (1.283 – 3.106)	0.002
Male	698 (76.0)	62 (8.9)	636 (91.1)	1	
Age (years)	59 ± 11	65 ± 11	58 ± 10		
<65	663 (72.1)	49 (7.4)	614 (92.6)	1	
65-75	195 (21.2)	27 (13.8)	168 (86.2)	2.014 (1.222 – 3.320)	0.006
>75	61 (6.7)	22 (36.1)	39 (63.9)	7.069 (3.887 – 12.856)	<0.001
BMI (kg/m^2)	23.4 (15.6 – 44.4)	23.4 (16.3 – 44.4)	23.4 (15.6 – 36.7)		
<18.5	22 (2.4)	2 (9.1)	20 (90.9)	0.758 (0.167 – 3.449)	0.720
18.5-22.9	206 (22.4)	24 (11.7)	182 (88.3)	1	
23.0-27.4	597 (65.0)	67 (11.2)	530 (88.8)	0.959 (0.584 – 1.574)	0.867
≥27.4	94 (10.2)	5 (5.3)	89 (94.7)	0.426 (0.157 – 1.154)	0.093
Cardiovascular History and Risk Factors, n (%)					
Smoking	656 (71.4)	51 (7.8)	605 (92.2)	0.387 (0.253 – 0.593)	<0.001
Diabetes Mellitus	206 (22.4)	27 (13.1)	179 (86.9)	1.364 (0.850 – 2.189)	0.197
Hypertension	594 (64.6)	63 (10.6)	531 (89.4)	0.983 (0.635 – 1.522)	0.939
Dyslipidemia	178 (19.4)	13 (7.3)	165 (92.7)	0.608 (0.331 – 1.117)	0.106
History of angina	329 (35.8)	37 (11.2)	292 (88.8)	1.099 (0.713 – 1.694)	0.669
History of premature CAD	73 (7.9)	4 (5.5)	69 (94.5)	0.464 (0.165 – 1.300)	0.135
History of PCI	110 (12.0)	6 (5.5)	104 (94.5)	0.450 (0.192 – 1.053)	0.059
History of CABG	6 (0.7)	0 (0.0)	6 (100.0)	0.637 (0.036 – 11.392)	0.759
Clinical Presentation					
First medical contact (hour)				1.006 (1.000 – 1.012)	0.054
Onset of hospital arrival (hour)	10 (0.3-288)	10 (0.33-228)	12 (20-240)	1.000 (1.000 – 1.000)	0.578
Cardiac arrest. n (%)	32 (3.5)	26 (81.3)	6 (18.8)	49.051 (19.551 – 123.060)	**<0.001**
SBP (n (%)					
<90 mmHg	45 (4.9)	26 (57.8)	19 (42.2)	14.476 (7.550 – 27.756)	**<0.001**
90-139 mmHg	660 (71.8)	57 (8.6)	603 (91.4)	1	
140-159 mmHg	140 (15.2)	10 (7.1)	130 (92.9)	0.814 (0.405 – 1.636)	0.563

160-179 mmHg	63 (6.9)	3 (4.8)	60 (95.2)	0.529 (0.161 – 1.740)	0.295
≥180 mmHg	11 (1.2)	2 (18.2)	9 (81.8)	2.351 (0.496 – 11.143)	0.282
Heart rate (n (%))					
<60 bpm	69 (7.5)	11 (15.9)	58 (84.1)	2.820 (1.386 – 5.738)	**0.004**
60-100 bpm	730 (79.4)	46 (6.3)	684 (93.7)	1	
>100 bpm	120 (13.1)	41 (34.2)	79 (65.8)	7.717 (4.770 – 12.485)	**<0.001**
Heart Failure. n(%)					
No heart failure	653 (71.1)	35 (5.4)	618 (94.6)	1	
Heart Failure	190 (20.7)	26 (13.7)	164 (86.3)	2.779 (1.638 – 4.784)	**0.016**
Cardiogenic shock	76 (8.2)	37 (48.7)	39 (51.3)	16.752 (9.529 – 29.449)	**<0.001**
ECG presentation, n (%)					
Persistent ST segment elevation	535 (58.2)	71 (13.3)	464 (86.7)	2.023 (1.272 – 3.218)	**0.003**
ST segment depression, non-persistent ST elevation, abnormality of T wave	384 (41.8)	27 (7.0)	357 (93.0)	1	
Laboratorium Values					
Troponin (n, %)					
<0.4 (ng/dL)	185 (20.1)	13 (7.0)	172 (93.0)	1	
0.4 - <1.0 (ng/dL)	84 (9.1)	9 (10.7)	75 (89.3)	1.588 (0.651 – 3.874)	0.310
1.0 - <2.0 (ng/dL)	65 (7.1)	6 (9.2)	59 (90.8)	1.346 (0.489 – 3.700)	0.565
2.0 - <5.0 (ng/dL)	90 (9.8)	9 (10.0)	81 (90.0)	1.470 (0.604 – 3.580)	0.396
5.0 - <9.0 (ng/dL)	66 (7.2)	4 (6.1)	62 (93.9)	0.854 (0.268 – 2.717)	0.789
≥ 9.0 (ng/dL)	429 (46.7)	57 (13.3)	372 (86.7)	2.027 (1.081 – 3.802)	**0.028**
Creatinine (n, %)					
≤1.2 mg/dL	535 (58.2)	31 (5.8)	504 (94.2)	1	
>1.2 – 2.0 mg/dL	218 (23.7)	25 (11.5)	193 (88.5)	2.106 (1.212 – 3.659)	**0.008**
>2.0 mg/dL	166 (18.1)	42 (25.3)	124 (74.7)	5.507 (3.327 – 9.115)	**<0.001**
Random blood glucose (n, %)					
<110 mg/dL	289 (31.4)	18 (6.2)	271 (93.8)	1	
110-199 mg/dL	494 (53.8)	51 (10.3)	443 (89.7)	1.733 (0.992 – 3.029)	0.053
≥200 mg/dL	136 (14.8)	29 (21.3)	107 (78.7)	4.080 (2.175 – 7.656)	**<0.001**
In-Hospital Utilization of Medications and Interventions					
Pharmacological Therapy in the First 24 hours					
DAPT, n (%)	902 (98.2)	89 (9.9)	813 (90.1)	0.111 (0.042-0.297)	**<0.001**
Anticoagulant, n(%)	786 (85.5)	75 (9.5)	711 (90.5)	0.524 (0.302-0.910)	**0.022**
ACE-inihibitor, n(%)	498 (54.2)	20 (4.0)	478 (96.0)	0.184 (0.110 – 0.307)	**<0.001**
Beta blocker, n(%)	574 (62.5)	25 (4.4)	549 (95.6)	0.170 (0.105 – 0.273)	<0.001
Statin, n(%)	895 (97.4)	85 (9.5)	810 (90.5)	0.089 (0.039 – 0.204)	**<0.001**

Revasculatization Therapy					
STEMI, n (%)					
PCI	319 (59.6)	27 (8.5)	292 (91.5)	0.361 (0.216 – 0.605)	**<0.001**
Fibrinolytic	117 (21.9)	7 (6.0)	110 (94.0)	0.352 (0.157 – 0.790)	**0.009**
Drugs	178 (33.3)	37 (20.8)	141 (79.2)	2.493 (1.503 – 4.134)	**<0.001**
NSTEMI/UAP, n (%)					
PCI	150 (39.1)	3 (2.0)	147 (98.0)	0.179 (0.053 – 0.604)	**0.002**
Drugs	234 (60.9)	24 (10.3)	210 (89.7)	5.600 (1.656 – 18.942)	0.006

OR: odds ratio; BMI: body mass index; STEMI: ST elevation myocardial infarction; NSTEMI: non-ST elevation myocardial infarction; PCI: percutaneous coronary intervention; ACE: angiotensin converting enzyme; DAPT: dual antiplatelet therapy; mg: milligrams; ng: nanograms; SBP: systolic blood pressure; CABG: coronary artery bypass surgery; CAD: coronary artery disease.

Multivariate analysis in this study showed that the factor associated with highest risk of death was cardiac arrest (AOR 48.700; 95% CI =14.289-165.980; p<0.001), then followed by clinical signs of cardiogenic shock (AOR: 5.433; 95% CI= 2.257-13.074; p<0.001), SBP <90mmHg (AOR: 4.972; 95% CI =1.730-14.293; p=0.003), heart rate >100 beats per minute (AOR 4.285; 95% CI =2.209-8.310; p<0,001) and age >65 years (mortality (AOR 2.143; 95% CI = 1.079-4.256; p = 0.030). Factors that reduced the risk of death were statins as statins (AOR 0.155; 95% CI=0.040-0.594; p=0.007), beta blockers (AOR 0.304; 95% CI=0.162-0.570; p<0,001) and PCI (AOR 0.352; 95% CI=0.184-0.673; p=0.002) were associated with a reduced risk of death. (**Table 2**)

Table 2. Multivariate analysis of mortality predictor in hospital care.

Variables	Coefficient B	S.E.	P Value	AOR	95% C.I. AOR	
					Min	Max
Age (years)						
<65 tahun				1		
65-75	0.762	0.350	**0.030***	**2.143**	**1.079**	**4.256**
> 75	1.596	0.426	**<0.001***	**4.931**	**2.139**	**11.365**
Smoking	-0.901	0.312	**0.004***	**0.406**	**0.220**	0.749
Cardiac arrest	3.886	0.626	**<0.001***	**48.700**	**14.289**	**165.980**
SBP (mmHg)						
<90	1.604	0.539	**0.003***	**4.972**	**1.730**	**14.293**
90-139				1		
140 – 159	-0.374	0.462	0.418	0.688	0.278	1.701
160 – 179	-1.004	0.715	0.161	0.366	0.090	1.489
≥180	-0.463	1.172	0.692	0.629	0.063	6.255
Heart rate (beats per minute)						
<60	-0.012	0.574	0.984	0.988	0.321	3.044
60 – 100				1		
>100	1.455	0.338	**<0.001***	**4.285**	**2.209**	**8.310**
Heart Failure						
No heart failure				1		
Heart Failure	0.546	0.353	0.122	1.727	0.864	3.450
Cardiogenic shock	1.692	0.448	**<0.001***	**5.433**	**2.257**	**13.074**
PCI	-1.044	0.330	**0.002***	**0.352**	**0.184**	**0.673**
Beta blockers	-1.192	0.322	**<0.001***	**0.304**	**0.162**	**0.570**
Statins	-1.867	0.687	**0.007***	**0.155**	**0.040**	0.594

S.E.: standard error; AOR: adjusted odds ratio; CI: confidence interval; SBP: systolic blood pressure; PCI: percutaneous coronary intervention.

DISCUSSION

The mortality rate of ACS in-hospital care in this study was 10.6% for all patients diagnosed with ACS. Indonesia does not have a national ACS mortality rate. Still, this number is higher when compared to the mortality rate in other Asian countries (5%)[7,8] and developed countries such as America and Europe, which is 4-8%.[9–12]

Regarding demographic data, most of the participants were male (76%) with age below 65 years (72.1%). Consistently, ACS registry data from Brazil conducted by Santos et al. also showed similar results.[13] ACS patients in our registry were more likely overweight (65%) and smokers (71.4%). Similarly, Mohanan et al. study stated that ACS patients were more likely overweight but Santos et al. study found that ACS patients were less likely smokers.[13,14] Moreover, in concern to comorbidities, history of diabetes mellitus, hypertension, dyslipidemia, and angina in our participants were 22.4%, 64.6%, 19.4%, and 35.8%, respectively. Nonetheless, Santos et al. study found that although the prevalence of prior diabetes mellitus, hypertension and angina in ACS patients were comparable to our results, the dyslipidemia occurs in half of ACS patients (53.1%).[13]

Prior revascularization procedure including PCI and CABG were performed in 12% and 0.7%, respectively of our participants. In contrast, Santos et al.[13] study revealed the prevalence of history of PCI was two times higher as opposed to our results and history of CABG was 23.6%. The explanation behind this various data is because our hospital still has limited resources and facilities.

In regard to clinical presentation, mean onset of chest pain duration at admission was 10 (0.3-288) hours. Furthermore, cardiac arrest, heart failure, clinical signs of cardiogenic shock were present in 3.5%, 20.7%, and 8,2%, respectively in our participants. Moreover, ACS data from Nigeria also revealed the similar results to ours.[15] Our participants more apparently had normal SBP with range of 90 to 139 mmHg (71.8%), normal HR with range of 60 to 100 bpm (79.4%) and ST-segment elevation on ECG (58.2%). Similar to our results, ACS registry from India and Nigeria revealed that ACS patients prone to had normal SBP and HR, and presented with STEMI.14,15 However, in Brazil, unstable angina was the most common presentation of ACS.[13] Concerning laboratory values at admission, our participants had troponin I levels equal or higher than 9 ng/dL (46.7%), creatinine equal or lower than 1.2 mg/dL (58.2%), and normal random blood glucose (53.8%). Consistently, Mohanan et al. study demonstrated similar results to ours.[14]

Furthermore, the majority of our participants received DAPT (98.2%), anticoagulant (85.5%), ACE inhibitor (54.2%), beta-blocker (62.5%), and statin (97.4%). Expectedly, ACS patients in Nigeria also demonstrated similar findings to ours.[15] In revascularization therapies, 59.6% and 21.9% of STEMI patients underwent PCI and fibrinolytic procedures, respectively. Whereas 39.1% of NSTEMI/UAP patients underwent PCI. Interestingly, in India, fibrinolytic were more often performed compared to PCI.[14] Whereas ACS registry in Brazil showed the opposite results.

This study showed that old age (>65 years old) was a consistent predictor of mortality, similar to the results from various examining predictors of mortality and other cardiovascular outcomes.[2] Patients with old age were associated with atypical symptoms, metabolic disturbances, more cardiovascular risk factors or comorbidities, complex coronary lesions, possible decreased ventricular function, decreased and impaired renal function, a high risk of bleeding, which increased the risk of complications after revascularization (PCI or CABG).[16–18]

Several studies have linked female sex to cardiovascular outcomes in ACS patients, but it turns out that the mortality rate in women occurs at non-unadjusted assessments. The female mortality rate decreased after multivariable adjustment. This multivariate adjustment had been made to age, comorbidities, and management.[19,20] Excess body mass index (BMI) was not associated with increased mortality in ACS patients. Following previous studies, Steinberg et al., Niedziela et al., and Kosuge et al. state that the excess body weight is not associated with death, known as the obesity paradox".[21–23]

Smoking in this study was independently and significantly associated with a reduction in mortality rate in ACS patients. These results support the smoker's paradox theory.[24] A randomized controlled trial conducted by Zahger et al study found that current smokers were presented with a higher incidence of thrombolysis in myocardial infarction (TIMI) flow grade III in 90 minutes post PCI compared to non-smokers.[25] The underlying pathogenesis of ACS in smokers was different compared to non-smokers. Haematocrit and fibrinogen levels were significantly higher in the smokers' population which eventually predisposes thrombogenic obstruction with minimal underlying atherosclerotic narrowing. On the contrary, the non-smokers' population were predominated with atherosclerotic narrowing condition.[26,27] Therefore, administration of thrombolysis and/or anti-coagulant in smokers' population with ACS resulted in greater favorable outcomes and eventually reduced mortality risk compared to non-smokers.[24] Nevertheless, larger observational studies are still needed to confirm this smoker's paradox theory.

The risk factors of hypertension in this study were not related to the risk of death. Another study states that blood pressure at the time of hospital admission influences the increased risk of death in hospitals. This low mortality rate in patients with hypertension is also associated with the administration of therapies such as ACE inhibitors or angiotensin receptor blockers (ARBs) and post-ACS statins.[28–31]

Presentation of cardiac arrest on hospital admission was one of the predictors of death in the hospital. Patients with cardiac arrest were less likely to receive inadequate management, including aspirin, beta-blockers, statins, and ACE inhibitors, than patients without these complications. Patients were also more likely to experience other complications such as recurrent ischemia, cardiogenic shock, heart failure, kidney failure, stroke, and major bleeding.[32]

Increased heart rate (>100 beats per minute) was a predictor of hospital death. Increased heart rate is associated with decreased diastolic filling time, increased myocardial oxygen consumption, which can worsen ischemia and increase the risk of developing malignant arrhythmias. These results were consistent with previous studies.[33–37] Blood pressure <90 mmHg on hospital admission was a predictor of death in ACS patients. Blood pressure on admission was inversely associated with hospital death and was related to the extent of myocardial damage.[38,39]

Myocardial infarction complicated by cardiogenic shock is still a major problem in ACS management with high morbidity and mortality. The poor prognosis was thought due to complex coronary lesions, ventricular dysfunction, and a large infarct area. Patients with acute heart failure were less likely to receive optimal treatment compared with patients without heart failure.[40,41] In line with this study, multivariate analysis showed that cardiogenic shock was a predictor of death in ACS during treatment.

Meanwhile, ECG and increased troponin and creatinine values were not predictors of death in ACS patients. This result was slightly different from the GRACE registry, which stated that ST-segment deviation, increased troponin value, and creatinine value at presentation are predictors of mortality in ACS.

Pharmacological treatment, such as beta-blocker administration, had been shown to reduce the mortality rate in the literature.[42] Statin effects stabilizing unstable plaque and increasing collateralization in severe CAD.[43,44] Administration of statin in hospitals is associated with a reduced short-term mortality rate among patients after ACS.[45] Revascularization aims at restoring blood flow to ischemic myocardium. Percutaneous coronary intervention (PCI) is proven to reduce mortality rate, recurrent infarction, and stroke in ACS patients.[46] Consistently, our analysis showed that PCI and administration of beta-blocker and statin significantly and independently reduced the risk of in-hospital mortality in ACS patients. Additionally, mechanical support device such as veno-arterial extracorporeal membrane oxygenation (VA-ECMO) was recommended by the European Society of Cardiology (ESC) as a final resort of therapy in ACS patients with cardiogenic shock who did not respond to vasopressor and inotropic administration.[47] Hence, despite of all aforementioned factors that associated with increased risk of mortality, unavailability of V-A ECMO in our center may also be responsible for increased risk of mortality especially in ACS patients who presented with cardiogenic shock.

This study had several limitations. First, this study was a single-center, retrospective study with a relatively small sample size. Thus, the results of this study could not be extrapolated from findings in other research centers, hospitals, or even communities. Second, there was no further sub-analysis of the other variables for hospital death.

CONCLUSION

Clinical presentation of cardiac arrest has the highest risk of death, then sequentially followed by cardiogenic shock, SBP <90 mmHg, heart rate >100 beats per minute, and age >65 years. Administration of statin, beta-blocker, PCI, and smoking are factors that reduce the risk of death.

CONFLICT OF INTERESTS

Authors declare have no conflict of interests.

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