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Indicators of Hospital Mortality in Patients Aged 80 Years with Acute Coronary Syndrome

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Abstract

Objectives: In modern times, life expectancy is increasing. At the same time, the burden of care and treatment for elderly patients is increasing. Against this background, we analyzed the factors influencing and contributing to mortality in patients aged 80 years with acute coronary syndromes.

Materials and Methods: This was an observational study of 250 patients with acute coronary syndrome. Clinical presentation, laboratory values, echocardiographic and electrocardiographic parameters, vital signs, thrombolysis in myocardial infarction (MI) scores, Killip class on admission, treatment options, and complications during hospitalization were analyzed.

Results: In our study, reducing the effect of invasive treatment on mortality was evident in this age group. From the data collected at first hospital presentation, the presence of diabetes and heart failure in the medical history, deterioration of vital signs, type of acute coronary syndrome, and presence of mitral regurgitation or segmental wall motion defect on echo were statistically significant for association with higher mortality in this age group. For laboratory analysis, lower HDL and higher troponin and creatinine levels on admission were also associated with higher mortality. In-hospital episodes of ventricular tachycardia or ventricular fibrillation, heart failure, acute renal failure, cardiac arrest, cardiogenic shock, and recurrent MI were indicators of worse prognosis and higher mortality. In our study, the in-hospital mortality rate was 11%. It would be reasonable to expect our mortality rate to be higher because our study group was 80 years or older. However, there was no statistically significant association between mortality and gender. We hypothesize that acute MI is

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Abstract

more common in male patients because of the protective effects of hormonal mechanisms in females. We found that the incidence of low EF, mitral regurgitation, and segmental wall motion defect was significantly higher in those who died. Many studies have also supported this finding. In our study, as in other studies, invasive treatment was superior to medical treatment, which is an indication that coronary angiography should be considered as the first treatment for acute coronary syndrome in octogenarians.

Conclusion: Many factors affect mortality in patients aged 80 years. Because the incidence of mortality in invasive procedures is low in these patients, it is advisable to prophylactically treat patients with invasive procedures when the treatment protocol is decided.

Keywords: Acute coronary syndrome, elderly, mortality

Introduction

Developments in technology and science have had a major impact on medicine, raising awareness of the importance of maintaining good health. Expected life expectancy has increased, and the proportion of older people in society has begun to rise[1]. It is projected that 10.8%, 13.6%, and 17.3% of the total population in Turkey will be over 65 years of age in 2030, 2040, and 2050, respectively[2]. Given that cardiovascular causes are the most common cause of death in the advanced age group and that the population is aging, more studies are needed in this age group. Because of advances and improvements in the management of acute myocardial infarction (AMI), deaths from cardiovascular disease have decreased significantly in recent decades[3]. While the in-hospital mortality rate was 29% at the end of the 1960s, it has fallen below 10% since 2015[4,5]. In studies to date, 1-year mortality has been associated with age, sex, and comorbidities, whereas treatment modality affects 30-day mortality. However, the effect of additional treatments is controversial[1,6].

In this study, we aimed to compare invasive and medical treatment with respect to mortality and identify other factors that influence in-hospital mortality in patients aged 80 years.

Materials and Methods

The study was an observational study of 250 patients aged 80 years hospitalised for acute coronary syndrome (ACS). Patients' age, sex, complaint of hospital admission, clinical presentation [unstable angina pectoris (USAP), ST segment elevation MI (STEMI), non-STEMI (NSTEMI)], laboratory values [hemoglobin (HGB), platelets (PLT), fasting glucose, creatinine, total cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL), triglycerideand troponin], current risk factors for ACS, comorbidities, 12-lead electrocardiogram (ECG) and transthoracic follow-up were recorded, comorbidities, 12-lead ECG and transthoracic echocardiography findings, thrombolysis in MI (TIMI) risk score results calculated from available data, vital parameters (blood pressure and pulse rate), Killip class, preferred treatment option, if invasive treatment was chosen, the responsible lesion, additional treatments after treatment, in-hospital complications and the effect of all these on mortality. We calculated TIMI score in STEMI patients with history (age, concomitant diseases like hypertension, diabet, angina), physics examination findings (systolic blood plessure, heart rate, Killip class, weight), presentation (anterior ST elevation or left bundle branch block, time to reperfusion) findings. For other USAP/NSTEMI patients, are calculated with age, coronary artery disease risk factors, known coronary artery disease, use of acetyl salicylic acid, angina, and ECG changes. Ejection fraction (EF), valve status, and segmental wall motion in the left ventricle were evaluated by echocardiography.

Treatment options were adjudicated between medical and invasive treatments by two experienced cardiologists. In addition to antiischemic treatment, medical treatment included thrombolytic and antithrombotic therapy. Patients who did not want to participate in the study for any reason, those who did not have chest pain compatible with ACS, and those with inoperable malignancies were excluded from the study.

Ethical approval was received from the University of Health Sciences Turkey, Antalya Training and Research Hospital Clinical Research Ethics Committee (approval no: 13/04, date: 21.09.2017).

Results

There were 250 patients in the follow-up, 23 died, and 227 were discharged. When comparing these two groups of patients, there were no significant differences between the age and sex of the patients (Table 1).

In terms of comorbidities, heart failure and diabetes were significantly different between the two groups. Diabetes was in 89 (39.2%) surviving patients and in 16 (69.6%) deceased patients (p=0.005). Heart failure was in 36 (15.9%) of the surviving patients and in 10 (43.5%) of the deceased patients (p=0.003). There were no significant differences between the two groups in terms of other chronic diseases or medical history (Table 2).

In the analysis of vital parameters, systolic blood pressure, diastolic blood pressure, and heart rate were significantly lower in the patients who died (p<0.001; p<0.001, p=0.003, respectively). The mean EF of the patients was 46.6±13.6; the mean EF of the patients who survived was 48.3±12.9, and the mean EF of the patients who died was 30.2±9.5%. In our study, the EFs of patients who died were significantly lower (p<0.001).

The mean TIMI score of the patients was 5.3±2.1, the mean TIMI score of the patients who survived was 5.1±1.9 and the mean TIMI score of the patients who died was 6.9±2.6. In our study, the TIMI scores of patients

Table 1. Distribution of patient groups by age and sex

	Overall, n (%)	Surviving (n=227), n (%)	Deceased (n=23), n (%)	p-value
Female	108 (43.2)	101 (44.5)	7 (30.4)	0.195
Male	142 (56.8)	126 (55.5)	16 (69.6)	
Age	84.4±3.9	85.4±4.0	84.3±3.9	0.184

Table 2. Association between comorbidities and mortality

		Overall n (%)	Surviving (n=227) n (%)	Deceased (n=23) n (%)	p-value
Hypertension		194 (77.6)	179 (78.9)	15 (65.2)	0.135
Diabetes mellitus		105 (42)	89 (39.2)	16 (69.6)	0.005
Hyperlipidemia		104 (41.6)	93 (41)	11 (47.8)	0.525
History of coronary angiography (CAG) or coronary revascularization		85 (34)	80 (35.2)	5 (21.7)	0.193
Family history		72 (28.9)	62 (27.4)	10 (43.5)	0.106
PCI/CABG in patients with a history of coronary revascularization	PCI	45 (67.2)	41 (66.1)	4 (80)	0.776
	CABG	19 (28.4)	18 (29)	1 (20)	
Smoking		50 (20)	43 (18.9)	7 (30.4)	0.183
Heart failure		46 (18.4)	36 (15.9)	10 (43.5)	0.003
Atrial fibrillation		41 (16.5)	35 (15.5)	6 (26.1)	0.233
History of AMI		38 (15.2)	34 (15)	4 (17.4)	0.761
Chronic renal failure (CRF)		15 (6)	13 (5.7)	2 (8.7)	0.636
History of cerebrovascular events		10 (4)	9 (4)	1 (4.3)	>0.999

who died were significantly higher (p=0.003). When the patients included in the study were examined in terms of Killip class, 75 (30%) of the patients were classified as stage 1, 113 (45.2%) as stage 2, 42 (16.8%) as stage 3, and 20 (8%) as stage 4. In our study, the mortality rate of stage 3 and 4 patients was significantly higher (p<0.001) (Table 3).

When analyzing patients' admission complaints, no significant difference in mortality was observed between typical angina, atypical angina, and other angina equivalents. Considering the preliminary diagnoses at admission, no mortality was observed in USAP in our study, whereas the mortality rate was higher in STEMI (p=0.008) (Table 4).

Another significant difference was observed in treatment decisions. Medical treatment was chosen in 42 (16.8%) of the 250 patients in our trial, and invasive treatment was chosen in 208 (83.2%) of the patients. It was found that 10 (23.8%) of the patients who received medical treatment alone and 13 (6.3%) of the patients who received both medical and invasive treatment died (Table 5).

No significant difference in mortality was observed when comparing lesions in patients who preferred the invasive approach (Table 6).

Echocardiograms of patients were also examined for the presence of segmental wall motion abnormalities and mitral regurgitation. Both were significantly associated with mortality (Table 7).

Ventricular tachycardia (VT)- Ventricular fibrillation (VF) developed during CAG in 15 patients (7.2%), CHF in 161 (64.7%), haemorrhage in 54 (21.6%), and bleeding in 4 (1%), 6%) recurrent MI, 29 (11.6%) shock, 26 (10.4%) cardiac arrest, 1 (0.4%) cerebrovascular incident(CVI, 54 (21.6%) acute renal failure (ARF) and 35 (14%) contrast nephropathy. The incidence of complications was higher in patients who were excised. Development of VT-VF, haemorrhage, recurrent MI, shock, cardiac arrest, HF and ARF during CAG were significantly associated with mortality. The incidence of SVI and contrast nephropathy was similar in living and excised patients (Table 8).

When the blood parameters of the patients are examined at the time of admission, it is seen that creatinine, HDL cholesterol, and troponin have a statistically significant effect on mortality. There was no significant association between other parameters and mortality (Table 9).

Table 3. Relationship between vital parameters and ejection fraction (EF) and mortality

	Overall Mean ± SD	Surviving (n=227) Mean ± SD	Deceased (n=23) Mean ± SD	p-value
Systolic blood pressure	132.7±25.9	137.2±22.8	88.9±9.3	<0.001
Diastolic blood pressure	76.5±11.3	78.4±10	57.7±5.7	<0.001
Pulse rate	76.5±15	77.4±13.5	67.7±24.3	0.003
EF	46.6±13.6	48.3±12.9	30.2±9.5	<0.001

Table 4. Association between preliminary diagnosis and mortality

	Overall n (%)	Surviving (n=227) n (%)	Deceased (n=23) n (%)	p-value
USAP	52 (20.8)	52 (22.9)	0	0.008
NSTEMI	147 (58.8)	133 (58.6)	14 (60.9)	
STEMI	51 (20.4)	42 (18.5)	9 (39.1)	

Table 5. Association between the treatment modality and mortality

	Invasive (n=208) n (%)	Medical treatment alone (n=42) n (%)	p-value
Deceased	13 (6.3)	10 (23.8)	<0.001
Surviving	195 (93.8)	32 (76.2)	

Table 6. Association between lesion characteristics and mortality in patients undergoing CAG

		Overall n (%)	Surviving n (%)	Deceased n (%)	p-value
Culprit lesion	Single vessel	74 (35.2)	68 (34.5)	6 (46.2)	0.128
	Multivessel	88 (41.9)	81 (41.1)	7 (53.8)	
Lesion location	LAD	114 (54.5)	106 (54.1)	8 (61.5)	0.601
	Cx	82 (39.2)	75 (38.3)	7 (53.8)	0.265
	RCA	84 (40.2)	76 (38.8)	8 (61.5)	0.105
	LMCA	8 (3.8)	6 (3.1)	2 (15.4)	0.081
Calcified lesion		74 (35.4)	67 (34.2)	7 (53.8)	0.229
Bifurcation lesion		37 (17.7)	33 (16.8)	4 (30.8)	0.253

Table 7. Association between the presence of mitral regurgitation and segmental motion defects and mortality

		Overall n (%)	Surviving (n=227) n (%)	Deceased (n=23) n (%)	p-value
Mitral regurgitation	None	29 (11.6)	29 (12.8)	0 (0)	<0.001
	Mild	79 (31.6)	78 (34.4)	1 (4.3)	
	Moderate	73 (29.2)	67 (29.5)	6 (26.1)	
	Severe	69 (27.6)	53 (23.3)	16 (69.6)	
Segmental wall motion defect	Present	176 (70.4)	154 (67.8)	22 (95.7)	0.005

Table 8. Assosiation between complications and mortality

	Overall n (%)	Surviving (n=227) n (%)	Deceased (n=23) n (%)	p-value
Development of VT/VF during CAG	15 (7.2)	4 (2.1)	11 (84.6)	<0.001
Heart failure	161 (64.7)	138 (61.1)	23 (100)	<0.001
Bleeding	54 (21.6)	54 (23.8)	0	0.006
Recurrent AMI	4 (1.6)	1 (0.4)	3 (13)	<0.001
Cardiogenic shock	29 (11.6)	6 (2.6)	23 (100)	<0.001
Cardiac arrest	26 (10.4)	4 (1.8)	22 (95.7)	<0.001
Cerebrovascular event	1 (0.4)	0	1 (4.3)	0.092
Acute renal failure	54 (21.6)	41 (18.1)	13 (56.5)	<0.001
Contrast nephropathy	35 (14)	32 (14.1)	3 (13)	>0.999

Table 9. Relationship between laboratory parameters and mortality

	Overall Mean ± SD	Surviving (n=227) Mean ± SD	Deceased (n=23) Mean ± SD	p-value
HGB	12.1±2	12.1±2	11.5±2.3	0.142
PLT	251.9±121	253±124.6	241.7±77.1	0.687
FG	133.4±60.1	130.6±57.6	161.1±76.8	0.062
Creatinine	1.3±0.8	1.3±0.7	1.8±0.8	0.001
Total cholesterol	179.5±49	180.6±48.2	168.9±56.7	0.278
LDL	111.2±40.1	112.2±39.3	101.5±47.3	0.223
HDL	46.1±13.3	46.5±12.7	41.9±18.3	0.008
Triglyceride	115.6±64.8	114.4±65.6	127.7±56.3	0.141
Troponin	701.7±1283.1	605.3±1184.4	1652.9±1783.7	<0.001

Discussion

The most common cause of death in patients over 65 years of age worldwide is coronary heart disease and related complications[6,7]. Considering today's increasingly aging society, we could not find any study in the literature that investigated the factors influencing in-hospital mortality after ACS in the patient group aged 80 years and older. Long-term follow-up of antithrombotic management patterns in ACS patients (EPICOR) stated that age is one of the most important factors for one-year mortality in patients[8]. In a study published in 2023 by Bianco et al.[9] was mortality rate 6.2% and invasive strategy of ACS in elderly patients seems safe and effective. In Thomachan et al.[10] published in JACC, it was reported that an invasive strategy in oncogenes was very effective in reducing long-term mortality. In the latest ESC ACS guideline, octogerian patients with NSTEMI reported superiority of an invasive vs. a conservative strategy in the reduction of the composite of MI, need for urgent revascularization, stroke, and death. In STEMI, primary percutaneous coronary intervention has drastically improved outcomes for all ages including elderly patients[11]. In a recent article published in the American Heart Association, the choice of medical treatment in octogenarians is stated as follows:

• A loading dose of aspirin 325 mg followed by a daily dose of 81 mg should be administered before an invasive approach to management to reduce ischemic events.

• A loading dose of a P2Y12 inhibitor should be administered after the anatomy is known in patients proceeding to PCI.

• Clopidogrel is the preferred P2Y12 inhibitor because of its significantly lower bleeding profile than ticagrelor or prasugrel; however, for patients with STEMI or complex anatomy, the use of ticagrelor is reasonable[12].

Arat et al.[13] found in their study that in-hospital mortality was 24% in patients with AMI over 70 years of age. Öner et al.[14], in their study conducted in all age groups, found that the in-hospital mortality rate was 18.4% and that the rate increased above 65 years of age. In their study, Haase et al. [15] found the mortality rate to be 11.2% in patients under 75 years of age, 26.4% in those over 75 years of age, and 33.6% in those over 80 years of age. In our study, the in-hospital mortality rate was 11%. It would be reasonable to expect our mortality rate to be higher because our study group was 80 years or older. Although the in-hospital mortality rate is related to the clinical status of the patient, we believe that it may be related to both the technical and medical quality of the hospital. In addition, considering that our study was conducted in patients aged 80 years, we believe that there is no difference between the groups after this period, as age is associated with a high risk of mortality.

Gierlotka et al.[5] found that AMI was more common in men and that mortality in these patients was similar in both sexes. McNamara et al.[4] reported that women in their study had higher in-hospital mortality. Mirić et al.[16] reported that although the mortality of patients undergoing coronary intervention was lower in both sexes than in those receiving medical treatment alone, the mortality rate was higher in women. In our study, there was no statistically significant association between mortality and gender. We hypothesize that AMI is more common in male patients because of the protective effects of hormonal mechanisms in females. We believe that the protective effect of the sex difference was removed because the study was conducted in older patients, in whom female patients are postmenopausal.

In our study, no association was found between mortality and HT, HPL, history of CAG or revascularization, history of PCI/CABG, smoking, atrial fibrillation, AMI, CRF, and cerebrovascular events. The incidence of DM and HF was significantly higher in patients who died. We believe that mortality is higher in patients with DM because of the deterioration of many organ systems, especially the vascular bed. We believe that HF may increase mortality because it predisposes patients to AMI and accelerates disease progression.

Hypotension and abnormalities in pulse rate, which are included in the GRACE classification used to show in-hospital mortality, are indicators of poor prognosis[17,18]. Ali et al.[19] reported that although blood pressure was lower in patients with high in-hospital mortality, there was no difference in heart rate. In our study, systolic blood pressure, diastolic blood pressure, and heart rate were significantly lower in patients who died. We believe that the vital parameters were low because of cardiogenic shock and fatal arrhythmias in the patients who died.

Our study confirmed that Killip and TIMI scores were successful in predicting mortality. In their study, De Luca et al.[20] found that long-term mortality was also high in patients with a high Killip score.

In Sladojevic et al.[21] a higher percentage of patients who died had impaired left ventricular function. In the EPICOR study, he found that EF was the second most important factor for long-term mortality in patients[8]. In our study, we found that the incidence of low EF, mitral regurgitation, and segmental wall motion defect was significantly higher in those who died.

In terms of treatment options, coronary interventions were found to reduce mortality in studies by Degano et al.[22]. Many other studies have found that invasive treatment is better than medical treatment alone in terms of mortality[5,15,17]. In our study, 83.2% of patients underwent an invasive procedure, and the mortality rate was significantly higher in patients who received only medical treatment. The superiority of the interventional approach over medical management in advanced age should encourage cardiologists. In this group, the standard of care is interventional.

When assessing blood parameters, Salisbury et al.[23] reported that the degree of anemia increased mortality in patients with AMI. Sattur et al.[24] reported that there was no association between mortality and anemia in patients undergoing PCI. In our study, although the HGB level was lower in the high mortality group, no statistical difference was observed. Oylumlu et al.[25] reported that total cholesterol and HGB had no effect on mortality, whereas PLT, HDL, LDL, triglycerides, and creatinine had an effect on mortality. Gibson et al.[26] found that renal function was a risk factor for in-hospital mortality and attributed this to the fact that abnormalities in renal function impair the fibrinolytic effect. The same study found that troponin was also affected in patients with impaired renal function, which increased mortality. Other studies confirm that high creatinine and troponin levels are indicators of poor prognosis[18,19]. In our study, no difference was found between the groups in terms of HGB, PLT, FPG, total cholesterol, LDL, and triglycerides. HDL levels were found to be significantly higher in the surviving patients and troponin and creatinine levels were found to be significantly higher in the deceased patients.

Conclusion

Today, society's average life expectancy is increasing because of improved welfare and accelerated medical development. As a result, geriatric cardiology is a field that will become increasingly important in the future. Because cardiovascular disease is one of the most common causes of death in people over the age of 80, it is necessary to determine the optimal treatment and follow-up for cardiovascular disease.

In our study, we found that the invasive approach reduced mortality in this patient group and should be the standard approach in the elderly age group.

We also found that the presence of diabetes and heart failure in the patient's medical history at the time of admission, deterioration of vital parameters, type of ACS, and presence of mitral regurgitation or segmental wall motion abnormalities on echocardiography were predictive of mortality. In hospital episodes of VT or VF, development of heart failure, development of acute renal failure, cardiac arrest, cardiogenic shock, and recurrent MI were indicators of poorer prognosis and higher mortality. When evaluating blood parameters, HDL, troponin, and creatinine levels were found to be predictive of mortality. In conclusion, in patients over 80 years of age with ACS, attention to these factors in the follow-up and treatment process is valuable in minimizing mortality. Further studies are needed on AMI in this age group.

Ethics

Ethics Committe Approval: Ethical approval was received from the University of Health Sciences Turkey, Antalya Training and Research Hospital Clinical Research Ethics Committee (approval no: 13/04, date: 21.09.2017).

Informed Consent: My article is original, patient rights have been protected by observing Helsinki ethical rules.

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Authorship Contributions

Concept: Arslan GY, Çağırıcı G, Design: Arslan GY, Çağırıcı G, Data Collection and/or Processing: Arslan GY, Çağırıcı G, Analysis and/or Interpretation: Arslan GY, Çağırıcı G, Literature Search: Arslan GY, Çağırıcı G, Writing: Arslan GY, Çağırıcı G.

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