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Original Article

Do elderly females have a higher risk of acute myocardial infarction? A retrospective analysis of 329 cases at an emergency department

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ABSTRACT

Objective: Acute myocardial infarction (AMI) is a medical emergency; a missed or delayed diagnosis of this disease may contribute to a poor outcome and even death. Several studies have found elderly patients with AMI have atypical presentations for diagnosis, therefore we undertook this study to determine the risks among the elderly population, especially in female patients.
Materials and Methods: In this one-year retrospective study, we reviewed the cases of AMI patients who had visited the emergency department at Mackay Memorial Hospital, Taiwan, and who had either been discharged or had died following a diagnosis of AMI (ICD code 410). We compared the differences between the clinical presentations of these two groups as well as the risk factors, medical management, and outcomes.
Results: In our study, only 329 patients (164 elderly; 165 adults) met the defined criteria. The most common symptom of AMI was chest pain, and this was more common in adult patients than in elderly patients (81.8% vs. 60.4%, $p < 0.001$). In comparison with patients in the adult group, the patients in the elderly group had a significantly higher proportion of females (46.3% vs. 12.7%), non-ST-elevation myocardial infarction (NSTEMI) (71.3% vs. 46.7%), presenting with no chest pain (39.6% vs. 18.2%), shortness of breath (17.7% vs. 8.8%), nausea/vomiting/dizziness (7.9% vs. 2.4%), abdominal pain (4.3% vs. 0.6%), diabetes mellitus (45.1% vs. 26.1%), cerebrovascular disease (22.6% vs. 6.1%), longer hospital stays (18.2 ± 31.0 days vs. 9.8 ± 8.2 days), and increased in-hospital mortality rates (15.9% vs. 6.7%).
Conclusion: Compared with the adult AMI group, the elderly AMI group had a higher proportion of females, electrocardiography with NSTEMI and no chest-pain complaints, and a larger proportion of elderly patients with diabetes, ischemic heart disease, heart attacks at home and cardiac shock, which had longer hospital stays, and higher mortality rates.

Introduction

Acute myocardial infarction (AMI) is an emergency medical condition often seen in emergency departments (EDs); a missed or delayed diagnosis of this disease may contribute to a poor outcome and even death. Chest pain is the classic symptom that AMI patients experience. However, previous reports have shown that atypical presentations, with no chest pain, are more common in the elderly, in female patients, and among people with diabetes [1–6].

Aging is an inevitable problem. Due to the advancements in public health and medical science, human life expectancy has increased and the proportion of elderly people in Taiwan has grown rapidly [7]. As 7% or more of the population in Taiwan is aged 65

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years or older, the country has been "aging" since 1993. Indeed, the proportion of elderly people is expected to increase to 15% of the total population by 2019, making Taiwan an "aged country" [7]. According to previous reports from studies conducted in Western countries, elderly people who have AMI tend to present with more atypical symptoms, such as shortness of breath, and they tend to be associated with significantly higher mortality rates in comparison with younger people [1,4,8–10]. However, based on the developments in geriatric medicine that have taken place in recent years it is important to ask whether or not these clinical presentations and outcomes are the same in elderly patients with AMI in Eastern countries.

To address that concern, we undertook this study in order to review the differences between elderly adults with AMI and younger adults with AMI, in terms of the clinical presentations, risk factors, medical management, and outcomes at Mackay Memorial Hospital, a medical center in northern Taiwan. We hope this study will help identify the specific issues for elderly patients with AMI and result in the formulation of strategies that can be used to make an early diagnosis and improve outcomes.

Materials and methods

This study, approved by the Mackay Memorial Hospital Institutional Review Board (10MMHIS010), involves a retrospective review of 329 AMI patients (164 elderly patients, aged 65 years and older; 165 adult patients, aged 18–64 years) who visited the hospital's ED from January 1, 2008 to December 31, 2008. All patients were treated at Mackay Memorial Hospital, a 2060-bed medical center in northern Taiwan. All the emergency physicians, staff members, and nurses were fully qualified, having taken the Advanced Cardiac Life Support 2005 guideline training course [11]. According to the proposed analysis for the data, we excluded patients younger than 18 years, and we divided the enrolled patients into two groups: an elderly group (≥65 years) and an adult group (18–64 years). The exclusion criteria included patients who were younger than 18 years old, who were pregnant, who had been admitted through the outpatient department, whose onset of AMI occurred during hospitalization, and who had been transferred from an outside hospital.

AMI included both ST-elevation myocardial infarction (STEMI) and non-ST-elevation myocardial infarction (NSTEMI). According to the American Heart Association guidelines [11], STEMI is defined as ST-segment elevation >1 mm (0.1 mV) in two or more contiguous precordial leads, two or more adjacent limb leads, or a presumed new left bundle branch block, in combination with subsequent elevation of cardiac markers (Troponin I/CK-MB). NSTEMI is defined as ischemic ST-segment depression <0.5 mm (0.05 mV) or dynamic T-wave inversion with pain or discomfort, in combination with elevation of cardiac markers (Troponin I/CK-MB). Acute heart failure is defined in terms of the clinical symptoms of shortness of breath, pulmonary rales from auscultation, pulmonary congestion on the chest X-ray, or cardiac shock in the ED. Cardiac shock was defined as systolic blood pressure <90 mmHg.

Typical symptoms presented as chest pain, chest tightness, and any chest discomfort. Atypical symptoms included shortness of breath, nausea/vomiting/dizziness, syncope/confusion/coma, fatigue/cold sweating, and abdominal pain.

Patients' information was collected from the emergency medical service data, the patients' medical charts, and reports after hospital admission. The main variables included age, gender, vital signs, STEMI or NSTEMI, presenting symptoms, risk factors, chest X-ray findings, interval between the time the patient had initial symptoms and the time the patient visited the ED, interval between the time the patient visited the ED and the time of diagnosis, heart-attack locations, medical treatment, cardiac intervention, complications, survival to discharge from hospital, survival around 1 year after discharge, and length of stay in the hospital. All records were reviewed and rechecked by two physicians.

Statistical analysis was conducted using SPSS software for Windows (version 12.0, SPSS Inc., Chicago, IL.). Chi-square tests and Fisher's exact tests were performed for the categorical variables; independent-samples *t*-tests were used for the continuous variables. A p value < 0.05 was determined to be statistically significant.

Results

Although the study reviewed 540 cases that had resulted in discharge or death after a diagnosis of AMI (ICD code 410), only 329 patients met the criteria defined. There were 165 elderly (≥65 years) and 164 adult patients (18–64 years) (Table 1).

There was a larger proportion of females among the elderly patients with AMI than among the adult patients (46.3% vs. 12.7%, $p < 0.001$). Moreover, the elderly patients were more likely to have NSTEMI (71.3% vs. 46.7%, $p < 0.001$), while the adult patients were

Table 1
Comparison of demographics, presentations, treatment, and outcomes between the elderly and adult AMI patients at the emergency department.

	Elderly patients (n = 164)	Adult patients (n = 165)	p
Age (y)	77.5 ± 7.8	50.8 ± 8.4	<0.001***
Female	76 (46.3)	21 (12.7)	<0.001***
Male	88 (53.7)	144 (87.3)	<0.001***
NSTEMI	117 (71.3)	77 (46.7)	<0.001***
STEMI	47 (28.7)	88 (53.3)	<0.001***
Presentations			
Chest pain	99 (60.4)	135 (81.8)	<0.001***
Short of breath	29 (17.7)	14 (8.8)	0.013*
Nausea/vomiting/dizziness	13 (7.9)	4 (2.4)	0.027*
Syncope/confusion/coma	9 (5.5)	6 (3.6)	0.42
Fatigue/cold sweating	7 (4.3)	5 (3.0)	0.55
Abdominal pain	7 (4.3)	1 (0.6)	0.037*
Risk factors			
Diabetes Mellitus	74 (45.1)	43 (26.1)	<0.001***
Hypertension	108 (65.9)	85 (51.5)	0.008***
Smoking	47 (28.7)	114 (69.1)	<0.001***
Ischemic heart disease	75 (45.7)	42 (25.5)	<0.001***
Hyperlipidemia	54 (32.9)	85 (51.4)	0.001**
Cerebrovascular disease	37 (22.6)	10 (6.1)	<0.001***
Previous AMI	26 (15.9)	14 (8.5)	0.041*
New onset AMI	138 (84.1)	151 (91.5)	0.041*
Interval from			
Onset to ED visit (h)	12.49 ± 19.95	8.79 ± 17.81	0.080
Arrival to diagnosis (h)	7.59 ± 25.54	3.11 ± 3.54	0.027*
Place of onset			
AMI at home	66 (40.2)	44 (26.7)	0.009**
Medication			
Aspirin	112 (68.3)	141 (85.5)	<0.001***
Plavix	102 (62.2)	132 (80.0)	<0.001***
Heparinization	73 (44.5)	96 (58.2)	0.013*
PCI	105 (64.0)	149 (90.3)	<0.001***
Primary PCI in STEMI	32 (68.1)	54 (61.4)	0.439
Thrombolytic in STEMI	1 (2.1)	12 (13.6)	0.034*
PCI in NSTEMI	58 (49.6)	61 (79.2)	<0.001***
Complications			
Acute heart failure	94 (57.3)	46 (27.9)	<0.001***
Shock	29 (17.7)	12 (7.3)	0.004**
Outcomes			
Hospital stay (d)	18.2 ± 31.0	9.8 ± 8.2	0.001**
In-hospital Mortality	26 (15.9)	11 (6.7)	0.008**
1-y mortality	39 (23.8)	14 (8.5)	<0.001***

Data were presented as n (%) or mean ± SD; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
AMI = acute myocardial infarction; ED = emergency department; NSTEMI = non-ST-elevation myocardial infarction; PCI = percutaneous coronary intervention; STEMI = ST-elevation myocardial infarction.