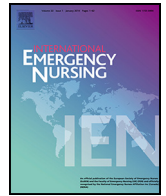




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Gender differences in symptom predictors associated with acute coronary syndrome: A prospective observational study

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ABSTRACT

Signs and symptoms (typical and atypical symptoms) of acute coronary syndromes (ACS) differ between men and women. Identification of gender differences has implications for both health care providers and the general public. The aim of this study was to determine the symptom predictors of the acute coronary syndromes in men and women. In this prospective study, nurse data collectors directly observed 256 men and 182 women (N = 438) with symptoms suggestive of ACS in the Emergency Departments of eight hospitals in Tehran. ACS was eventually diagnosed in 183 (57.2%) men and 137 (42.8%) women on the basis of standard electrocardiogram and cardiac enzyme (CPK-MB) level. In men, chest symptoms (OR = 3.22, CI = 0.137–0.756, $P = 0.009$), dyspnea (OR = 2.65, CI = 1.78–4.123 $P = 0.001$) and diaphoresis (OR = 2.175, CI = 1.020–4.639, $P = 0.044$) were significantly associated with the diagnosis of ACS 3.78, 2.72 and 1.87 times more than in women having these symptoms, respectively. These results indicated that chest symptoms, diaphoresis and dyspnea were the more pronounced typical symptoms of ACS in men compared to women. Additionally, the numbers of typical symptoms can be considered as more predictive of ACS in men (OR = 1.673, CI = 1.211–2.224, $P < 0.001$) than women (OR = 1.271, CI = 1.157–2.331, $P = 0.212$). Therefore, clinicians need to take men showing typical symptoms into consideration carefully.

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1. Introduction

Cardiovascular diseases mainly related to coronary artery disease (CAD) and its acute complications are one of the major causes of death in developing countries (Pankert et al., 2012). CAD remains the leading cause of morbidity and mortality in both men and women worldwide (Pelter et al., 2012). Acute coronary syndromes (ACS) are the most common causes of hospitalization for men and women in the United States (Biranvand and Asadpourpiranfar, 2006; Biranvand et al., 2008; McCaig and Nawar, 2006). ACS encompass a spectrum of coronary artery diseases, including unstable angina, ST-elevation myocardial infarction and non-ST elevation myocardial infarction with initial presentation and early management (Achar et al., 2005). Symptoms are often the initial clinical feature of ACS (Pelter et al., 2012). The accurate labeling of the symptoms of ACS as being cardiac in nature may reduce the time for treatment and expedite a timely

diagnosis (Hwang et al., 2009; McCaig and Nawar, 2006; Thygesen et al., 2007). Previous research studies suggest that the presentation of ACS and ACS symptoms may differ in both men and women (Arslanian-Engoren et al., 2006; Milner et al., 1999). Gender differences in the cardiovascular physiologic factors may further contribute to the differences between the men and women in the symptoms of ACS. Identification of the gender differences has implications for health care providers and the general public (DeVon and Zerwic, 2002; Patel et al., 2004). There are not enough studies regarding the differences of typical and atypical symptoms of ACS in both men and women (Milner et al., 1999). Therefore, the aim of this study was to determine the differences of typical and atypical symptom predictors of ACS in men and women.

2. Methods

2.1. Design, sample and setting

This prospective observational study was conducted in the Emergency Departments of eight affiliated teaching hospitals in Tehran, Iran between March 2011 and June 2012. These departments were selected by a cluster sampling method. The voluntary patients having

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at least one of the typical or atypical symptoms of ACS were considered for participation in the study. The typical symptoms of ACS were chest symptoms not related to trauma (chest pressure, heaviness, tightness/squeezing, or center or left chest pain), diaphoresis, shortness of breath (dyspnea) not related to pulmonary disorders, arm pain, and jaw/neck pain not related to trauma. Atypical symptoms were numbness, tingling, pricking, or stabbing in the chest (mid-back pain and chest pain in another location), palpitation, nausea/vomiting (not related to gastrointestinal diseases), dizziness or syncope, fatigue and indigestion (Milner et al., 2001). Patients with the history of stroke, neurologic disorders, trauma, chronic obstructive pulmonary diseases, pneumonia or pulmonary embolism were excluded. According to the results of a pilot study with $p = 0.3$ and $d = 0.04$ a selection of 530 patients was sufficient for the sample. Therefore, a total of 530 patients meeting study criteria were approached for the participation in the study. Of these, 438 patients agreed to participate and enrolled in this study.

2.2. Ethical approval

The study was approved by the Institutional Ethics Committee of the Shahed University in Tehran. Written approvals were obtained from the Shahed University Institute of Health Sciences (March 2010), Ethics Board of the Shahed University Midwifery and Nursing Faculty (May 2010), and the affiliated teaching hospitals (June 2010). Written and verbal informed consents were obtained from all patients after explaining the aims and protocol of the study.

2.3. Data collection, instruments and procedures

Data collecting instruments were developed based on a review of literature and from the specialists' comments. The specialists were one ED physician, one ED nurse specialist, two ED staff nurses, one cardiologist, and a cardiac clinical nurse specialist. The checklist included the typical and atypical symptoms of ACS. To determine the validity of the checklist, each of the specialists was asked to note each symptom relevant or not relevant to the ACS. This process was done several times until the specialists were in 100% agreement. To determine the inter rater reliability two independent emergency nurse observers assessed twenty patients by using the checklist. The reliability of each item was calculated by using the percent agreement and the Kappa coefficient. The total percent agreement ranged from 86% to 100%, and the Kappa statistics ranged from 0.24 to 1. Therefore, providing the symptoms checklist was a reliable tool for identifying the symptoms of ACS.

The data were collected by eight nurses who observed all the patients and met the study criteria as they were admitted to the ED during 6 hour shift intervals in a day for 7 days. ACS was defined as either unstable angina or acute myocardial infarction, confirmed

by electrocardiography changes (ST-segment and T-wave changes) and cardiac enzyme (creatin kinase-MB). For the more unified data collection, the investigators interviewed and trained the nurses before beginning the study. The data about symptoms were obtained by observing the patient–nurse interview, and the related symptoms of ACS expressed by the patients were documented in the ACS symptoms check list. The demographics data (sex, age, education) and the risk factors (history of hypertension, hypercholesterolemia, diabetes, smoking, and obesity) were collected from the medical records and by interviews with patients. Obesity was considered as body mass index (BMI) ≥ 30 .

2.4. Data analysis

The statistical analysis of data was performed by using the SPSS windows program (version 16.0). To examine the associations between the ACS and baseline characteristics and also presenting symptoms in women and men, the chi-squared test was used. The symptoms reported by at least 5% were included in the bivariate analyses. To determine symptom predictors in the men and women patients, the method of multiple logistic regressions with stepwise was performed. Logistic regression methods were used to identify the best model and the cutoff to stay in the model was $P < 0.20$ (Milner et al., 1999). Adjusted Odd ratios were estimated for each symptom predictor. The statistical significance was set at $P < 0.05$.

3. Results

3.1. Risk factors and symptom predictors of ACS in men

Out of 438 patients, 73.05% ($N = 320$) of them had ACS diagnosis. For the diagnosed patients with ACS, 57.2% ($n = 183$) were male and their mean age was 60.92 ± 1.24 years. Regarding the risk factors, the men with ACS usually had diabetes and hypercholesterolemia compared with men without ACS ($P < 0.05$). Additionally, men with ACS reported a higher number of typical and atypical symptoms (2.75 ± 1.36) compared to the men without ACS (1.78 ± 0.58) ($P = 0.006$) (Table 1).

The most reported typical symptoms in the male patients with ACS were chest symptoms, diaphoresis and dyspnea ($P < 0.05$). The men with typical symptoms such as chest symptoms ($P < 0.001$), arm pain ($P = 0.012$), diaphoresis ($P < 0.001$) and dyspnea ($P < 0.001$) were significantly more likely to be diagnosed with ACS compared to the men who did not report these symptoms (Table 2).

According to the atypical symptoms, there was a trend for more indigestion and dizziness/syncope in the men with non-ACS compared to the men with ACS, and the difference was statistically significant ($P < 0.05$) (Table 3).

Table 1
Relationship between baseline characteristics and ACS in men and women.

Characteristics	Men				P	Women				P
	With ACS ($n = 183$)		Without ACS ($n = 73$)			With ACS ($n = 137$)		Without ACS ($n = 45$)		
	N	%	N	%		N	%	N	%	
Hypertension	126	70	54	30	0.103	50	39.4	77	60.6	0.722
Diabetes mellitus	152	84.9	27	15.1	0.000	88	65.2	47	34.8	0.033
Currently smoking	83	46.4	96	53.6	0.543	123	90.4	13	9.6	0.764
Hypercholesterolemia	93	55.4	75	44.6	0.040	64	50.4	63	49.6	0.860
Obesity (BMI ≥ 30)	46	74.2	16	25.8	0.148	63	80.8	15	19.2	0.034
Menopause						103	74.1	36	25.9	0.660
	Mean \pm SD					Mean \pm SD				
Age (years)	60.92 \pm 1.24		56.32 \pm 1.11		0.011	63.29 \pm 3.84		59.13 \pm 2.17		0.020
Number of presenting symptoms	2.75 \pm 1.36		1.78 \pm 0.58		0.006	2.94 \pm 1.78		1.56 \pm 0.69		0.018

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