Gender Differences in Symptom Presentation Associated With Coronary Heart Disease

Kerry A. Milner, DNSc, RN, Marjorie Funk, PhD, RN, CCRN, Sally Richards, MSN, APRN, Rebekah Mull Wilmes, MSN, APRN, Viola Vaccarino, MD, PhD, and Harlan M. Krumholz, MD

This study explores gender differences in symptom presentation associated with coronary heart disease (CHD). In this prospective study, nurse data collectors directly observed 550 patients as they presented to the Emergency Department (ED) of Yale-New Haven Hospital. The final sample included 217 patients (41% women) diagnosed with CHD (acute coronary ischemia or myocardial infarction). Chest pain was the most frequently reported symptom in women (70%) and men (71%). Unadjusted analyses revealed that women were more likely than men to present with midback pain (odds ratio [OR] 9.61, 95% confidence interval [CI] 2.10 to 44.11, p = 0.001), nausea and/or vomiting (OR 2.29, 95% CI 1.19 to 4.42, p = 0.012), dyspnea (OR 1.82, 95% CI 1.05 to 3.16, p = 0.032), palpitations (OR 3.42, 95% CI 1.02 to 11.47, p = 0.036), and indigestion (OR 2.13, 95% CI 1.03 to 4.44, p = 0.040). After adjustment for age and diabetes, women were more likely to present with nausea and/or vomiting (OR 2.43, 95% CI 1.23 to 4.79, p = 0.011) and indigestion (OR 2.13, 95% CI 1.10 to 4.53, p = 0.048). Women (30%) and men (29%) were equally likely to present without chest pain, and dyspnea was the most common non–chest pain symptom. In the subgroup of patients without chest pain, unadjusted analyses revealed that women were more likely to report nausea and/or vomiting compared with men (OR 4.40, 95% CI 1.30 to 14.84, p = 0.013). Although we found some significant gender differences in non–chest pain symptoms, we conclude that there were more similarities than differences in symptoms in women and men presenting to the ED with symptoms suggestive of CHD who were later diagnosed with CHD.

(Am J Cardiol 1999;84:396–399)

Some studies suggest that women with coronary heart disease (CHD) experience different or more vague symptoms than men.[1–4] Others[5,6] report minimal gender differences in presenting symptoms associated with acute myocardial infarction. It is difficult to draw conclusions from previous studies because: (1) patients had to present with chest pain to be included, and (2) data on symptoms were collected retrospectively by medical record review or interview several days after admission. This study explores gender differences in symptom presentation associated with CHD.

METHODS

Study patients: We conducted this study in the Emergency Department (ED) of Yale-New Haven Hospital, an 810-bed university teaching hospital and a regional cardiac referral center. We approached patients ≥45 years of age presenting to the ED who reported ≥1 typical or atypical symptoms suggestive of CHD. Additionally, patients 18 to 44 years were asked to participate if they had diabetes mellitus or ≥2 cardiac risk factors (history of CHD, systemic hypertension, hypercholesteremia, smoking, obesity, family history of premature CHD, and postmenopausal), and ≥1 typical or atypical symptoms suggestive of CHD. We included these additional criteria for younger patients to exclude patients at very low risk for CHD. We approached a total of 550 patients in the ED, and of these, 545 patients agreed to participate in this study.

For the purpose of this investigation, we limited the study population to those patients who were diagnosed with CHD in their ED visit (n = 217). CHD included either acute coronary ischemia or myocardial infarction. Acute coronary ischemia was defined as electrocardiographic evidence of ST-segment depression, ST-segment elevation, T-wave inversion, or T-wave abnormalities different from the last electrocardiogram in ≥2 consecutive leads and lack of cardiac enzyme elevation. Elevated cardiac enzymes indicated acute myocardial infarction.

Data collection: We obtained approval from the Yale University School of Nursing Human Subjects Committee. Between September 1995 and August 1997, during shifts of 2 to 5 hours, across all 24 hours and all 7 days, nurse data collectors unobtrusively observed all patients meeting the study criteria as they presented to the ED, and recorded the patients' description of their symptoms. Patients were approached for study participation after the ED staff had completed the patient's initial assessment. In the event that the patient was too sick to provide oral consent in the ED, patients were approached when considered stable

From The Yale University School of Nursing; The Yale University School of Medicine, the Department of Internal Medicine, Section of Cardiovascular Medicine; The Yale-New Haven Hospital Center for Outcomes Research and Evaluation; and The Yale University School of Epidemiology and Public Health, New Haven, Connecticut. Manuscript received January 21, 1999; revised manuscript received and accepted April 5, 1999.

Address for reprints: Kerry A. Milner, DNSc, RN, 60 Barrister Road, Stratford, Connecticut 06614. E-mail: marjorie.funk@yale.com.

0002-9149/99/$–see front matter
PII S0002-9149(99)00322-7

TABLE I Gender Differences in Baseline Characteristics

Demographics	Women (n = 90)	Men (n = 127)	p Value
White (per patient self-report)	61 (68%)	98 (77%)	0.141
Age (mean [SD]; range)	68.8 (14.7); 35–96	63.0 (15.0); 30–93	0.008
Cardiac risk factors			
Smoking (current or having quit within the past year)	13 (14%)	40 (32%)	0.003
Diabetes (type I or II, insulin or non–insulin dependent)	34 (38%)	32 (25%)	0.040
Hypercholesteremia (serum cholesterol >200 mg/dl or notation in medical record of elevated cholesterol/treatment with lipid-lowering drug)	30 (33%)	55 (43%)	0.165
Systemic hypertension (treatment with antihypertensive medications before ED admission)	57 (63%)	73 (58%)	0.317
Obesity (body mass index above the 85th percentile)	50 (60%)	67 (55%)	0.412
Family history of premature CHD (mother, father, or sibling with MI or CHD before age 56)	27 (30%)	33 (26%)	0.471
Preexisting health conditions			
Heart failure (by history)	21 (23%)	18 (14%)	0.074
Other cardiac problems (history of arrhythmias, cardiomyopathy, or valvular disease)	25 (28%)	27 (21%)	0.241
History of CHD	56 (62%)	73 (58%)	0.404
History of MI	36 (40%)	51 (40%)	0.945

MI = myocardial infarction.

and within 24 hours of hospital admission. This occurred in <1% of patients. No patient died before obtaining consent.

Data on presenting symptoms were obtained by observing the patient-physician or patient-nurse interview and symptoms were documented verbatim. Data on preexisting health conditions and cardiac risk factors were gathered from the patient and the medical record (see Table I for definitions). Data on severity of symptoms were obtained by asking the patient to identify the number on a scale of 0 to 10 for the worst physical discomfort they experienced on that day, where 0 was none at all and 10 was the worst the patient could imagine. All electrocardiograms were interpreted by experienced nurses and confirmed by an expert in electrocardiographic interpretation.

Twelve nurses collected data during the study period. All the data collectors were experienced cardiac nurses or nurse practitioner students who were not blinded to the study question. To ensure that all data were collected in the same manner, we used mock clinical scenarios with nursing students as patients to train all data collectors. Among pairs or triads of data collectors we measured the percent agreement for presenting symptoms, severity of symptoms, preexisting health conditions, and cardiac risk factors. Additional training and measuring of agreement among pairs or triads of data collectors took place in the ED. Once agreement among data collectors was >95% in ≥3 consecutive agreement checks, data collectors began data collection. Bimonthly agreement checks were done thereafter in the ED until study completion, and always remained >95%.

Statistical analyses: Fisher's exact or chi-square tests were used to examine the association between gender and (1) baseline characteristics listed in Table I, and (2) the individual symptoms listed in Table II. Only those individual symptoms that were reported by >5% (n = 11) of the sample were included in the bivariate analyses. Student's *t* test was used to evaluate the association between gender and (1) age, (2) total number of symptoms, and (3) severity of symptoms. Because data on total number of symptoms were skewed among patients who presented without chest pain, a Wilcoxon 2-sample test was used. Although multiple statistical comparisons were conducted, an α of 0.05 was chosen as the cutoff for significance due to the exploratory and hypothesis-generating nature of this study.

We used logistic regression models to examine the association between gender and the individual symptoms found to be significant ($p < 0.05$) in the bivariate analyses while controlling for age and diabetes. Goodness-of-fit was evaluated by comparing fitted probabilities of each of the individual symptoms with the observed individual symptoms and calculating the corresponding observed chi-square statistics.[7] To evaluate the discriminating power of the fitted model, we calculated an area under the receiver-operating characteristic curve for each model.[8] We did not conduct multivariate analyses in the subgroup of patients without chest pain because of the small sample size. All analyses were performed using SAS 6.12 statistical software (SAS Institute, Cary, North Carolina).

RESULTS

In the sample of 217 patients with an ultimate diagnosis of CHD, there were 90 women (41%). Baseline differences in women and men were compared in an attempt to account for any potential differences in symptom presentation. The results are presented in Table I. The women in the sample were significantly older compared with the men. Most women and men were white. Most women (91%) and men (90%) were diagnosed with acute coronary ischemia. Acute myocardial infarction was diagnosed in only 8 women (9%) and 13 men (10%). These gender differences in diagnoses were not significant ($p = 0.741$). Women were significantly less likely than men to smoke, but were significantly more likely to have diabetes.

TABLE II Gender Differences in Chest Pain and Nonchest Pain Symptoms

Symptoms	Women (n = 90)	Men (n = 127)	OR	95% CI	p Value
No chest pain	27 (30%)	37 (29%)	1.04	0.58–1.88	0.890
Chest symptoms					
Pain in center or left chest	36 (57%)	63 (70%)	0.58	0.30–1.12	0.101
Chest heaviness, pressure, or tightness/squeezing	27 (43%)	27 (30%)			
Non–chest pain symptoms					
Midback pain	12 (13%)	2 (2%)	9.61	2.10–44.11	0.001
Nausea and/or vomiting	27 (30%)	20 (16%)	2.29	1.19–4.42	0.012
Dyspnea	45 (50%)	45 (35%)	1.82	1.05–3.16	0.032
Palpitations	9 (10%)	4 (3%)	3.42	1.02–11.47	0.036
Indigestion	20 (22%)	15 (12%)	2.13	1.03–4.44	0.040
Fatigue	16 (18%)	12 (9%)	2.07	0.93–4.63	0.071
Arm/shoulder pain	34 (38%)	34 (27%)	1.66	0.93–2.96	0.085
Sweating	27 (30%)	29 (23%)	1.45	0.78–2.67	0.235
Jaw pain	4 (4%)	9 (7%)	0.61	0.18–2.04	0.419
Dizziness/fainting	19 (21%)	23 (18%)	1.21	0.61–2.38	0.581
Neck or throat pain	9 (10%)	11 (8%)	1.17	0.46–2.96	0.737

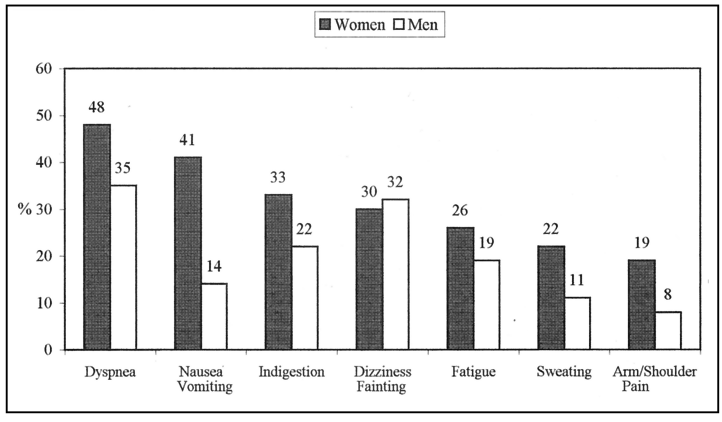

FIGURE 1. Differences in symptom presentation among patients without chest pain. The gender difference for nausea and/or vomiting was significant (p = 0.013). The numbers at the *top* of the *bars* are the actual percentages.

Gender differences in symptom presentation associated with coronary heart disease: Gender differences in chest pain and nonchest pain symptoms are shown in Table II. Women and men were equally likely to present with some type of chest pain. Although gender differences were not statistically significant when we evaluated "chest symptoms," we noted that women were slightly more likely than men to describe symptoms as a pressure, heaviness, or tightness and/or squeezing in chest and less likely to report pain in the center or left chest. Gender differences were observed among the nonchest pain symptoms with women being significantly more likely than men to report midback pain, nausea and/or vomiting, dyspnea, palpitations, and indigestion. Women reported a mean of 3.4 ± 1.8 symptoms; men reported a mean of 2.5 ± 1.4 symptoms (p = 0.0002). The mean rating of physical discomfort using the severity of symptoms scale was 7.3 ± 2.2 in women compared with a mean of 6.7 ± 2.6 in men (p = 0.085).

Although we noticed a strong association between women and the symptoms of midback pain and palpitations in the bivariate analyses, only a few men reported these symptoms (Table II), so further analyses were considered inappropriate. Logistic regression analyses using the individual symptoms of nausea and/or vomiting, dyspnea, and indigestion as the dependent variables and gender as the independent variable of interest, while controlling for age and diabetes, revealed that female gender was significantly associated with nausea and/or vomiting (odds ratio [OR] 2.43, 95% confidence interval [CI] 1.23 to 4.79, p = 0.011) and indigestion (OR 2.13, 95% CI 1.01 to 4.53, p = 0.048), but not with dyspnea (OR 1.68, 95% CI 0.95 to 2.96; p = 0.072). The chi-square goodness-of-fit statistic for each of the models had a p value of >0.05, indicating that these data did not significantly depart from the model. Additionally, the area under the receiver-operating characteristic curve was ≥ 0.60, indicating moderate model discrimination.

Gender differences among patients without chest pain: We found that women and men were equally likely to present without chest pain. Figure 1 displays the differences in symptom presentation among patients without chest pain. The most frequently occurring presenting symptoms in women were dyspnea followed by nausea and/or vomiting, indigestion, dizziness and/or fainting, and fatigue. Similarly, in men, dyspnea was the most common symptom followed by dizziness and/or fainting, indigestion, fatigue, and nausea and/or vomiting.

Bivariate analyses revealed that women were significantly (OR 4.40, 95% CI 1.30 to 14.84, p = 0.013) more likely than men to report nausea and/or vomiting. Although gender differences in the other presenting symptoms were not significant, we observed greater frequencies among women compared with men in most of the symptom categories. Women reported a mean of 2.6 ± 1.4 symptoms; the men reported a mean of 1.8 ±1.0 symptoms (p = 0.011). Self-reports of severity of symptoms were similar among women and men. The mean rating of severity of symptoms in women was 7.3 ± 2.5; in men the mean was 6.5 ± 2.2 (p = 0.274).

DISCUSSION

The results of this prospective observational study suggest that women and men are more similar than different with respect to symptom presentation associated with CHD. In our study, women and men with CHD were equally likely to present with chest pain. Although the differences were not statistically significant, we observed subtle gender differences in de-

scriptions of chest pain with women being more likely to describe a heaviness, pressure, or tightness and/or squeezing in the chest, whereas men were more likely to complain of pain in the center or left chest. Our findings are consistent with data reported by investigators for the Multicenter Chest Pain study[6] in that women were more likely than men to describe chest pain as pressure; however, unlike their study, we noted that women were less likely to report pain in center of the chest. This inconsistency may be due to inclusion of patients with acute coronary ischemia and acute myocardial infarction in our study.

In bivariate analyses we observed significant gender differences in non–chest pain symptoms with women being more likely than men to report midback pain, nausea and/or vomiting, dyspnea, palpitations, and indigestion. After controlling for age and diabetes, female gender was significantly associated with nausea and/or vomiting and indigestion. Our data were consistent with several studies[1–4] in which investigators reported that women with acute myocardial infarction were significantly more likely than men to present with non–chest pain symptoms, such as nausea or vomiting, abdominal pain, dyspnea, back pain, neck pain, and jaw pain, in addition to chest pain.

In the major studies evaluating symptom presentation,[1,3,4,6] none of the investigators examined the total number of symptoms or severity of symptoms. We found that women reported a significantly greater number of symptoms compared with men. Possible explanations for this finding are: (1) women are better at communicating their complaints than men; (2) women may consider and verbalize symptoms that men may consider trivial and keep to themselves; or (3) women may actually experience more symptoms than men. Further investigation is needed to assess the importance of this variable.

Asking patients about the severity of their symptoms on a scale of 0 to 10 is common practice in many clinical settings. We found no significant gender differences in severity of symptoms. This suggests that women and men admit to similar levels of discomfort when experiencing symptoms associated with CHD.

We found 30% of women and 29% of men presented without chest pain. Rates of presentation without chest pain in patients with acute myocardial infarction are variable and range from 6% to 25% in women and 1% to 20% in men, depending on the study.[1–4,6] Possible explanations for these wide variations in non–chest pain rates include differences in symptom ascertainment and inclusion criteria.

Our study has several limitations. During the study period, we enrolled 545 patients, 217 of whom were diagnosed with CHD. It is possible that our sample size may have been too small to have enough power to detect possible gender differences in some of the presenting symptoms. Because this study was exploratory and hypothesis generating, we did not correct for the multiple statistical comparisons, and it is possible that some of the observed gender differences with significance levels close to $p = 0.05$ may be due to chance. All patients who were not diagnosed with CHD and were discharged to home from the ED had, at minimum, an electrocardiogram; however, no further follow-up was done. It is possible that these patients had ischemia-related symptoms. Patients who stayed home or died before they reached the hospital were not included and it is unknown whether gender differences in symptom presentation occurred in these patients.

Acknowledgement: We wish to thank the following people for their help with this project: Jane Dixon, PhD, Joanne Sullivan, MSN, APRN, Rebecca O. Henry, MSN, RN, Veronica Carlevale Roddy, MSN, APRN, Joe Filakovsky, MSN, RN, Christy Bebon, BSN, RN, Janice Naum, BSN, RN, and the nursing and physician staff at Yale-New Haven Hospital Emergency Department.

1. Goldberg RJ, O'Donnell C, Yarzebski J, Bigelow C, Savageau J, Gore JM. Sex differences in symptom presentation associated with acute myocardial infarction: a population-based perspective. *Am Heart J* 1998;136:189–195.
2. Penque S, Halm M, Smith M, Deutsch J, VanRoekel M, McLaughlin L, Dzubay S, Doll N, Beahrs M. Women and coronary disease: relationship between descriptors of signs and symptoms and diagnostic and treatment course. *Am J Crit Care* 1998;7:175–182.
3. Zucker DR, Griffith JL, Beshansky JR, Selker HP. Presentations of acute myocardial infarction in men and women. *J Gen Intern Med* 1997;12:79–87.
4. Maynard C, Weaver WD. Treatment of women with acute MI: new findings from the MITI Registry. *J Myocardial Ischemia* 1992;4:27–37.
5. Kudenchuk PJ, Maynard C, Martin JS, Wirkus M, Weaver WD. Comparison of presentation, treatment and outcome of acute myocardial infarction in men versus women (The Myocardial Infarction Triage and Intervention Registry). *Am J Cardiol* 1996;78:9–14.
6. Cunningham MA, Lee TH, Cook EF, Brand DA, Rouan GW, Weisberg MC, Goldman L. The effect of gender on the probability of myocardial infarction among emergency department patients with acute chest pain. *J Gen Intern Med* 1989;4:392–398.
7. Hosmer DW, Lemeshow S. Applied Logistic Regression. New York: John Wiley & Sons, 1989:135–175.
8. Hanley JA, McNeil BJ. The meaning and use of the area under the receiver operating characteristic (ROC) curve. *Radiology* 1992;143:29–36.