# Gender-specific characteristics of individuals with depressive symptoms and coronary heart disease

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**OBJECTIVE:** In individuals with depressive symptoms and coronary heart disease (CHD), little is known about gender-specific characteristics that may inform treatments and outcomes. This study sought to identify characteristics that distinguish men from women with both conditions.

**METHODS:** By cross-sectional design, 1951 adults with CHD and elevated depressive symptoms completed questionnaires to measure anxiety, hostility, perceived control, and knowledge, attitudes, and beliefs about CHD. Gender differences were evaluated by multivariable logistic regression.

**RESULTS:** Women were more likely to be single (odds ratio [OR] 3.61, $P < .001$), to be unemployed (OR 2.52, $P < .001$), to be poorly educated (OR 2.52, $P < .001$), to be anxious (OR 1.14, $P < .01$), and to perceive lower control over health (OR 1.34, $P < .01$) than men.

**CONCLUSION:** Women with CHD and depressive symptoms have fewer resources, greater anxiety, and lower perceived control than men. In women, targeting modifiable factors, such as anxiety and perceived control, is warranted. (Heart Lung® 2011;40:e4–e14.)

In the context of coronary heart disease (CHD), being female is linked with poor outcomes, including higher mortality and morbidity after coronary events and poorer symptom relief, compared with men. Among patients with CHD after myocardial infarction (MI), the death rate has declined less for women than for men, with current mortality reported at 11% for men and 16% for women.[1,2] During the first year after a cardiac event, women have greater symptom frequency and experience greater risk of death and reinfarction than men.[3-6] Despite the significant increase in rates of coronary revascularization among women during the last decade, women have lower rates of graft patency, lower survival after coronary artery bypass, less postoperative symptomatic relief, more frequent perioperative infarction, and greater rates of subsequent heart failure than men.[7-10] A handful of studies indicate that women are more likely to experience greater psychologic disturbance associated with CHD than are men. These studies have taken place in the context of recovery from acute MI and show that women have higher levels of depressive symptoms,[11,12] greater distress, and worse mental health up to 5 years post-MI than men.[13]

In both men and women with CHD, depression is common and linked to increased mortality and morbidity.[11,14-18] Several studies suggest that the presence of depression or depressive symptoms during or shortly after hospitalization for acute MI confers 2 to 3 times the risk for mortality, even when other factors known to be linked to mortality are taken into account.[19] In addition to all-cause mortality, depression after acute MI is positively associated with both cardiac mortality and nonfatal cardiac events.[20]

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Despite the compelling evidence that both female gender and the presence of depression are associated with negative outcomes in the face of CHD, the characteristics that distinguish women from men in the presence of both CHD and depressive symptoms are unclear. As a result, identification of women at greatest risk for adverse outcomes associated with both depression and CHD remains difficult. Thus, the purpose of this study was to identify sociodemographic, clinical, and psychobehavioral characteristics that distinguish men from women with both conditions.

## MATERIALS AND METHODS

### Design

A cross-sectional correlational design was used for this secondary analysis of a large multicenter randomized clinical trial to reduce prehospital delay in patients with CHD experiencing symptoms of acute coronary syndrome.[21] In the parent study (PROMOTION Trial), 3522 patients were enrolled from hospital cardiovascular and coronary catheterization units after discharge, a variety of outpatient clinics, cardiac rehabilitation programs, and community medical practices in the United States, Australia, and New Zealand.

### Patient population

Patients were eligible for the parent study if they 1) had a diagnosis of ischemic heart disease confirmed by their physician or medical record and 2) were living independently (ie, not in an institutional setting). Patients were excluded if they had 1) a complicating serious comorbidity, such as malignancy with survival expected < 12 months; 2) an untreated malignancy or neurologic disorder that impaired cognition; 3) an inability to understand spoken English and inability to respond to questions on data-collection instruments; or 4) a major and uncorrected hearing loss. For this report, an additional inclusion criterion was the presence of depressive symptoms above the community norm of 11 on the Multiple Affect Adjective Checklist (MAACL).[22] Of all patients enrolled (n = 3522), 3419 (97.0%) had complete data and were evaluated for depressive symptoms. A total of 1951 patients (57.1%) met criteria for depressive symptoms and are the subject of the present report (Fig 1).

### Instruments

Symptoms of depression, anxiety, and hostility were measured by the MAACL, a self-report measure consisting of 132 alphabetically arranged adjectives. Higher scores indicate greater dysphoria. The MAACL was selected because it has been used extensively in research and clinical practice and has established reliability and validity, with reported internal consistency coefficients of .89, .83, and .88, respectively.[23] The MAACL provided efficiency because it included depression, anxiety, and depression. In addition, unlike other depression instruments, it did not include somatic symptoms. Established community norms for the MAACL include ≤ 11 for depressive symptoms and ≤ 7 for symptoms of anxiety and hostility;[22] these cutoffs were used in the current study to categorize the presence or absence of dysphoric symptoms. In the current study, Cronbach's $\alpha$ coefficients for symptoms of depression, anxiety, hostility, and total dysphoria scores were .86, .77, .84, and .95, respectively.

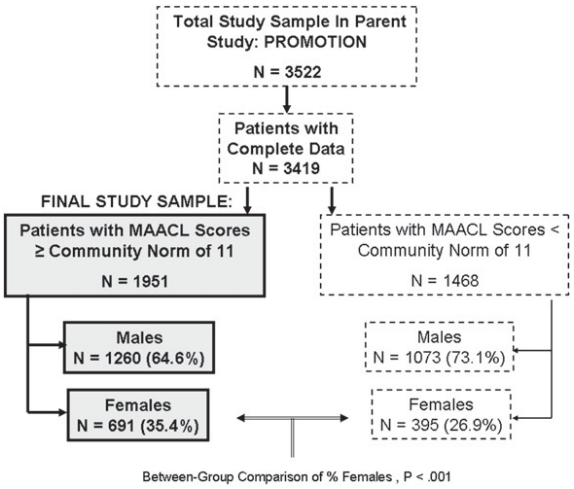


**Fig 1** Derivation of study sample. MAACL, Multiple Affect Adjective Checklist.

The variable, perceived control related to health, was measured using the Control Attitudes Scale-Revised (CAS-R), which consists of 8 belief statements measuring perceived control in the context of cardiac disease.[24] Participants rate agreement with statements on a 5-point Likert scale, and responses for each item are summed to arrive at a total score. A higher score indicates a higher level of perceived control. The CAS-R was selected because it is the only instrument developed for use with cardiac patients that evaluates perceived control related to health. Instead of measuring locus of control, a conceptually related variable, the CAS-R measures control relevant to patients' current health problems. It predicts health

outcomes better than more general locus of control instruments.[25, 26] High instrument reliability, with Cronbach's $\alpha$ = .89, has been reported.[26] In the current study, Cronbach's $\alpha$ was .79.

Knowledge, attitudes, and beliefs about CHD were assessed using the Acute Coronary Syndrome (ACS) Response Index, which was developed from an instrument used in the Rapid Early Action for Coronary Treatment study.[27] The ACS Response Index includes 3 subscales. The first is a 26-item knowledge subscale that consists of questions regarding general facts about CHD and acute ischemic events. The knowledge score is calculated as percent correct, with 70% or greater considered to be adequate knowledge. The second is a 5-item attitudes subscale that reflects confidence in the ability to respond to acute coronary syndrome symptoms. The third is a 7-item beliefs subscale that evaluates respondents' opinions about CHD and includes items such as "I would be embarrassed to go to the hospital if I thought I was having a heart attack." For the attitudes and beliefs subscales, items are scored on a 4-point Likert scale, with higher scores indicating more confident attitudes and more positive beliefs. Cronbach's $\alpha$ scores for the knowledge, attitudes, and beliefs subscales were .76, .71, and .74, respectively. Internal consistency for the total scale was .78. The ACS Response Index was selected because it allows evaluation of 3 dimensions (knowledge, attitudes, and beliefs) that are highly salient for both depression and cardiac-related health behaviors.

Demographic variables were obtained by self-report. Participants were asked to complete a questionnaire indicating the following: self-identified ethnicity (Caucasian, Hispanic, Asian/Pacific Islander, African American, Native American, Mauri, Aboriginal/Torres Strait Islander, other); educational level (high school, college/university, technical school, graduate school); marital status (single, divorced, widowed, married, separated, living with significant other); employment status (working for pay, homemaker, disabled, not currently employed, retired, student); health insurance status (uninsured-self pay, government only-Medicare/Medicaid, Veterans Affairs, government plus private, private, health maintenance organization-independent practice association, other), insured for ambulance use (yes/no), insured for visits to the emergency department (yes/no); and number living in the home (besides yourself). Before data entry, income data were adjusted for US dollars at the time of questionnaire completion.

## Procedure

Recruitment methods used have been described.[21] In brief, patients were recruited from hospital cardiovascular and coronary catheterization units and from a variety of outpatient clinics and medical practices in their communities. Participation was solicited through mechanisms such as letters from healthcare providers, sign-in clinics, and radio announcements. Patients signed informed consents approved by local institutional review boards. Before completion of the baseline questionnaire, demographic and clinical characteristics were obtained by self-report. The current report includes only baseline data obtained before randomization.

## Statistical analysis

Women and men with depressive symptoms were compared using the *t* test for interval data and the chi-square test for ordinal data. For comparison, patients from the original study without depressive symptoms were also compared by gender.

For patients with depressive symptoms, variables significant at the $P \leq .10$ level were entered into a logistic multiple regression analysis (dependent variable = gender: female = 1; male = 0) with backward elimination. To control for any variation related to national differences, the country of origin was entered into the logistic regression as a separate block. To control for differences in health care systems, insurance status was dichotomized as uninsured or government-only insurance versus private insurance. Demographic characteristics (including age and marital, work, and insurance statuses) and clinical variables (history of angina, MI, percutaneous coronary intervention [PCI], or coronary artery bypass grafting) were entered as separate blocks, followed by psychobehavioral (knowledge, perceived control, and symptoms of depression, anxiety, hostility) variables. Two separate regressions were run: first, with psychobehavioral variables at the interval, or continuous, level and second, with the same variables dichotomized as *present/absent* based on community norms for symptoms of depression, anxiety, and hostility; *adequate/inadequate* for knowledge of ACS symptoms (based on score of $\geq$ 70%); and *high/low* (based on median splits because community norms have not been established) for perceived control, attitudes, and beliefs regarding ACS symptoms. This approach was applied because the use of dichotomized variables allows more interpretable clinical data but may risk loss of power. Because results from both models yielded equivalent findings, only the dichotomized findings are presented. Model fit

was assessed by the Hosmer and Lemeshow Test, with nonsignificant values ≥ .10 considered to reflect acceptable fit. Significance level was set at P = .05. Analyses were performed using SPSS version 17.0 (SPSS, Chicago, IL).

## RESULTS

### Baseline characteristics

***Comparisons of variables by gender.*** Of the 1951 patients with CHD with depressive symptoms above community norms, 691 (35.4%) were women. In contrast, among patients without depressive symptoms, 395 (26.9%) were women (P < .001). Sample demographic and clinical characteristics of patients with CHD with and without depressive symptoms are compared by gender in Tables I and II. Among those with depressive symptoms, compared with men, women were older, more poorly educated, more likely to be single and not working, and more likely to have government-only or no health insurance. Compared with men with depressive symptoms, women with depressive symptoms were less likely to have a history of MI or revascularization by PCI or bypass surgery, or to have attended cardiac rehabilitation programs. Conversely, women with depressive symptoms were more likely to have angina and hypertension than men with depressive symptoms. With few exceptions, gender comparisons of the 2 samples (with and without depressive symptoms) were similar. The only differences between samples with and without depressive symptoms were for history of MI, angina, or cardiac rehabilitation attendance. In the sample without depressive symptoms, there were no gender differences in these clinical characteristics.

Bivariate comparisons of psychobehavioral variables by gender and presence/absence of depressive symptoms status are presented in Table III. Compared with men with depressive symptoms, women with depressive symptoms were less likely to be smokers. They were more likely to be below the norm for hostility symptoms and to have perceived control scores below the sample median. Conversely, compared with men with depressive symptoms, women with depressive symptoms were more likely to be above community norms for anxiety symptoms, to have knowledge scores > 70%, and to accurately assess their risk of cardiac events. The distribution of scores for depressive, anxiety, and hostility symptoms in men and women with depressive symptoms at or above community norms are presented in Table IV. As with clinical and demographic characteristics, gender patterns for psychobehavioral variables were similar in the samples with and without depressive symptoms. The only difference between the samples was that women without depressive symptoms were more likely to describe themselves as sedentary than men without depressive symptoms, whereas among those with depressive symptoms there was no gender difference in self-reported sedentary activity levels.

In further evaluation of the sample with depressive symptoms, demographic, clinical, and psychobehavioral variables were regressed on gender. Of demographic characteristics of patients with depressive symptoms, those included in the final logistic regression model included age, education (high school education or less, or college), marital status (single or married/cohabitating), insurance status (uninsured/government-only insurance vs private), and employment status (working vs not working). Clinical characteristics included in the final model of patients with depressive symptoms were history of angina, MI, PCI, coronary artery bypass, and attendance at a cardiac rehabilitation program. Psychobehavioral variables included in the model of patients with depressive symptoms were smoking status (current, former, or never smoker), anxiety, hostility, perceived control, knowledge of ACS symptoms, and attitudes toward symptoms. Odds ratios and confidence intervals for variables independently associated with female gender in the multivariable analysis are presented in Fig 2.

When demographic, clinical, and psychobehavioral factors were considered together, those independently associated with female gender were lower education, single status, unemployment, negative history of revascularization or MI, negative smoking history, high anxiety, adequate knowledge of ACS symptoms, and feeling less personal control over one's health. Specifically, when all factors were considered together, depressed women were approximately 4 times as likely to be single and twice as likely to have a high school education or less, compared with depressed men (Fig 2). Compared with depressed men, depressed women were 50% more likely to be anxious and 30% more likely to experience a sense of low control over their health status (Fig 2).

## DISCUSSION

In our study, women with depressive symptoms were more likely to be anxious and have lower perceived control over their health than men with

**Table I**
Bivariate comparisons of demographic characteristics in men and women with coronary heart disease with and without depressive symptoms

| | Sample without depressive symptoms (N = 1468) | | | | Sample with depressive symptoms (N = 1951) | | | |
|---|---|---|---|---|---|---|---|---|
| Variable | Male (N = 1073) Mean (SD) | Female (N = 1129) Mean (SD) | | *P* | Male (N = 1260) Mean (SD) | Female (N = 691) Mean (SD) | | *P* |
| Age y | 67.4 (10.1) | 69.6 (9.8) | | < .001 | 65.5 (11.6) | 68.3 (11.5) | | < .001 |
| | N (%) | N (%) | OR (95% CI) | | N (%) | N (%) | OR (95% CI) | |
| High school education or less | 299 (27.9) | 172 (43.5) | 2.00 (1.57-2.54) | < .001 | 438 (34.8) | 379 (54.8) | 2.28 (1.89-2.76) | < .001 |
| Single | 197 (18.4) | 195 (49.4) | 4.34 (3.38-5.57) | < .001 | 276 (21.9) | 344 (49.8) | 3.53 (2.89-4.32) | < .001 |
| Uninsured or government-only health insurance | 494 (46.0) | 639 (56.6) | 1.39 (1.10-1.75) | .006 | 610 (48.4) | 389 (56.3) | 1.37 (1.1-1.65) | .001 |
| Non-Caucasian | 96 (8.9) | 39 (9.9) | 1.12 (.75-1.65) | .586 | 100 (7.9) | 58 (8.4) | 1.06 (.7-1.49) | .723 |
| Not working | 716 (66.7) | 314 (79.5) | 1.93 (1.47-2.55) | < .001 | 840 (66.7) | 577 (83.5) | 2.53 (2.0-3.19) | < .001 |

CI, confidence interval; OR, odds ratio; SD, standard deviation.

**Table II**
Bivariate comparisons of clinical characteristics in men and women with coronary heart disease with and without depressive symptoms

| | Sample without depressive symptoms (N = 1468) | | | | Sample with depressive symptoms (N = 1951) | | | |
|---|---|---|---|---|---|---|---|---|
| | Male (N = 1073) | Female (N = 395) | | | Male (N = 1260) | Female (N = 691) | | |
| Variable | Mean (SD) | Mean (SD) | | *P* | Mean (SD) | Mean (SD) | | *P* |
| Body mass index | 27.2 | 26.9 | | .185 | 27.9 (4.8) | 27.8 (6.2) | | .777 |
| | N (%) | N (%) | OR (95% CI) | | N (%) | N (%) | OR (95% CI) | |
| History of MI | 569 (54.2) | 201 (51.5) | .90 (.71-01.13) | .361 | 729 (57.9) | 340 (49.2) | .71 (.59-.85) | < .001 |
| History of angina | 532 (50.0) | 167 (42.6) | 1.08 (.85-1.37) | .516 | 734 (58.3) | 442 (64.0) | 1.27 (1.05-1.54) | .014 |
| History of PCI | 1178 (49.8) | 489 (43.8) | .74 (.59-.94) | .012 | 619 (49.1) | 301 (43.6) | .80 (.66-.96) | .018 |
| History of bypass | 555 (51.8) | 159 (40.3) | .63 (.50-.79) | < .001 | 619 (49.1) | 240 (34.7) | .55 (.46-.67) | < .001 |
| History of valvular surgery | 52 ( 4.9) | 19 ( 4.9) | 1.00 (.58-1.71) | .987 | 67 (5.3) | 41 (5.9) | 1.12 (.75-1.67) | .569 |
| Peripheral vascular disease | 87 ( 8.4) | 42 (11.1) | 1.36 (.93-2.00) | .118 | 135 (10.7) | 82 (11.9) | 1.12 (.84-1.50) | .439 |
| Diabetic | 196 (18.4) | 68 (17.2) | .92 (.68-1.29) | .595 | 316 (25.1) | 157 (22.7) | .88 (.71-1.09) | .245 |
| History of stroke | 84 ( 8.0) | 36 ( 9.1) | 1.16 (.77-1.75) | .467 | 136 (10.8) | 80 (11.6) | 1.08 (.81-1.45) | .598 |
| Hypercholesterolemic | 683 (63.7) | 263 (66,6) | 1.14 (.89-1.45) | .298 | 812 (64.4) | 466 (67.4) | 1.14 (.94-1.39) | .183 |
| Hypertensive | 563 (52.5) | 246 (62.3) | 1.50 (1.18-1.89) | .001 | 661 (52.5) | 404 (58.5) | 1.28 (1.06-1.54) | .011 |
| Did not attend cardiac rehab | 476 (44.4) | 194 (49.1) | 1.21 (.96-1.53) | .105 | 607 (48.2) | 399 (57.7) | 1.47 (1.22-1.77) | < .001 |
| No cardiologist | 168 (15.7) | 56 (14.2) | .89 (.64-1.23) | .484 | 217 (17.2) | 124 (17.9) | 1.05 (.82-1.34) | .688 |

MI, myocardial infarction; PCI, percutaneous intervention; CI, confidence interval; SD, standard deviation.

**Table III**
Bivariate comparisons of psychobehavioral variables in men and women with coronary heart disease with and without depressive symptoms

| | Sample without depressive symptoms (N = 1468) | | | | Sample with depressive symptoms (N = 1951) | | | |
|---|---|---|---|---|---|---|---|---|
| | Male (N = 1073) | Female (N = 395) | | | Male (N = 1260) | Female (N = 691) | | |
| Variable | N (%) | N (%) | | *P* | N (%) | N (%) | OR (95% CI) | *P* |
| Smoking status: | | | | < .001 | | | | < .001 |
| Never | 359 (33,5) | 204 (51.6) | | | 353 (28.0) | 337 (48.8) | | |
| Former | 670 (62.4) | 175 (44.3) | | | 799 (63.4) | 306 (44.3) | | |
| Current | 73 ( 4.1) | 16 ( 4.1) | | | 108 (8.6) | 48 (6.0) | | |
| Sedentary by self-report | 743 (31.3) | 411 (36.7) | 1.34 (1.03-1.75) | .027 | 477 (37.9) | 281 (40.7) | 1.13 (.93-1.36) | .224 |
| Anxious | 38 ( 3.5) | 31 ( 7.8) | 2.32 (1.42-3.78) | < .001 | 712 (56.6) | 433 (62.7) | 1.29 (1.07-1.56) | .008 |
| Hostile | 211 (19.7) | 73 (18.5) | .95 (.69-1.24) | .611 | 953 (75.6) | 497 (71.9) | .83 (.67-1.02) | .073 |
| Low perceived control | 398 (37.1) | 168 (42.5) | 1.26 (.99-1.59) | .058 | 676 (53.7) | 420 (60.8) | 1.34 (1.11-1.62) | .002 |
| Low knowledge of ASC symptoms | 518 (48.3) | 143 (36.2) | .61 (.48-.77) | < .001 | 592 (47.0) | 275 (39.8) | .75 (.62-.90) | .002 |
| Less confident to respond to ASC symptoms | 630 (58.7) | 246 (62.3) | 1.16 (.92-1.47) | .217 | 791 (62.8) | 458 (66.3) | 1.17 (.96-1.14) | .123 |
| More negative beliefs about ASC symptoms | 443 (41.3) | 165 (41.8) | 1.02 (.81-1.29) | .867 | 600 (47.6) | 339 (48.9) | 1.05 (.88-1.27) | .584 |
| Assesses risk of heart attack inaccurately | 543 (50.6) | 156 (39.5) | .64 (.51-.81) | < .001 | 547 (43.4) | 230 (33.3) | .65 (.54-.79) | < .001 |

ASC, acute coronary syndrome; CI, confidence interval; OR, odds ratio.

**Table IV**
Distribution of scores for symptoms of depression, anxiety, and hostility by gender

| | Whole sample (N = 1951) | Male (N = 1260) | Female (N = 691) | *P* |
|---|---|---|---|---|
| Depressive symptoms (community norm ≤ 11) | | | | |
| Mean | 17.47 ± 4.4 | 17.25 ± 4.38 | 17.87 ± 4.42 | .003 |
| Median | 17 | 16 | 17 | |
| Range (min-max) | 27 (12-39) | 26 (12-38) | 27 (12-39) | |
| Percentiles: 25 | 14 | 14 | 14 | |
| 50 | 17 | 16 | 17 | |
| 75 | 20 | 19 | 21 | |
| Anxiety symptoms (community norm = ≤ 7) | | | | |
| Mean | 8.49 ± 3.50 | 8.32 ± 3.42 | 8.81 ± 3.62 | |
| Median | 8 | 8 | 9 | .003 |
| Range (min-max) | 21 (0-21) | 20 (1-21) | 20 (0-20) | |
| Percentiles: 25 | 6 | 6 | 6 | |
| 50 | 8 | 8 | 9 | |
| 75 | 11 | 10 | 11 | |
| Hostility symptoms (community norm = ≤ 7) | | | | |
| Mean | 9.68 ± 3.38 | 9.84 ± 3.38 | 9.40 ± 3.35 | |
| Median | 10 | 10 | 9 | .005 |
| Range | 26 (1-27) | 26 (1-27) | 24 (1-25) | |
| Percentiles: 25 | 7 | 8 | 7 | |
| 50 | 10 | 10 | 9 | |
| 75 | 12 | 12 | 12 | |

depressive symptoms. Both attributes offer an opportunity for intervention. In contrast, men were more likely than women to have both changeable characteristics (less knowledge of ischemic symptoms and current smoking status) and immutable factors (a history of infarction and revascularization). These findings are important for 3 reasons. First, they illuminate the common observation that more women with CHD are depressed than men with CHD. Second, they highlight gender-associated differences in CHD alone and in the presence of comorbid CHD and depressive symptoms. Third, they identify gender-specific clinical and psychobehavioral factors associated with depression that are amenable to change in individuals with both CHD and elevated depressive symptoms. For example, although cardiac rehabilitation attendance was not a significant correlate of gender when other factors were considered, it is possible that fewer women with depressive symptoms and CHD attend cardiac rehabilitation because low perceived control interferes with their belief that they can influence the course of their CHD. Although further study is needed to fully explicate potential relationships such as these, the findings of this study add to existing knowledge of women with CHD and depressive symptoms. These findings provide important support for research investigations to test the effects of modifying factors, such as anxiety and low perceived control, on such outcome variables as patient acceptance of treatment modalities and depression.

## Differences in populations with only coronary heart disease

A striking feature of our findings is that, when considered with other factors, 2 factors that have been associated with female gender in CHD alone—older age and the presence of angina—were not independently associated with gender in the context of both CHD and comorbid depressive symptoms. Because the effect of age was controlled in the multivariable analysis, our findings dispel the common myth that the depression documented in women with CHD is a result of their older age.[28-30] Thus, even though women with CHD and

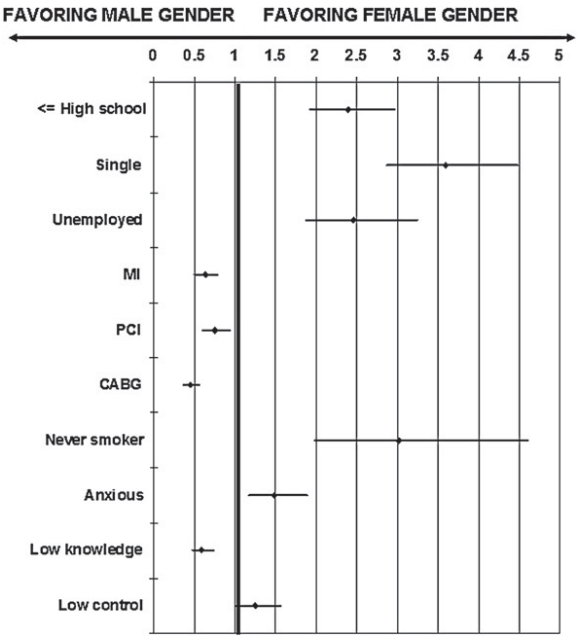


**Fig 2** Factors favoring male and female gender in multivariable analysis. MI, myocardial infarction; PCI, percutaneous coronary intervention; CABG, coronary artery bypass grafting.

depressive symptoms were older than their male counterparts (Table I), age was not a distinguishing factor between men and women when clinical and psychobehavioral variables were also considered.

This conundrum regarding the role of age in the presence of comorbid depressive symptoms and CHD is probably explained by the opposing trends of age and gender found in these conditions. In those with CHD, women are approximately 10 years older than men,[2] whereas women tend to exhibit depressive symptoms at earlier ages than men during the adult years.[31] Of note, in the largest study of clinical depression after MI to date, the Enhancing Recovery in Coronary Heart Disease study, investigators found that depressed women were younger than depressed men. This difference was attributed to an interaction between age and ethnicity in which minority women were younger than their Caucasian counterparts.[32] Our finding that women were 50% more likely to have depressive symptoms than men, a finding consistent with other reports comparing the rate of depression between men and women,[33] is therefore not explained by the known age differential in CHD favoring later disease development in women.

We also found that the presence of angina did not distinguish women with depressive symptoms from men with depressive symptoms in the context of CHD. This finding stands in contrast with existing data regarding gender in patients with CHD alone. Women with CHD have been shown to be more likely than men to have angina, particularly as an initial presenting symptom.[29,34,35] The disappearance of angina as a distinguishing characteristic between women and men when both have CHD and depressive symptoms may indicate that these men may be more symptomatic and have more comorbidities than men with CHD alone. This implication is consistent with our finding that other comorbidities known to be more common in women than in men with CHD (ie, diabetes and hypertension) are found with equivalent prevalence in those with both CHD and depressive symptoms.

## Psychobehavioral factors

Our findings indicate that scores for depressive, anxiety, and hostility symptoms differed between men and women with depressive symptoms (Table IV). Although actual differences between men and women were small and probably not clinically meaningful, it is noteworthy that mean and median scores for symptoms of anxiety and hostility mirrored those for depressive symptoms in that they all were above community norms. This corresponds to previous reports that depressive symptoms are correlated with anxiety and hostility.[36,37] For anxiety symptoms in women compared with men, a higher percentage of women experienced levels above community norms, which is similar to the pattern we observed for depressive symptoms. Conversely, a larger percentage of men reported symptoms of hostility. Again, these patterns of increased prevalence of anxiety in women and increased prevalence of hostility in men confirm previous reports.[36-38] Investigators have posited that hostility in men with CHD may be related to underreporting distress.[37] Others have reported that hostility may interact with depression to moderate inflammatory processes.[39] Further study is needed to understand how these processes may be influenced by gender.

Corresponding with increased anxiety in women, women with comorbid CHD and depressive symptoms have better knowledge of ACS symptoms but less perceived control over their health than do men. Little has been reported about knowledge differences in men and women with CHD, with a single small study showing no gender differences in knowledge of heart attack symptoms.[40] However, an inverse relationship of perceived control and anxiety in cardiac patients has been reported.[26,41] This is the first report to show that knowledge

about ACS, anxiety, and perceived control differs by gender in patients with CHD. In a single study of 661 patients with CHD, women and men had similar depression scores, but men reported higher personal control than women.[16]

The causes of gender differences in perceived control are not known, although earlier reports point to putative causes. Researchers have suggested that expectations of helplessness, a concept inversely related to perceived control, and negative outcomes are more common in women than in men and, thus, lead to increases in depression.[38] Other investigators report that orientation to personal control underlies gender differences, with men perceiving greater control of causation and women perceiving greater control of solutions.[42] Further study is needed to elucidate these relationships.

## Demographic factors

Our findings also shed some light on the relationship of gender to socioeconomic factors other than age in the context of both CHD and depressive symptoms. In the current study, women with comorbid depressive symptoms and CHD were more likely to be single, unemployed, and less educated compared with male counterparts. Our findings are supported by previous reports in patients with CHD that lower educational attainment and female gender interact to increase the risk of incident CHD,[43] and that higher education and employment are protective against depressive symptoms in both men and women after an MI.[36]

Stress theory postulates that individuals with higher socioeconomic status have greater personal resources (eg, mastery and self-esteem) and social resources (eg, social support) that buffer the impact of stress on depression compared with individuals with lower socioeconomic status.[44] Thus, it is not surprising that in the context of comorbid depressive symptoms and CHD, lower socioeconomic status in women may be linked to decreased access to social and personal resources that promote effective coping. However, these conjectures require further testing.

## LIMITATIONS

Our sample was primarily Caucasian, so our findings may not be generalizable to a more ethnically diverse population. We did not measure some variables that could influence depressive symptoms, including history of depression, treatment of depression, and use of medications that might influence such symptoms (ie, beta-blockers). Thus, we could not assess the influence of these factors on severity of depressive symptoms in the presence of CHD.

Although we measured depressive symptoms with a well-validated instrument, we did not use diagnostic criteria to define depression. Thus, we cannot infer that clinical depression was present in our sample. However, studies have demonstrated that subthreshold symptoms of depression are associated with increased use of health care resources and negative clinical outcomes, including increased mortality.[36,45-47]

## CONCLUSIONS

Women with CHD who are depressed are not significantly older than men with CHD; however, they have fewer economic resources, greater anxiety, and less perceived control over their health than their male counterparts. These differences may predispose them to poorer health outcomes than men. Notably, however, these characteristics are amenable to intervention. Further research into the interaction of depressive symptoms and gender may change the manner in which depressive symptoms are addressed in women with CHD.

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