6-2011

Gender-Specific Characteristics of Individuals With Depressive Symptoms and Coronary Heart Disease

Lynn V. Doering

Sharon McKinley

Barbara Riegel
University of Pennsylvania, briegel@nursing.upenn.edu

Debra K. Moser

Hendrika Meischke

See next page for additional authors

Recommended Citation

Doering, L. V., McKinley, S., Riegel, B., Moser, D. K., Meischke, H., Pelter, M. M., & Dracup, K. (2011). Gender-Specific Characteristics of Individuals With Depressive Symptoms and Coronary Heart Disease. *Heart & Lung: The Journal of Acute and Critical Care, 40* (3), e4-e14. http://dx.doi.org/10.1016/j.hrtlng.2010.04.002

Gender-Specific Characteristics of Individuals With Depressive Symptoms and Coronary Heart Disease

Abstract

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.

Disciplines

Cardiology

Author(s)

Lynn V. Doering, Sharon McKinley, Barbara Riegel, Debra K. Moser, Hendrika Meischke, Michele M. Pelter, and Kathleen Dracup

Published in final edited form as:
Heart Lung. 2011 ; 40(3): e4–e14. doi:10.1016/j.hrtlng.2010.04.002.

Gender-Specific Characteristics of Individuals with Depressive Symptoms and Coronary Heart Disease

Lynn V. Doering, DNSc[a], **Sharon McKinley, PhD**[b], **Barbara Riegel, DNSc**[c], **Debra K. Moser, DNSc**[d], **Hendrika Meischke, PhD**[e], **Michele M. Pelter, PhD**[f], and **Kathleen Dracup, DNSc**[g]

[a]University of California, Los Angeles, CA

[b]Royal North Shore Hospital, St. Leonards, Australia

[c]University of Pennsylvania, Philadelphia, PA

[d]University of Kentucky, Lexington, KY

[e]University of Washington, Seattle, WA

[f]University of Nevada, Reno

[g]University of California, San Francisco, CA.

Abstract

Objective—In individuals suffering from 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 (OR 3.61, $p < .001$), unemployed (OR 2.52, $p < .001$), poorly educated (OR 2.52, $p < .001$), anxious (OR 1.14, $p < .01$), and to perceive lower control over health (OR 1.34, $p < .01$) than males.

Conclusions—Women with CHD and depressive symptoms have fewer resources, greater anxiety, and lower perceived control than men. In women, targeting of modifiable factors, like anxiety and perceived control, is warranted.

Keywords

Coronary heart disease; depression; gender

INTRODUCTION

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 to men. Among CHD patients following myocardial infarction, the death rate has declined less for women than for men, with current mortality reported at 11% for men, but 16% for women.1, 2 During the first year following a cardiac event, women suffer greater symptom frequency and experience greater risk of death and re-infarction than men.3–6 Despite the significant rise in rates of coronary revascularization among women over the last decade, women have lower rates of graft patency, lower survival following 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 psychological disturbance associated with CHD than men. These studies have taken place in the context of recovery from acute myocardial infarction and show that women suffer higher levels of depressive symptoms 11, 12, as well as greater distress and worse mental health up to five years post-myocardial infarction than men 13.

In both men and women with CHD, depression is common and is 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 myocardial infarction (MI) confers two to three 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 with nonfatal cardiac events.20 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.

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 CHD patients 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: 1) they had a diagnosis of ischemic heart disease confirmed by their physician and/or medical record; and 2) were living independently (i.e., 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 neurological disorder which 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 11on 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 (57.1%) patients met criteria for depressive symptoms and are the subject of the present report (Figure 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, since 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 hostility22; these cut-offs were used in the current study to categorize the presence or absence of dysphoric symptoms. In the current study, Cronbach's α coefficients for symptoms of depression, anxiety, hostility and total dysphoria scores were 0.86, 0.77, 0.84 and 0.95, respectively.

The variable, perceived control related to health, was measured using the Control Attitudes Scale-Revised (CAS-R), which consists of eight 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. Different from 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 α = 0.89, has been reported.26 In the current study, Cronbach's α was 0.79.

Knowledge, attitudes, and beliefs about CHD were assessed using the ACS Response Index (ARI), which was developed from an instrument used in the Rapid Early Action for Coronary Treatment (REACT) study.27 The ARI includes three subscales. The first, a 26-item knowledge subscale 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 ASC 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 α scores for the knowledge, attitudes, and beliefs subscales were 0.76, 0.71, and 0.74, respectively. Internal consistency for the total scale was 0.78. The ARI was selected because it allows evaluation of three 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, HMO-IPA, other), insured for ambulance use (yes/no), insured for visits to the Emergency Department (yes/no); and number living in the home (besides yourself). Prior to data entry, income data were adjusted for U.S. dollars at the time of questionnaire completion.

Procedure

Recruitment methods used have been described elsewhere.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, signs in clinics, and radio announcements. Patients signed informed consents approved by local institutional review boards. Prior to completion of the baseline questionnaire, demographic and clinical characteristics were obtained by self-report. The current report includes only baseline data obtained prior to randomization.

Statistical Analysis

Women and men with depressive symptoms were compared using the *t* test for interval data and the χ^2 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 vs. private insurance. Then demographic characteristics (including age and marital, work, and insurance statuses) and clinical variables (history of angina, MI, PCI, and/or CABG) 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 70% or higher); and *high/low* (based on median splits since 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 non-significant values $\geq .10$ 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 CHD patients 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 CHD patients with and without depressive symptoms are compared by gender in Tables 1 and 2. Among those with depressive symptoms, compared to men, women were older, more poorly educated, and more likely to be single and not working, and to have government-only or no health insurance. Compared to men with

depressive symptoms, women with depressive symptoms were less likely to have a history of myocardial infarction or revascularization by percutaneous coronary intervention (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 two samples (with and without depressive symptoms) were similar. The only differences between samples with and without depressive symptoms were for history of myocardial infarction, angina, or cardiac rehab 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 3. Compared to 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 to men with depressive symptoms, women with depressive symptoms were more likely to be above community norms for anxiety symptoms, to have knowledge scores above 70%, and to assess their risk of cardiac events accurately. 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 4. 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 or above), 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, myocardial infarction, 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 Figure 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 myocardial infarction, 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 almost four times as likely to be single and twice as likely to have a high school education or less, compared to depressed men (Figure 2). Compared to depressed men, they were 50% more likely to be anxious and 30% more likely to experience a sense of low control over their health status (Figure 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 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 three 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, while cardiac rehab 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 rehab because low perceived control interferes with their belief that they can influence the course of their CHD. While 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 on depression.

Differences with CHD Only Populations

A striking feature of our findings is that, when considered with other factors, two 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 depressive symptoms were older than their male counterparts (Table 1), 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 CHD, women are approximately ten years older than men,[2] while 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 following MI to date, the Enhancing Recovery in Coronary Heart Disease (ENRICHD) 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 to 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 (i.e. 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 4). While 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 to 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 of 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, we found that women with comorbid CHD and depressive symptoms have better knowledge of ACS symptoms, but less perceived control over their health than men do. Very 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 that knowledge about ACS, anxiety, and perceived control differ by gender in CHD patients. In a single study of 661 CHD patients, 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 in women compared to men expectations of helplessness, a concept inversely related to perceived control, and negative outcomes are more common in women 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, not working, and less educated compared to male counterparts. Our findings are supported by previous reports in CHD patients that that lower educational attainment and female gender interact to increase risk of incident CHD,[43] and that higher education and employment are protective against depressive symptoms in both men and women following a myocardial infarction.[36]

Stress theory postulates that individuals with higher socioeconomic status have greater personal resources, such as mastery and self-esteem, and social resources, such as social support, that buffer the impact of stress on depression, compared to 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 (i.e. beta blockers). Thus, we could not assess the influence of these factors on severity of depressive symptoms in the presence of CHD.

While 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. Importantly, 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.

Acknowledgments

Supported by National Institutes of Health R01NR07952

Reference List

1. Wenger N. Should women have a different risk assessment from men for primary prevention of coronary heart disease? J Womens Health Gender Based Med. 1999; 8(4):465–467.
2. Rosamond W, Flegal K, Furie K, Go A, Greenlund K, Haase N, et al. Heart disease and stroke statistics--2008 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation. 2008 January 29; 117(4):e25–e146. [PubMed: 18086926]
3. Wenger NK. Coronary heart disease: an older woman's major health risk. BMJ. 1997 October 25; 315(7115):1085–1090. [PubMed: 9366743]
4. Kelsey S, James M, Holubkov A, Holubkov R, Cowley M, Detre K. Results of percutaneous transluminal coronary angioplasty in women. 1985–1986 National Heart, Lung, and Blood Institute's Coronary Angioplasty Registry. Circulation. 1993; 87(3):720–727. [PubMed: 8443892]
5. DeVon HA, Zerwic JJ. The Symptoms of Unstable Angina: Do Women and Men Differ? Nurs Res. 2003; 52(2):108–118. [PubMed: 12657986]
6. Crowley A, Menon V, Lessard D, Yarzebski J, Jackson E, Gore JM, et al. Sex differences in survival after acute myocardial infarction in patients with diabetes mellitus (Worcester Heart Attack Study). Am Heart J. 2003 November; 146(5):824–831. [PubMed: 14597931]

7. Vaccarino V, Abramson JL, Veledar E, Weintraub WS. Sex Differences in Hospital Mortality After Coronary Artery Bypass Surgery: Evidence for a Higher Mortality in Younger Women. Circulation. 2002 March 12; 105(10):1176–1181. [PubMed: 11889010]
8. Vaccarino V, Lin ZQ, Kasl SV, Mattera JA, Roumanis SA, Abramson JL, et al. Gender differences in recovery after coronary artery bypass surgery. J Am Coll Card. 2003 January 15; 41(2):307–314.
9. Schultz P, Zimmerman L, Barnason S, Nieveen J. Gender differences in recovery after coronary artery bypass graft surgery. Prog Cardiovasc Nurs. 2005; 20(2):58–64. [PubMed: 15886548]
10. Gruberg L, Beyar R. Women, coronary artery disease and percutaneous coronary intervention: still the same after all these years? Isr Med Assoc J. 2003; 5(6):434–436. [PubMed: 12841018]
11. Frasure-Smith N, Lesperance F, Juneau M, Talajic M, Bourassa MG. Gender, Depression, and One-Year Prognosis After Myocardial Infarction. Psychosom Med. 1999 January 1; 61(1):26–37. [PubMed: 10024065]
12. Mendes de Leon CF, DiLillo V, Czajkowski S, Norten J, Schaefer J, Catellier D, et al. Psychosocial Characteristics After Acute Myocardial Infarction: The ENRICHD Pilot Study. J Cardiopulm Rehab. 2005; 21(6):353–362.
13. Drory Y, Kravetz S, Hirschberger G. Long-term mental health of women after a first acute myocardial infarction. Arch Phys Med Rehab. 2003 October; 84(10):1492–1498.
14. Carney RM, Blumenthal JA, Freedland KE, Youngblood M, Veith RC, Burg MM, et al. Depression and Late Mortality After Myocardial Infarction in the Enhancing Recovery in Coronary Heart Disease (ENRICHD) Study. Psychosom Med. 2004 July 1; 66(4):466–474. [PubMed: 15272090]
15. Barth J, Schumacher M, Herrmann-Lingen C. Depression as a Risk Factor for Mortality in Patients With Coronary Heart Disease: A Meta-analysis. Psychosom Med. 2004 November 1; 66(6):802–813. [PubMed: 15564343]
16. Grace SL, Abbey SE, Kapral MK, Fang J, Nolan RP, Stewart DE. Effect of Depression on Five-Year Mortality After an Acute Coronary Syndrome. Am J Card. 2005 November 1; 96(9):1179–1185. [PubMed: 16253578]
17. Empana JP, Jouven X, Lemaitre RN, Sotoodehnia N, Rea T, Raghunathan TE, et al. Clinical Depression and Risk of Out-of-Hospital Cardiac Arrest. Arch Intern Med. 2006 January 23; 166(2):195–200. [PubMed: 16432088]
18. Frasure-Smith N, Lesperance F, Talajic M. Depression and 18-month prognosis after myocardial infarction. Circulation. 1995; 91:999–1005. [PubMed: 7531624]
19. Lesperance F, Frasure-Smith N, Talajic M, Bourassa MG. Five-Year Risk of Cardiac Mortality in Relation to Initial Severity and One-Year Changes in Depression Symptoms After Myocardial Infarction. Circulation. 2002 March 5; 105(9):1049–1053. [PubMed: 11877353]
20. Lett HS, Blumenthal JA, Babyak MA, Sherwood A, Strauman T, Robins C, et al. Depression as a Risk Factor for Coronary Artery Disease: Evidence, Mechanisms, and Treatment. Psychosom Med. 2004 May 1; 66(3):305–315. [PubMed: 15184688]
21. Dracup K, McKinley S, Riegel B, Mieschke H, Doering LV, Moser DK. A nursing intervention to reduce prehospital delay in acute coronary syndrome: a randomized clinical trial 1. J Cardiovasc Nurs. 2006 May; 21(3):186–193. [PubMed: 16699358]
22. Zuckerman M, Lubin B, Rinck C. Construction of new scales for the multiple affect adjective checklist. J Behav Assess. 1983; 5(2):119–129.
23. Lubin B, Van Whitlock R, Reddy D, Petren S. A comparison of the short and long forms of the Multiple Affect Adjective Check List-Revised (MAACL-R). J Clin Psychol. 2001 57 3.:411–416. [PubMed: 11241371]
24. Moser D, Dracup K, Doering L. Effect of cardiopulmonary resuscitation training for parents of high-risk neonates on perceived anxiety, control, and burden. Heart Lung. 1999; 28(5):326–333. [PubMed: 10486449]
25. Moser D, Dracup K. Impact of cardiopulmonary resuscitation training on perceived control in spouses of recovering cardiac patients. Res Nurs Health. 2000; 23:270–278. [PubMed: 10940952]
26. Moser DDK. Psychosocial recovery from a cardiac event: The influence of perceived control. Heart Lung. 1995; 24:273–280. [PubMed: 7591794]

27. Luepker RV, Raczynski JM, Osganian S, Goldberg RJ, Finnegan JR Jr, Hedges JR, et al. Effect of a Community Intervention on Patient Delay and Emergency Medical Service Use in Acute Coronary Heart Disease: The Rapid Early Action for Coronary Treatment (REACT) Trial. JAMA. 2000 July 5; 284(1):60–67. [PubMed: 10872014]
28. Anand SS, Xie CC, Mehta S, Franzosi MG, Joyner C, Chrolavicius S, et al. Differences in the Management and Prognosis of Women and Men Who Suffer From Acute Coronary Syndromes. J Am Coll Cardl. 2005 November 15; 46(10):1845–1851.
29. Daly C, Clemens F, Lopez Sendon JL, Tavazzi L, Boersma E, Danchin N, et al. Gender Differences in the Management and Clinical Outcome of Stable Angina. Circulation. 2006 January 31; 113(4):490–498. [PubMed: 16449728]
30. Shaw LJ, Bairey Merz CN, Pepine CJ, Reis SE, Bittner V, Kelsey SF, et al. Insights From the NHLBI-Sponsored Women's Ischemia Syndrome Evaluation (WISE) Study: Part I: Gender Differences in Traditional and Novel Risk Factors, Symptom Evaluation, and Gender-Optimized Diagnostic Strategies. J Am Coll Card. 2006 February 7; 47 Supplement 1(3):S4–S20.
31. Wilhelm K, Parker G, Geerligs L, Wedgwood L. Women and depression: a 30 year learning curve. Aust N Z J Psychiatry. 2008 January; 42(1):3–12. [PubMed: 18058438]
32. Enriched Investigators. Enhancing recovery in coronary heart disease (ENRICHD): baseline characteristics. Am J Card. 2001 August 1; 88(3):316–322. [PubMed: 11472719]
33. National Institute of Mental Health. The Numbers Count: Mental Disorders in America. Bethesda, MD: National Institute of Mental Health; 2006.
34. Milner KA, Funk M, Arnold A, Vaccarino V. Typical symptoms are predictive of acute coronary syndromes in women. Am Heart J. 2002 February; 143(2):283–288. [PubMed: 11835032]
35. Lerner DJ, Kannel WB. Patterns of coronary heart disease morbidity and mortality in the sexes: A 26-year follow-up of the Framingham population. Am Heart J. 1986 February; 111(2):383–390. [PubMed: 3946178]
36. Bjerkeset O, Nordahl HM, Mykletun A, Holmen J, Dahl AA. Anxiety and depression following myocardial infarction: gender differences in a 5-year prospective study. J Psychosom Res. 2005 February; 58(2):153–161. [PubMed: 15820843]
37. Ketterer MW, Denollet J, Chapp J, Thayer B, Keteyian S, Clark V, et al. Men deny and women cry, but who dies? Do the wages of "denial" include early ischemic coronary heart disease? J Psychosom Res. 2004 January; 56(1):119–123. [PubMed: 14987973]
38. Piccinelli M, Wilkinson G. Gender differences in depression: Critical review. Br J Psychiatry. 2000 December 1; 177(6):486–492. [PubMed: 11102321]
39. Stewart JC, Janicki-Deverts D, Muldoon MF, Kamarck TW. Depressive Symptoms Moderate the Influence of Hostility on Serum Interleukin-6 and C-Reactive Protein. Psychosom Med. 2008 February 1; 70(2):197–204. [PubMed: 18256345]
40. Tullman DF, Dracup K. Knowledge of heart attack symptoms in older men and women at risk for acute myocardial infarction. J Cardiopulm Rehab. 2005; 25(1):40–42.
41. Dracup K, Westlake C, Erickson VS, Moser DK, Caldwell ML, Hamilton MA. Perceived control reduces emotional stress in patients with heart failure. J Heart Lung Transplant. 2003 January; 22(1):90–93. [PubMed: 12531418]
42. Nemeroff R, MIdlarsky E. Gender and racial correlates of personal control among emotionally disturbed older adults. Int J Aging Hum Dev. 2000; 50(1):1–15. [PubMed: 10735179]
43. Thurston RC, Kubzansky LD, Kawachi I, Berkman LF. Do Depression and Anxiety Mediate the Link Between Educational Attainment and CHD? Psychosom Med. 2006 January 1; 68(1):25–32. [PubMed: 16449408]
44. Turner RJ, Lloyd DA. The Stress Process and the Social Distribution of Depression. J Health SocBehav. 1999; 40(4):374–404.
45. Judd LL, Paulus MP, Wells KB, Rapaport MH. Socioeconomic burden of subsyndromal depressive symptoms and major depression in a sample of the general population. Am J Psychiatry. 1996 November 1; 153(11):1411–1147. [PubMed: 8890673]
46. Johnson J, Weissman MM, Klerman GL. Service utilization and social morbidity associated with depressive symptoms in the community. JAMA. 1992 March 18; 267(11):1478–1483. [PubMed: 1538538]

47. Bush DE, Ziegelstein RC, Tayback M, Richter D, Stevens S, Zahalsky H, et al. Even minimal symptoms of depression increase mortality risk after acute myocardial infarction. Am J Card. 2001 August 15; 88(4):337–341. [PubMed: 11545750]

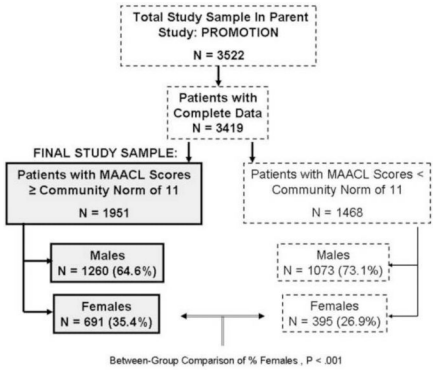

Figure 1.
Derivation of Study Sample

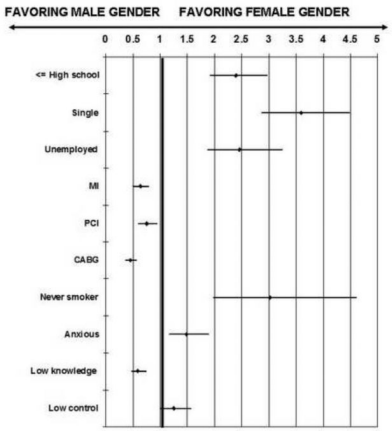

Figure 2.
Factors favoring male and female gender in multivariable analysis

Table 1

Bivariate Comparisons of Demographic Characteristics in Men and Women with CHD and with and without Depressive Symptoms

	Sample without Depressive Symptoms (N = 1468)				**Sample with Depressive Symptoms (N= 1951)**			
Variable	**Male (N = 1073)**	**Female (N = 1129)**		**P**	**Male (N = 1260)**	**Female (N = 691)**		**P**
	Mean (SD)	Mean (SD)			Mean (SD)	Mean (SD)		
Age	67.4 (10.1)	69.6 (9.8)		< 0.001	65.5 (11.6)	68.3 (11.5)		< 0.001
	N (%)	N (%)	Odds Ratio (95% CI)		N (%)	N (%)	Odds Ratio (95% CI)	
≤ High school education	299 (27.9)	172 (43.5)	2.00 (1.57–2.54)	<0.001	438 (34.8)	379 (54.8)	2.28 (1.89–2.76)	< 0.001
Single	197 (18.4)	195 (49.4)	4.34 (3.38–5.57)	<0.001	276 (21.9)	344 (49.8)	3.53 (2.89–4.32)	< 0.001
Uninsured or government-only health insurance	494 (46.0)	639 (56.6)	1.39 (1.10–1.75)	0.006	610 (48.4)	389 (56.3)	1.37 (1.1 –1.65)	0.001
Non-Caucasian	96 (8.9)	39 (9.9)	1.12 (0.75–1.65)	0.586	100 (7.9)	58 (8.4)	1.06 (0.7 –1.49)	0.723
Not working	716 (66.7)	314 (79.5)	1.93 (1.47–2.55)	< 0.001	840 (66.7)	577 (83.5)	2.53 (2.0 –3.19)	< 0.001

*CI = Confidence Interval

Table 2

Bivariate Comparisons of Clinical Characteristic in Men and Women with CHD and with and without Depressive Symptoms

	Sample without Depressive Symptoms (N = 1468)				**Sample with Depressive Symptoms (N= 1951)**			
Variable	Male (N = 1073)	Female (N = 395)			Male (N = 1260)	Female (N = 691)		P
	Mean (SD)	Mean (SD)			Mean (SD)	Mean (SD)		
Body mass index	27.2	26.9		0.185	27.9 (4.8)	27.8 (6.2)		0.777
	N (%)	N (%)	Odds Ratio (95% CI)		N (%)	N (%)	Odds Ratio (95% CI)	
History of MI	569 (54.2)	201 (51.5)	0.90 (0.71–01.13)	0.361	729 (57.9)	340 (49.2)	0.71 (0.59–0.85)	< 0.001
History of angina	532 (50.0)	167 (42.6)	1.08 (0.85–1.37)	0.516	734(58.3)	442(64.0)	1.27 (1.05–1.54)	0.014
History of PCI	1178 (49.8)	489 (43.8)	0.74 (0.59–0.94)	0.012	619 (49.1)	301 (43.6)	0.80 (0.66 – 0.96)	0.018
History of bypass	555 (51.8)	159 (40.3)	0.63 (0.50–0.79)	<0.001	619 (49.1)	240 (34.7)	0.55 (0.46 – 0.67)	< 0.001
History of valvular surgery	52 (4.9)	19(4.9)	1.00 (0.58–1.71)	0.987	67 (5.3)	41	1.12 (0.75 – 1.67)	0.569
Peripheral vascular disease	87 (8.4)	42 (11.1)	1.36 (0.93–2.00)	0.118	135 (10.7)	82 (11.9)	1.12 (0.84 – 1.50)	0.439
Diabetic	196 (18.4)	68 (17.2)	0.92 (0.68–1.29)	0.595	316 (25.1)	157 (22.7)	0.88 (0.71 – 1.09)	0.245
History of stroke	84 (8.0)	36 (9.1)	1.16 (0.77–1.75)	0.467	136 (10.8)	80 (11.6)	1.08 (0.81 – 1.45)	0.598
Hypercholesterolemic	683 (63.7)	263 (66,6)	1.14 (0.89–1.45)	0.298	812 (64.4)	466 (67.4)	1.14 (0.94 – 1.39)	0.183
Hypertensive	563 (52.5)	246 (62.3)	1.50 (1.18–1.89)	0.001	661 (52.5)	404 (58.5)	1.28 (1.06 – 1.54)	0.011
Did not attend cardiac rehab	476 (44.4)	194 (49.1)	1.21 (0.96–1.53)	0.105	607 (48.2)	399 (57.7)	1.47 (1.22 – 1.77)	< 0.001
No cardiologist	168 (15.7)	56 (14.2)	0.89 (0.64–1.23)	0.484	217 (17.2)	124 (17.9)	1.05 (0.82 – 1.34)	0.688

*CI = Confidence Interval

Table 3

Bivariate Comparisons of Psychobehavioral Variables in Men and Women with CHD and with and without Depressive Symptoms

	Sample without Depressive Symptoms (N = 1468)				Sample with Depressive Symptoms (N= 1951)			
Variable	**Male (N = 1073)**	**Female (N = 395)**			**Male (N = 1260)**	**Female (N = 691)**	**Odds Ratio (95% CI)**	**P**
	N (%)	N (%)			N (%)	N (%)		
Smoking status:				< 0.001				< 0.001
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)	0.027	477 (37.9)	281 (40.7)	1.13 (0.93–1.36)	0.224
Anxious	38 (3.5)	31 (7.8)	2.32 (1.42–3.78)	<0.001	712 (56.6)	433 (62.7)	1.29 (1.07–1.56)	0.008
Hostile	211 (19.7)	73 (18.5)	0.95 (0.69–1.24)	0.611	953 (75.6)	497 (71.9)	0.83 (0.67–1.02)	0.073
Low perceived control	398 (37.1)	168 (42.5)	1.26 (0.99–1.59)	0.058	676 (53.7)	420 (60.8)	1.34 (1.11–1.62)	0.002
Low knowledge of ASC symptoms	518 (48.3)	143 (36.2)	0.61 (0.48–0.77)	< 0.001	592 (47.0)	275 (39.8)	0.75 (0.62–0.90)	0.002
Less confident to respond to ASC symptoms	630 (58.7)	246 (62.3)	1.16 (0.92–1.47)	0.217	791 (62.8)	458 (66.3)	1.17 (0.96 1.14)	0.123
More negative beliefs about ASC symptoms	443 (41.3)	165 (41.8)	1.02 (0.81–1.29)	0.867	600 (47.6)	339 (48.9)	1.05 (0.88– 1.27)	0.584
Assesses risk of heart attack inaccurately	543 (50.6)	156 (39.5)	0.64 (0.51–0.81)	< 0.001	547 (43.4)	230 (33.3)	0.65 (0.54– 0.79)	< 0.001

Table 4

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	.
Median	17	16	17	.003
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	