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Gender Differences in Fatigue Associated With Acute Myocardial Infarction

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Abstract

INTRODUCTION—Fatigue is a symptom of acute myocardial infarction (AMI); however, few studies have characterized the fatigue associated with AMI in men and women.

METHODS—The convenience sample included 88 men and 28 women admitted with a diagnosis of AMI at 6 Midwestern facilities. Data were collected upon hospital admission and 30 days after discharge. A total of 37 men and 10 women responded to the 30-day questionnaires. The Profile of Mood States Fatigue (POMS-F) subscale was used to measure fatigue and the Depression-Dejection subscale to measure depressed mood.

RESULTS—At baseline, significant gender differences were found, with women more likely to have higher POMS-F scores (15.80, SD = 7.33) than men (11.19, SD = 7.04, $P = .004$). Significant gender differences were also found at 30 days ($t = 2.40$, $df = 45$, $P = .02$). POMS-F scores for women were higher at baseline, with decreased fatigue levels 30 days after discharge ($t = 5.36$, $df = 9$, $P \leq .05$). No differences were found in POMS-F scores for men ($t = 1.26$, $df = 36$, $P = .213$) between baseline and 30 days after discharge. Fatigue was associated with depressed mood and gender at baseline ($R^2 = 0.48$, $P < .05$) and 30 days after discharge ($R^2 = 0.308$, $P < .05$).

CONCLUSIONS—In this sample, fatigue at baseline and at 30 days after discharge was associated with gender and depressed mood. Women reported high levels of fatigue with AMI and lower fatigue after discharge. Men reported moderate to high fatigue levels, which did not change over time. Further research is needed to discern fatigue patterns before and after AMI.

Keywords

acute myocardial infarction; fatigue; gender differences; symptoms; women

Greater understanding of acute myocardial infarction (AMI) symptoms would facilitate prompt recognition of AMI and early access to medical care. AMI symptoms, however, may be challenging to recognize. Patients and clinicians most commonly identify chest pain, shortness of breath, and left arm pain as AMI symptoms.¹⁻³ However, not all patients experience chest pain or perceive it as significant.

Fatigue is a particularly concerning symptom because it is reported by up to 70% of patients diagnosed with AMI.⁴⁻⁶ Fatigue has been reported as a common early symptom preceding AMI in women,⁷ who are less likely than men to present with chest pain.^{2,4,6} Previous studies examining fatigue associated with AMI have several limitations. First, the severity of fatigue was often not quantified using instruments with established reliability and validity. Second, fatigue was measured only once, providing no context for changes in fatigue that may have been experienced. Therefore, this study was designed to measure the fatigue associated with AMI, using a reliable and valid measure after hospital admission and 30 days after discharge and to examine factors (gender, age, and depressive symptoms) that contribute to that fatigue.

METHODS

In this descriptive correlational study, subjects were studied after admission for AMI (2 days to 1 week) and 30 days after discharge. For the purpose of this article, the results focus strictly on fatigue as analyzed from the Profile of Mood States Fatigue (POMS-F) subscale. Data were collected between August 2005 and December 2007.

Sample

The study population consisted of 116 subjects (male, $n = 88$; female, $n = 28$) admitted with a diagnosis of AMI at 6 Midwestern hospitals with facilities capable of treating patients with AMI, ranging from small community hospitals to larger academic medical centers. Patients were eligible for the study if they were 18 years of age or older and (a) diagnosed on admission to the hospital with AMI confirmed with Troponin T or I $> .05$, or ST segment elevation greater than 1 mm in 2 or more contiguous leads; (b) not experiencing symptoms for at least 6 hours prior to data collection; (c) noted to have stable hemodynamic parameters; (d) able to speak and read English; and (e) alert and oriented to person, place, and time.

Instruments

Mood states were measured using the Profile of Mood States (POMS), a 65-item self-report instrument with evidence for reliability and construct validity to assess (1) tension-anxiety, (2) depression-dejection, (3) anger-hostility, (4) fatigue-inertia, (5) vigor-activity, and (6) confusion-bewilderment.⁸ The POMS has been used to assess mood states in various cardiac populations such as AMI^{9,10} and heart failure.^{11,12} Subjects are given a list of words and asked to describe their mood state, using a 5-point Likert scale from 0 (*not at all*) to 4 (*extremely*). Subject mood responses reflected the 7-day period prior to each of the

measured time points: hospital admission and 30 days after hospital discharge. The scores for each subscale are derived by adding the numeric modifiers for each item in a particular subscale.

The fatigue subscale (POMS-F) was used in this study to measure the symptom of fatigue at baseline and 30 days after discharge. The POMS-F consists of 7 items: (1) worn out, (2) listless, (3) fatigued, (4) exhausted, (5) sluggish, (6) weary, and (7) bushed. The score range is 0–28, with higher scores reflecting higher levels of fatigue. Mean scores were 7.3 ± 5.7 for men and 8.7 ± 6.1 for women according to normative data using a healthy adult sample.¹³

The POMS Depression-Dejection (POMS-D) subscale was included as a covariate variable to account for the association between depressed mood and symptoms of fatigue. The POMS-D includes 15 items and reflects a depressed mood.⁸ The score range is 0–60; higher scores reflect higher levels of depressed mood. Normative mean scores are 7.5 ± 9.2 for men and 8.5 ± 9.4 for women.¹³ Internal consistency for this study was high during both measurement time points: hospitalization (POMS-F, $\alpha = .89$; POMS-D, $\alpha = .90$) and 30 days after discharge (POMS-F, $\alpha = .91$; POMS-D, $\alpha = .90$).

Protocol

The study was approved by institutional review boards at each of the 6 participating facilities. Written consent was obtained from subjects determined to meet the inclusion criteria and willing to participate. Data collection occurred in 2 separate phases. In the first phase, questionnaires were distributed to subjects and completed in-hospital and collected by designated research personnel. Demographic data were also collected. Medical records were reviewed to provide baseline clinical information and medical history for each subject.

During phase 2, follow-up questionnaires were mailed to subjects 30 days after discharge. Subjects were informed through accompanying letters that continued participation was encouraged but not required. Each subject was provided with a self-addressed, stamped envelope to return questionnaires. Subjects responding to the 30-day questionnaires were included in a subset analysis to examine fatigue differences associated with and after discharge. Follow-up health history updates were collected to review any changes in subject medical regimen after hospital discharge.

Data Analysis

Data were analyzed using SPSS for Windows (version 15.0, SPSS Inc, Chicago, Illinois). The α level selected for statistical significance was $P < .05$. Measures of central tendency and frequency were used to describe demographic characteristics and POMS-F and POMS-D subscale levels for the initial and 30-day time periods. Comparisons between men and women were conducted using *chi-square* statistics and the Student *t* test. Stepwise multiple regression was used to determine the predictors of fatigue at both time points. In addition, demographic characteristics such as age and gender were included in the regression model. Furthermore, since many symptoms of fatigue are associated with depressive mood,¹⁴ the POMS-D subscale was included in the regression model.

Missing values from items on the POMS were assumed to be missing at random and were replaced using regression imputation from items of the same subscale when more than 90% of the items were answered. If more than 10% of the data were missing for a corresponding subscale, scores were determined to be invalid and excluded from computing a final POMS-F. Of the 116 subjects who completed initial POMS questionnaires, 2 did not have a POMS-F calculated because of more than 10% of missing data for this subscale. Of the 42.2% of

subjects who returned the 30-day POMS questionnaires, one subject did not have a POMS-F calculated because of missing data.

RESULTS

A convenience sample of 116 subjects (male, $n = 88$; and female, $n = 28$) was enrolled (Table 1). The mean ($\pm$ SD) age of subjects was 59.9 ± 11.15 years. A majority of subjects were white ($n = 86$, 74.1%) and employed full-time ($n = 59$, 51.8%) and had a high school education or less ($n = 57$, 51.3%). The proportion of African American women was significantly greater ($P = .026$) than that of African American men. A greater proportion of women ($P = .010$) than that of men were divorced/separated. Among subjects with identified locations of AMI ($n = 96$), most were diagnosed with inferior wall AMI ($n = 53$, 53.5%) or anterior wall AMI ($n = 20$, 20.2%). Most subjects ($n = 96$, 88.1%) underwent percutaneous coronary intervention for treatment of AMI. There were no differences in the comorbidities between men and women. Participation in cardiac rehabilitation programs was reported in returned 30-day questionnaires by 32.4% of men and 50% of women.

Data collection for the 30-day surveys generated a return rate of 42.2%. Analysis of the nonresponder subgroup yielded no differences in age, race, education, marital status, employment, or previous history of coronary artery disease, hypertension, and hypercholesterolemia. To eliminate the possibility of fatigue or depressed mood as a source for nonresponse, fatigue measures were compared to the initial data collection. This analysis demonstrated no significant difference in fatigue (POMS-F: $t[112] = -0.680$; $P = .498$) or depressed mood scores (POMS-D: $t[111] = 1.16$; $P = .246$) between responders and nonresponders.

The relationships between fatigue and the following variables were examined: gender, age, and depressive symptoms. Significant effects were found between fatigue/gender and fatigue/depressive symptoms, and these are described below. There was no significant relationship between fatigue and age (Table 2). Therefore, the relationship among fatigue, gender, and depressive symptoms was examined in the final regression model (Table 3).

Gender Differences

Descriptive findings of fatigue scores are summarized in Table 4. The following gender comparisons for baseline and 30-day data reflect only those subjects who returned follow-up questionnaires (men, $n = 37$; women, $n = 10$). For the baseline data, women were more likely to have higher POMS-F scores (15.80, SD = 7.33) than men (11.19, SD = 7.04, $P = .004$). When analyzed as a separate group, POMS-F scores for women were significantly higher at baseline, with decreases in the level of fatigue 30 days after discharge ($t = 5.36$, $df = 9$, $P \leq .05$). In contrast, 30-day POMS-F scores of men did not change substantially from baseline ($t = 1.26$, $df = 36$, $P = .213$). Although women had lower POMS-F scores (5.73, SD = 4.13) at 30 days, men at that time continued to exhibit moderate to high levels of fatigue (10.63, SD = 6.03). Even with the 47% response rate for returned questionnaires, significant gender differences were maintained between POMS-F scores for men and women at 30 days ($t = 2.40$, $df = 45$, $P = .02$).

Mean POMS-D scores at baseline were 10.38 (SD = 9.95) for men and 14.19 (SD = 11.24) for women and were not significantly different ($t = -1.66$, $df = 111$, $P = .09$). When examining only those subjects who returned questionnaires at both time points, mean POMS-D scores decreased at 30 days (men, 7.39 [SD = 8.35]; women, 6.00 [SD = 5.98]) for women. The POMS-D scores were not significantly different between men and women at either time point in this study.

Correlates of Fatigue

The correlates of fatigue at both study time points are displayed in Table 3. Gender and depressive mood were included in the regression model as independent variables. Regression analysis showed that fatigue after hospital admission for AMI ($P < .05$) and at 30 days after discharge ($P < .05$) was best predicted by the POMS-D and gender. Both variables explained 48% of the variance in fatigue at baseline and 30.8% of the variance 30 days after discharge. In both regression models, the POMS-D contributed the most toward explaining fatigue levels at baseline (45.2%) and after discharge (21.6%). The negative beta ($\beta = -.304$, $P = .02$) in the 30-day analysis supports the directional change in the fatigue experienced by men and women measured at the time of AMI hospital admission and 30 days after discharge.

DISCUSSION

Fatigue is a complex symptom that can result in physical and/or mental weariness, decreased functional capacity, and diminished quality of life.¹⁵ The potential diagnostic use of fatigue in the clinical setting is limited by the high incidence of this symptom in acute and chronic illness, and the lack of any consistent definition hinders understanding the role of fatigue within the clinical setting.

Results from DeVon et al¹⁶ suggest that fatigue is often reported by patients as a symptom in AMI but is rarely documented in the medical record. Current research exploring fatigue in AMI has focused on defined groups, particularly women, at 1 period in time.^{7,17-21} Extreme fatigue was found to be the most commonly experienced symptom reported by women before AMI.¹⁸ In qualitative studies, women described fatigue levels as overwhelming and unusual.^{19,20} McSweeney et al⁷ assessed fatigue by evaluating the prodromal symptoms of women ($n = 515$), using 60-minute telephone surveys; however, the surveys were administered 4–6 months after AMI, requiring participants to use distant recall. A study using only male subjects ($n = 3,877$) found that exhaustion in those without heart disease was predictive of future coronary events.²²

Depressive symptoms may be an important covariate of fatigue in AMI because the comorbid presence of depression with heart disease has been associated with poorer prognosis and increased mortality, even as long as 18 months after the acute cardiac event.^{14,23} The overlapping symptoms of fatigue and depression creates challenges for diagnosing depression and for measuring fatigue. Therefore, when investigating fatigue as a symptom of AMI, it is important to measure patient depressive symptoms to determine the possible contribution of depressive symptoms to the experience of fatigue.

Findings suggest that men and women differ in their experiences of fatigue associated with AMI measured after hospital admission and 30 days after AMI. Previous studies evaluated fatigue with AMI using samples consisting primarily of women.^{7,18-20} In our sample, the differences in the amount of fatigue experienced were explained by gender and depressed mood, with women reporting less fatigue 30 days after discharge. Furthermore, most subjects reported moderate or high levels of fatigue associated with and after discharge. This important finding lends support to the hypothesis that interrelationships exist among gender, depressive symptoms, and fatigue symptoms for AMI and 30 days after discharge.

Symptom of Fatigue in Women

The findings from the women concur with previously published data for prodromal symptoms during AMI. Women reported higher POMS-F scores at baseline, indicating that fatigue levels might be increased during the period immediately before AMI. Interestingly,

statistically significant differences were still obtained despite the sample size of 28 women at baseline and only 10 women during the 30-day follow-up period.

Mean fatigue scores were higher than the normative scores, except for fatigue scores in women at 30 days. These findings are consistent with earlier reports of fatigue prior to AMI,^{4,5} although it was found to be much more of an issue for women than for men in our sample. Our results, while limited to only 2 measurement time points, suggest changes in fatigue for women experiencing AMI.

Fatigue in Men

Fatigue scores for men were found to be moderate or high, both at baseline and 30 days after discharge. Men may experience fatigue for a longer time because of social and physical readjustments after AMI. For example, men may have struggled with fatigue after AMI as a result of returning to work and resuming previous roles.

Our study used only 2 time points, so it is premature to draw conclusions about the importance of the 30-day post-AMI time point for fatigue in men. Instead, we suggest that gender may influence the timing and level of fatigue experienced during the post-AMI recovery period. In a previous study,²² fatigue was assessed in men without heart disease, but only as a predictor for future AMI. As such, there is little to compare with our findings. Further research is needed to isolate the timing and source of fatigue in men and determine whether this symptom can be correlated with other clinical factors.

Depressed Mood at Baseline and 30 Days After Discharge

Women were found to have higher depressed mood scores at baseline and at 30 days than men, supporting earlier findings.⁵ Both men and women had lower depressed mood scores at the 30-day time point, with scores that were lower than those reported in the POMS-D adult normative data.¹³ Although findings were not significantly different between men and women, depression was found to predict almost half of the variance in the model of fatigue associated with AMI.

Given the high POMS-D scores exhibited at baseline and the reductions after 30 days, subjects may have experienced depressed mood because of the emergent nature of the hospitalization, recent diagnosis of AMI, and/or the hospital environment where these questionnaires were completed. Some data suggest that the symptoms of depressed mood and fatigue may actually represent similar constructs.²⁴ Additional research is needed to clarify the distinction between depressive mood and fatigue with and after AMI.

Strengths and Limitations

The current study has several strengths. Our study is one of the first to explore changes in fatigue for men and women, using a validated measure of fatigue. Furthermore, fatigue was quantitatively measured using a method other than a present/absent symptom format. The inclusion of both men and women diagnosed with AMI helps shed further light on gender differences associated with the symptom of fatigue. Furthermore, the collection of data at 6 Midwestern hospital facilities, ranging from academic medical centers to community hospitals, adds to the generalizability of these findings.

Some limitations of the study should be addressed. First, the study included only 2 time points using a descriptive, correlational design. With a limited measurement time frame, there was no way to determine how much fatigue was experienced during the recovery period 30 days after discharge or whether fatigue was impacted by physical inactivity or increasing physical activity as a part of recovery or participation in exercise training, such as

cardiac rehabilitation. Second, a convenience sampling was used for inclusion, so the potential for selection bias may limit the validity of these results. Third, we restricted the sample to those subjects who were hemodynamically stable. Quite possibly, the sickest patients were excluded, resulting in a possible sampling bias. Finally, the limited number of women at both time points may be problematic. Despite this limitation, gender differences for the symptom of fatigue remained statistically significant.

CONCLUSIONS

The results of this study suggest that men and women differ in their experiences of fatigue associated with, and after, AMI. Women in our sample experienced higher fatigue during the week prior to AMI. Fatigue level in men remained moderate to high 30 days after discharge, while dropping significantly in women. Further research is needed to fully understand the multidimensional aspects of fatigue associated with AMI, as well as the best approaches for the measurement of this clinical symptom. More long-term studies evaluating fatigue, using larger sample sizes of men and women after AMI, may help clarify the results. Other factors such as medications, treatment modalities (percutaneous coronary interventions compared to surgical treatment), and assessment of left ventricular dysfunction should be incorporated into future studies to determine whether these variables may be the source of fatigue experienced by patients before and after AMI. As more is understood about the symptom of fatigue during the prodromal period of AMI, providers will be able to develop targeted interventions to help patients recognize the early signs and symptoms of a myocardial infarction.

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Table 1

Baseline Demographic and Clinical Characteristics by Gender (N = 116)

Characteristics	Men (n = 88), n (%)	Women (n = 28), n (%)	P
Age mean (range)	59.3 (34–88)	62.0 (40–81)	.146
Race			.026
African American	12 (13.6)	11 (39.3)	
Hispanic	3 (3.4)	1 (3.6)	
White, non-Hispanic	71 (80.7)	15 (53.6)	
Other	2 (2.3)	1 (3.6)	
Education			.260
High school or less	44 (52.9)	13 (46.5)	
College	24 (28.9)	13 (46.5)	
Graduate school	15 (18.1)	2 (7.1)	
Marital status			.010
Married	65 (73.9)	13 (46.4)	
Divorced/separated	10 (11.4)	7 (25.0)	
Widowed	3 (3.4)	5 (17.9)	
Single	6 (6.8)	3 (10.7)	
Employment			.011
Full-time	51 (59.3)	8 (28.6)	
Part-time	2 (2.3)	0	
Retired	24 (27.3)	12 (42.9)	
Homemaker	0	2 (7.1)	
Disabled	1 (1.1)	2 (7.1)	
Unemployed	3 (3.4)	3 (10.7)	
Comorbidities			
CAD	28 (31.8)	10 (35.7)	.818
Hypertension	39 (44.3)	15 (53.6)	.512
Hypercholesterolemia	37 (42.0)	12 (42.9)	.912
PVD	6 (6.8)	3 (10.7)	.547
Diabetes ^a	22 (25.1)	13 (46.4)	.055
Anxiety/depression	8 (9.1)	3 (10.7)	.855
Location of AMI			.265
Inferior	42 (56.0)	11 (45.8)	
Posterior	2 (2.7)	0	
Anterior	16 (21.3)	4 (16.7)	
Lateral	3 (4.0)	3 (12.5)	
Anterior lateral	6 (8.0)	2 (8.3)	
Inferior lateral	5 (6.7)	2 (8.3)	
Type of Intervention			.493
PCI	73 (83.0)	23 (82.0)	
CABG	4 (4.5)	3 (10.7)	

Characteristics	Men (<i>n</i> = 88), <i>n</i> (%)	Women (<i>n</i> = 28), <i>n</i> (%)	<i>P</i>
Medical therapy	4 (4.5)	2 (7.1)	

Abbreviations: AMI, acute myocardial infarction; CABG, coronary artery bypass graft; CAD coronary artery disease; PCI, percutaneous coronary intervention; PVD, peripheral vascular disease.

^aReflects type 1 and type 2 diabetes.

Table 2

Correlation Matrix—Fatigue Before and After AMI

Factor	POMS-F	Gender	POMS-D	Age
Initial POMS fatigue (<i>n</i> = 113)				
POMS-F				
Gender	0.268 ^a			
POMS-D	0.672 ^a	1.56		
Age	−0.021	0.105	−0.194 ^a	
30-day POMS fatigue (<i>n</i> = 47) ^b				
POMS-F				
Gender	−0.338 ^a			
POMS-D	0.465 ^a	−0.072		
Age	−0.068	0.105	−0.224	

Abbreviations: AMI, acute myocardial infarction; POMS-F, Profile of Mood States Fatigue subscale; POMS-D, Profile of Mood States Depression Dejection subscale.

^a*P* < .05.

^b30-day POMS-F and POMS-D.

Table 3

Predictors of Fatigue Before and After AMI Using Stepwise Regression

Factor	β	r^2 change	t	P
Initial POMS fatigue ($n = 113$)				
POMS depression-dejection	.642	0.452	9.29	<.001
Gender	.192	0.036	2.77	.006
Full model information: $R^2 = 0.48$; $F_{2,110} = 52.36$;				<.05
30-day POMS fatigue ($n = 47$)				
POMS depression-dejection ^a	.442	0.216	3.51	.001
Gender	-.304	0.092	-2.41	.02
Full model information: $R^2 = 0.308$; $F_{2,44} = 9.81$;				<.05

Abbreviations: AMI, acute myocardial infarction; POMS, Profile of Mood States.

^a30-day POMS depression dejection.

Table 4

Profile of Mood States Fatigue Subscale Scores

Response (Score range)	Men	Women
Initial data collection ($N = 114$), n (%)		
None (0)	3 (3.4)	0 (0)
A little (1–6)	25 (28.8)	3 (11.1)
Moderate (7–13)	25 (27.6)	7 (25.9)
Quite a bit (14–20)	23 (27.6)	9 (33.4)
Extreme (>20)	11 (12.6)	8 (29.6)
Total	87	27
30-day data collection ($N = 47$) ^a , n (%)		
None (0)	1 (2.7)	2 (20.0)
A little (1–6)	9 (24.3)	4 (40.0)
Moderate (7–13)	18 (48.7)	4 (40.0)
Quite a bit (14–20)	6 (16.2)	0 (0)
Extreme (>20)	3 (8.1)	0 (0)
Total	37	10

^aData reflect only subjects who returned Profile of Mood States questionnaire 30-Days after acute myocardial infarction