Racial Differences in Women's Prodromal and Acute Myocardial Infarction Symptoms

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Abstract

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Background—Minority women, especially Black and Hispanic, have higher rates of coronary heart disease (CHD) and resulting disability and death than Whites. Because most studies have included insufficient numbers of Blacks and Hispanics for meaningful analyses, lack of knowledge of minority women's CHD symptoms may contribute to these disparities.

Objective—To compare Black, Hispanic and White women's prodromal CHD and acute myocardial infarction (AMI) symptoms.

Methods—Retrospective telephone surveys were conducted with 1270 (545 Black; 539 White, 186 Hispanic) cognitively intact women post AMI at 15 sites. Using general linear models, symptom severity and frequency were compared among racial groups, controlling for cardiovascular risk factors. Using logistic regression models, we examined individual prodromal or AMI symptoms by race, adjusting for cardiovascular risk factors.

Results—Ninety-six percent of all women reported prodromal symptoms. Unusual fatigue (73%) and sleep disturbance (50%) were the most frequent prodromal symptoms. Eighteen symptoms differed significantly by race ($p < 0.01$); Blacks reported higher frequencies of 10 symptoms than Hispanics or Whites. Less than 37% reported prodromal chest discomfort; Hispanics reported more pain/discomfort symptoms than Black or White women.

Minority women reported more acute symptoms ($p < 0.01$). The most frequent symptom, regardless of race, was shortness of breath (62.8%); 22 symptoms differed by race ($p < 0.01$). Twenty-eight percent of Hispanics, 38% Blacks, and 42% Whites reported no chest pain/discomfort.

Conclusions—Significant racial differences existed in prodromal and AMI symptoms reported by women in this study. Racial descriptions of women's CHD and AMI symptoms should assist providers in interpreting women's symptoms.

INTRODUCTION

Minority women, especially Black and Hispanic women, have higher rates of coronary heart disease (CHD) disability and death than White women, even when controlling for socioeconomic status.[1–4] The reasons for minority women's poor CHD outcomes are well-established and include disparities in access to care and sub-standard treatment.{Agency for Healthcare Research and Quality, 2006 1086 /id; Casper, 2000 1112 /id; Chin, 2007 1081 / id; Davis, 2007 1082 /id; Jani, 2006 1064 /id} Lack of recognition of early presenting symptoms of CHD and acute myocardial infarction (AMI) by women and their health care providers also contributes to these poor outcomes since delayed recognition of symptoms limits options for efficacious treatment. However, little is known about minority women's CHD and AMI symptom presentation.

Recent research has explored differences in CHD and AMI symptoms, primarily between men and women.[8–10] For example Canto et al.[8] reviewed both large multi-site and smaller studies conducted over the past 35 years and concluded that chest pain/discomfort is the most commonly reported AMI symptom among both men and women, but more women than men report non-chest pain AMIs. However, because of insufficient numbers of minority women in studies such as those reviewed by Canto, et al,[8] no comparisons of women's symptoms by race have been reported. Although, a few studies have indicated that women's CHD and AMI symptoms, descriptors, or expectations may vary by race or ethnicity,[11–19] little is known about minority women's most common signs and symptoms of CHD and AMI.[20] Commenting on the challenge of diagnosing women's heart disease,

Dracup concluded that in order to foster early recognition and diagnosis, research must identify "those factors that shape symptom presentation."[21(p. 2396)] Race and cultural background may influence women's interpretation and description of their symptoms.[11–17] Therefore, examination of women's CHD symptoms by race is warranted and may add valuable information to assist in modulating the difficulty of diagnosing CHD in women.

To compare early warning prodromal CHD and AMI symptoms of women of different races/ethnicities, we conducted a study to:

1. Describe the prodromal and acute symptoms that women report with AMI and determine whether Black, Hispanic and White women differ in symptomatology.

2. Determine whether Black, Hispanic, and White women's prodromal and acute symptoms' differ in severity and frequency when controlling for known cardiovascular (CV) risk factors.

METHODS

This was a multi-center, retrospective telephone survey of ethnically diverse women who had experienced an AMI with subsequent hospitalization in the previous 4–6 months. We selected this 4–6 month time frame because women in earlier studies indicated that they needed time to identify which symptoms were prodromes to AMI based upon symptom changes prior to and after AMI.[22,23] We obtained women's names from 15 urban and rural medical centers of various sizes in eight geographically diverse states across the United States. Employees at each center compiled a list of all women's names with a discharge ICD-9 code of 410.0–410.9, indicating AMI, and verified this diagnosis with the medical record. Recruiters at each center attempted to telephone all women on the list to determine their interest in participation, establish self-reported ethnicity and race, and ascertain language preference. Recruiters then provided the investigators with a list of women who expressed interest including their contact information, date of AMI, discharge ICD-9 code, ethnicity/race (race) and language preference. All appropriate institutional review boards for the protection of human subjects approved the study.

Research assistants (RAs) telephoned potential participants, explained the study, and verified eligibility. Besides having a diagnosed AMI in the previous 4–6 months, eligible women were 21 or older, identified themselves as Black (non-Hispanic), Hispanic, or White (non-Hispanic), spoke either English or Spanish, had telephone access, and passed the Blessed Cognitive Screen.[24] After gaining verbal consent, RAs administered the cognitive screen and if the women passed the screen, conducted the interviews in each participant's preferred language: English, Mexican-Spanish or Caribbean/South American-Spanish. During the interviews, RAs entered responses directly into an ACCESS database, programmed to force choices and reject responses outside the specified range. This strategy minimized missing and erroneous data.

Measurement

Prodromal and Acute Symptoms—RAs collected data using the McSweeney Acute and Prodromal Myocardial Infarction Symptom Survey (MAPMISS), which includes 33 prodromal and 37 acute symptoms.[25] The psychometric properties of the MAPMISS have been described elsewhere.[23,25] Symptoms are categorized as either *general* (e.g. fatigue, anxious) or *discomfort/pain.* The MAPMISS uses the following definitions: "Prodromal symptoms (1) are new or change in intensity or frequency before the AMI, (2) are intermittent before the AMI, and (3) disappear or return to previous levels after the AMI."[23](p2619–20) Acute symptoms appear with the AMI and resolve after treatment. The MAPMISS also contains questions about 10 risk factors (body mass index (BMI) > 29,

diabetes mellitus, hypertension, hypercholesterolemia, nicotine addiction, consistent secondhand smoke exposure, non-exerciser, over age 50, personal history of CHD, and family history of CHD), comorbidities, and demographics. Preliminary work indicated most women did not know their serum cholesterol numbers, therefore we asked women if they had ever been told by a clinician if their cholesterol was high or elevated. Nicotine addiction was defined as being a smoker at the time of the AMI. We queried women about second hand smoke by asking if they were consistently exposed to second-hand smoke "every day or most days" at any location (e.g. home, work).

Because we recruited from sites across the United States, we translated the MAPMISS into Spanish using standard protocols. Two bilingual health professionals translated the MAPMISS into Mexican-Spanish and Caribbean/South-American-Spanish and then back into English with 100% agreement on the second back-translation. We pilot tested the Spanish versions in Texas and Florida with Hispanic women who had experienced an AMI in the previous 6 months (N=19). The women did not add any additional prodromal or acute symptoms and had no difficulty understanding or answering the questions.

Data Analysis

From the women's responses, we created two symptom description indexes. To calculate the prodromal symptom index, we weighted each of the 33 prodromal symptoms by its reported severity (0–3, 3=most severe) and frequency (less than monthly to daily, 0.125–7, 7=daily), and summed across symptoms (range 0–693). We calculated the acute symptom index in a parallel manner based on 37 acute symptoms, omitting frequency because acute symptoms were onetime events (range 0–111).

Proportions and exact 95% confidence intervals were computed for each cardiovascular risk factor by racial groups (age, BMI, high cholesterol, hypertension, diabetes mellitus, personal or family history cardiovascular disease, nicotine addition, second hand smoke exposure, and no exercise during the 6 months prior to the AMI). We used Chi-square tests to compare differences among racial groups. Poisson regression was used to compare the number of symptoms in different racial groups while adjusting for cardiovascular risk factors. After square root transformation of the severity and/or frequency symptom indexes to improve normality, we developed general linear models, adjusting for cardiovascular risk factors to compare symptom indexes with different racial groups. After calculating the number of prodromal and acute symptoms for each woman, we used logistic regression to examine the association of racial groups and each prodromal and acute symptom. Significant symptoms at the level of 0.01 were presented. The adjusted p values were further calculated after adjusting for the cardiovascular risk factors. The data analysis was conducted using SAS (Version 9.1, 2004, SAS Institute, Cary, NC).

RESULTS

Study Participants

Recruiters submitted 1935 names of potential subjects. Of these, 286 were ineligible. Of the remaining 1649 eligible names, 225 (14%) could not be located, 87 (5%) declined to participate, and 43 had died (3%). We consented 1294 women (78%) but excluded 24 who failed the cognitive screen. A total of 1270 women, 545 (43%) Black, 186 (15%) Hispanic, and 539 (42%) White, participated in the study.

On average, Black women were 62.8 (±13.3) years old, Hispanic women were 64.3 (±12.9) years old, and White women were 66.6 (±12.2) years old. White women were significantly older than Blacks (p=0.001). Educational levels ranged from first grade to doctoral degrees though the majority of women had attended high school; Whites were more educated than

minority women (p=0.001). Income distribution differed significantly (p<0.001), with minorities reporting less household income than Whites. Over 50% of the minority women reported annual household incomes of less than $10,000, compared with 23% of Whites. Table 1 shows the distribution of CV risk factors by racial group. Significantly more Black women than White or Hispanic women reported having a BMI >29 (p<0.003) and hypertension before AMI (p<0.003), and significantly more minority women than White women reported having diabetes mellitus (p<0.003).

Group Comparisons of Symptoms: Number, Severity, &/or Frequency

On average, the Black and Hispanic groups reported significantly more prodromal symptoms than Whites (p <0.001), which remained significant after controlling for CV risk factors. However, after controlling for CV risk factors there were no differences in severity and/or frequency of prodromal symptoms among the groups (p=0.035). As with prodromal symptoms, White women, as a group, reported the fewest number of acute symptoms and had a significantly lower mean acute severity index than minority women even after controlling for CV risk factors (p<0.001; see Table 2). General linear models, that included race and all risk factors simultaneously, were fitted to compute adjusted significance probabilities of the impact of these factors on the mean number of prodromal and acute symptoms and their respective indices (see Table 3).

Prodromal Symptoms

Over 95 % of all women, regardless of race, (n=1213) reported early warning prodromal symptoms, with unusual fatigue the most frequently reported symptom (n=930, 73%). The other most commonly reported symptoms were sleep disturbances (n=638, 50%), anxiety (n=573, 45%), shortness of breath (n=565, 44.5%), and frequent indigestion (n=494, 38.9%). Only 37.7% of women reported any chest discomfort or pain during the prodromal period.

Using Chi-square tests we examined differences among racial groups. We found significant differences (p<0.01) on 18 of the 33 prodromal symptoms. Using logistic regression, we examined the association between the frequency of prodromal symptoms and race adjusting for the 10 CV risk factors; 10 symptoms remained significantly different ($p \leq 0.003$; see Table 4). A complete list of prodromal symptoms on the MAPMISS, including those that were not significant in this study, has been reported elsewhere.[23]

Symptoms were classified as either generalized or pain/discomfort. Black women had the highest rates of all generalized symptoms except increased intensity of headaches and cough prior to AMI. Hispanic women had the highest rates of all pain/discomfort symptoms during the prodromal period.

Because angina is a classic CHD symptom and the locations of chest pain/discomfort on the MAPMISS are not mutually exclusive, we combined these locations (generalized chest, centered high in chest, and left breast) to examine the frequency of women reporting any chest pain/discomfort. We found that 43.5% of the Hispanic women, 39.4% of Black women, and 30.1% of the White women reported chest pain/discomfort during the prodromal period. Women also reported a variety of shoulder, arm, and hand sensations including burning, numbness, and pain. Again, because these symptoms were not mutually exclusive, we combined the symptoms to form inclusive symptoms of either right or left arm sensations. Fewer than 21% of the women reported any prodromal left or right arm symptoms.

Finally, we developed a list of the ten most common prodromal symptoms by race, using the combined chest and combined arm locations as single symptoms (see Table 5). Unusual

fatigue was the most frequently reported symptom, regardless of race. Sleep disturbance was the second most commonly reported symptom for Black and White women and it was third for Hispanic women. Feeling anxious was the second most common for Hispanic women. Prodromal chest pain/discomfort ranked 4th for Hispanic women, 6th for White women and 8th for Black women.

Acute Symptoms

Of the 1270 women, all but 3 reported acute symptoms. These 3 denied experiencing any symptoms. Shortness of breath was the most frequently reported symptom (n=798, 62.8%) followed by weakness (n=697, 54.9%), unusual fatigue (n=613, 48.3%), dizziness (n=559, 44%), and cold sweat (n=508, 40%). Using Chi-square tests we examined differences among racial groups. We found significant differences ($p<0.01$) on 22 of the 37 acute symptoms (see Table 6). Using logistic regression, we examined the association between the frequency of acute symptoms and race adjusting for CV risk factors; 15 symptoms remained significantly different ($p \leq 0.003$). Of these 15 symptoms, Black women reported 2 generalized symptoms, feeling hot and flushed and indigestion, significantly more frequently than Hispanic and White women. Hispanics and Whites did not report any generalized symptoms significantly more often than Blacks. White women reported the least number of generalized symptoms except for indigestion. Like the racial differences seen in prodromal symptoms, Hispanic women had the highest rates of pain/discomfort in all locations, except for pain in the left breast. White women reported pain/discomfort in 4 locations significantly more often than Black women (back, generalized chest, both arms and jaw/teeth); but less frequently than Hispanic women.

We collapsed the three chest locations of acute pain/discomfort and three arm locations into inclusive symptoms as we did for prodromal symptoms. We then developed a list of the ten most frequent acute symptoms by race (see Table 7). Chest pain/discomfort was the most frequent acute symptom for Hispanic (72.0%) and White (58.3%) women and the second most frequent symptom for Black (61.8%) women. Shortness of breath was the most frequently reported symptom for Black women. The three groups differed significantly in chest symptoms ($p=0.004$); post hoc tests indicated that the White women differed significantly from the Hispanic women ($p<0.001$). These differences remain significant after adjusting for cardiovascular risk factors ($p=0.023$ and $p=0.006$ respectively).

Approximately 41% of the sample reported acute left arm sensations, while only 8.5% reported right arm sensations. Although not statistically significant, Hispanic women (44.1%) identified the most left arm involvement followed by Blacks (42.0%) and Whites (38.2%). Less than 13% of women subjects of any race reported right arm sensations during the acute episode.

DISCUSSION

This study provides the most comprehensive evidence-based description to date of women's CHD and AMI symptoms. Additionally, comparisons of the symptom intensity and/or frequency of the most common prodromal and AMI symptoms reported by women in different ethnic/racial groups in this study address major gaps in the literature concerning CHD and AMI symptoms in minorities and women.[20,21] Our descriptions of women's symptoms should assist racially diverse women in recognizing and interpreting the onset of symptoms as possibly cardiac in origin and increase the likelihood of seeking timely treatment. These data also provide valuable information to health care providers on CHD and AMI symptoms experienced by women in different racial groups.

Results indicate that racial groups have both differences and similarities in prodromal and AMI symptoms. Minority women reported significantly more prodromal symptoms than White women, although women in all racial groups (95–97%) experienced prodromal early warning symptoms. Unusual fatigue was the most common prodromal symptom regardless of race. Other researchers[11,22,23,26,27] have also implicated unusual fatigue as a prodromal symptom. The prodromal symptoms frequently reported by women in this study, including shortness of breath, indigestion, and unexplained anxiety, have also been reported by others as CHD symptoms.[9,23,28,29] A recent multi-site study[30] conducted with 247 elders post-MI (66% women) also reported frequent prodromal symptoms of fatigue (76%), dyspnea (62%), and sleep disturbance (41%), similar to the symptoms reported by the women in this study.

In our study, Black women reported significantly more prodromal symptoms than did White women, especially generalized symptoms such as unusual fatigue, and episodes of heart racing. Further, Blacks reported significantly greater intensity and/or frequency of prodromal symptoms than Whites. The Black women in this study were younger than the Hispanic and White women and had a greater number of potent risk factors, such as diabetes mellitus, suggesting that younger Black women with risk factors who have diffuse generalized, frequent and often severe symptoms may require vigilant attention and diagnostic evaluation for CHD. Although there is a scarcity of research on minority women's prodromal CHD symptoms, researchers investigating Black women's acute symptoms have noted that Black women reported more AMI symptoms[15] and more severe symptoms[12] than White women. These racial differences may be influenced by multiple comorbidities or by cultural interpretation of symptoms.

The majority of the women in this study (63%) did not report prodromal chest discomfort, and it was least common in White women. Lindgren et al.[30] found that approximately 50% of patients had some type of prodromal chest symptoms, but their findings were based on a sample of predominately White men and women and may not accurately reflect ethnically diverse women's prodromal chest symptoms. Because chest pain is often an essential symptom for pre-authorization of cardiovascular diagnostic procedures, such as cardiac catheterization, women without chest pain may not be referred for definitive diagnostic procedures.[31,32] If our finding that chest pain is not a frequent prodromal symptom in women is replicated, revision of referral policies/procedures for diagnostic testing may be warranted.

Minority women reported significantly more acute symptoms than White women, but regardless of race, shortness of breath was the most frequently reported individual acute symptom. Results from other studies[9,11,31,33] also support dyspnea as a major AMI symptom. The women in this study like those in others,[15,16,22,23,34] also reported other generalized acute symptoms, such as unusual fatigue, dizziness, and indigestion. However, in contrast to our findings, others[9,15,16] have indicated that women's key generalized AMI symptoms are neck and jaw pain and nausea. White and Black women in this study identified nausea among the top ten AMI symptoms, but they were numbers 9 and 10, respectively. Our findings and those of others cited above support the importance of assessing for non-chest pain generalized symptoms in addition to chest pain in women with suspected AMI.

After we combined all locations of acute chest pain/discomfort into a single symptom, it became the most frequent symptom for Hispanics and Whites but not for Blacks. Although the majority reported some type of chest symptoms during the actual AMI, 28% of Hispanic, 38% of Black, and 42% of White women did not report any chest pain/discomfort. Their lack of acute chest pain/discomfort is important since inappropriate or missed diagnosis in women is frequently attributed to lack of chest pain on presentation.[35,36] Other studies also

suggest that lack of chest pain in patients presenting with AMI is problematic.[29,32,36,37] For instance, Brieger and colleagues,[37] who compared the treatment and outcomes of those with and without chest pain, found that those without chest pain received less effective treatment and experienced greater inpatient morbidity and mortality. Other investigators[32,36] have reported similar findings, suggesting that women, especially those without chest pain, have a higher proportion of unrecognized AMI events than men.[35] This clearly indicates the need for health care providers to recognize the importance of assessing for non-chest pain generalized symptoms so that women presenting without chest pain during AMI events may receive optimal treatment.

Notably, Hispanic women in this study reported more pain/discomfort in multiple locations, similar to the findings of the Corpus Christi Heart Project,[16] which found that Hispanic women experienced significantly more upper back pain than their White counterparts did. Other studies[9,16,17,34] also indicate that women, including minorities, have more back pain/ discomfort than men.

Study limitations include non-probability sampling and the retrospective nature of the data. Additionally, all the women in the study had experienced an AMI event; therefore, we do not know whether women without AMI experience similar symptoms, though a small study[23] indicated that women with CHD reported significantly more symptoms than healthy women. It is also possible that women who did not survive the AMI event or expired prior to the interview might have reported different symptoms. Although the number of Black and White women in this study was essentially equal, Hispanic women constituted only 15% of the sample. It is possible that a larger number of Hispanic women may have reported different symptoms or intensity and/or frequency of symptoms. Finally, although we performed a cognitive screen, women may not have accurately remembered their symptoms, though Green[38] reports accurate recall after life-altering events.

CONCLUSION

Results of this study substantially increase our understanding of racial differences and similarities in prodromal and AMI symptoms. The tables showing the 10 most frequent prodromal and acute symptoms of AMI by race provide an evidence-based normative picture of racial symptom patterns. This is especially important for Black and Hispanic women with multiple risk factors who are more likely than Whites to have poor outcomes. Prodromal symptoms, especially unusual fatigue, sleep disturbance, anxiety, and dyspnea, even in the absence of chest pain/discomfort, should elevate the health provider's index of suspicion for a differential diagnosis including CHD. Early recognition of prodromal symptoms by both patients and providers maximize opportunities for risk stratification and diagnostic intervention prior to the occurrence of AMI. Additionally, the description of women's AMI symptoms by race should assist providers in interpreting women's symptoms, especially generalized non-chest pain symptoms. Earlier recognition, diagnosis, and treatment of AMI will increase the likelihood of improved outcomes in women with CHD.

CLINICAL PEARLS PAGE

Summary of Key Points

Minority women, especially Black and Hispanic, have higher rates of coronary heart disease (CHD) and resulting disability and death than Whites. This report provides an evidence-based description of a diverse sample of women's early warning prodromal and acute myocardial infarction (AMI) symptoms. Our findings indicate there are similarities

as well as significant racial differences in prodromal and AMI symptoms among Black, Hispanic, and White women.

- 96% of 1270 racially diverse women reported an average of approximately 7 prodromal (early warning) symptoms prior to their AMI.

- 63% of 1270 racially diverse women did not report any prodromal chest discomfort prior to AMI.

- During the prodromal period, Black women reported the greatest number of generalized symptoms, Hispanic women reported the highest rates of pain or discomfort symptoms, and White women reported the fewest prodromal symptoms.

- Black and Hispanic women reported a greater number of acute symptoms that were significantly more intense and/or frequent than White women's symptoms.

- Hispanic women reported the most pain and/or discomfort symptoms during AMI.

- During the AMI event, 28% of Hispanic women, 38% Black women, and 42% White women did not report any chest pain or discomfort.

Acknowledgments

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Table 1

Differences in Women's Cardiovascular Risk Factors by Race

Risk Factors	Black (N=545) No. (%) (95% CI)	Hispanic (N=186) No. (%) (95% CI)	White (N=539) No. (%) (95% CI)	All (N=1270) No. (%) (95% CI)	p-value
Age >50 years	438 (80.4)[b] (76.8, 83.6)	156 (83.9)[a,b] (77.8, 88.8)	481 (89.2)[a] (86.3, 91.7)	1075 (84.6) (82.5, 86.6)	<0.001
BMI > 29 (kg/m^2)	327 (60.0)[a] (55.8, 64.1)	70 (37.6)[b] (30.7, 45.0)	216 (40.1)[b] (35.9, 44.3)	613 (48.3) (45.5, 51.1)	<0.001
High cholesterol	357 (65.5)[a,b] (61.3, 69.5)	135 (72.6)[a] (65.6, 78.9)	325 (60.3)[b] (56.0, 64.5)	817 (64.3) (61.6, 67.0)	0.008
Hypertension	471 (86.4)[a] (83.3, 89.2)	135 (72.6)[b] (65.6, 78.9)	389 (72.2)[b] (68.2, 75.9)	995 (78.3) (76.0, 80.6)	<0.001
Diabetes Mellitus	286 (52.5)[a] (48.2, 56.7)	87 (46.8)[a] (39.4, 54.2)	174 (32.3)[b] (28.3, 36.4)	547 (43.1) (40.3, 45.8)	<0.001
Personal history CV disease	263 (48.3)[b] (44.0, 52.5)	115 (61.8)[a] (54.4, 68.8)	239 (44.3)[b] (40.1, 48.6)	617 (48.6) (45.8, 51.4)	<0.001
Family history CV disease	494 (90.6)[b] (87.9, 93.0)	158 (84.9)[b] (79.0, 89.8)	516 (95.7)[a] (93.7, 97.3)	1168 (92.0) (90.3, 93.4)	<0.001
Nicotine Addiction	154 (28.3)[a] (24.5, 32.2)	19 (10.2)[b] (6.26, 15.5)	161 (29.9)[a] (26.0, 33.9)	334 (26.3) (23.9, 28.8)	<0.001
Second hand smoke exposure	345 (63.3)[a] (59.1, 67.4)	85 (45.7)[b] (38.4, 53.1)	363 (67.3)[a] (63.2, 71.3)	793 (62.4) (59.7, 65.1)	<0.001
Percent with no exercise 6 months pre-AMI	331 (60.7)[b] (56.5, 64.9)	78 (41.9)[b] (34.8, 49.4)	295 (54.7)[a] (50.4, 59.0)	704 (55.4) (52.7, 58.2)	<0.001

Note: Values with same superscript letter indicate non-significant post hoc difference (Bonferroni adjusted p = 0.003)

CI – Confidence Interval; BMI – Body Mass Index; CV – Cardiovascular; AMI – Acute Myocardial Infarction.

Table 2

Group Comparisons of Women's Symptoms: Number, Severity, &/or Frequency

	Black	Hispanic	White	p-value[*]
	(N=545) (95% CI)	(N=186) (95% CI)	(N=539) (95% CI)	
Mean number of prodromal symptoms	7.48[a] (7.08, 7.89)	6.98[a] (6.22, 7.75)	5.84[b] (5.47, 6.20)	<0.001
Mean prodromal index (frequency and severity)	74.35 (68.87, 79.83)	64.68 (55.44, 73.92)	59.72 (54.77, 64.66)	0.035
Mean number of acute symptoms	9.35[b] (8.85, 9.84)	9.97[a] (9.08, 10.87)	8.04[c] (7.60, 8.47)	<0.001
Mean acute index (severity)	21.23[a, b] (19.97, 22.50)	23.02[a] (20.79, 25.24)	17.96[b] (16.88, 19.05)	<0.001

Note: Values with same superscript letter indicate non-significant post hoc difference (Bonferroni adjusted $p = 0.003$).

CI - Confidence Interval.

[*] Adjusted for CV risk factors presented in Table 1.

Table 3

Significance Probabilities for the Effect of Race and CV Risk Factors on Women's Symptoms

Race and CV risk factors	Mean number of prodromal symptoms	Mean prodromal index (frequency and severity)	Mean number of acute symptoms	Mean acute index (severity)
Race	<0.001	0.035	<0.001	<0.001
Age > 50 years	<0.001	0.011	<0.001	<0.001
BMI > 29	<0.001	<0.001	<0.001	<0.001
High cholesterol	0.549	0.558	0.029	0.445
Hypertension	0.114	0.188	0.027	0.132
Diabetes Mellitus	0.044	0.209	0.022	0.528
Personal history CV disease	<0.001	<0.001	<0.001	<0.001
Family history CV disease	0.001	0.039	0.367	0.293
Nicotine Addiction	<0.001	0.004	<0.001	<0.001
Second hand smoke exposure	<0.001	0.110	0.715	0.582
No exercise 6 months pre-AMI	0.695	0.207	0.049	0.317

BMI – Body Mass Index; CV – Cardiovascular; AMI – Acute Myocardial Infarction.

Table 4

Significant Differences in Frequency of Women's Prodromal Symptoms by Race

	Black (N=545) No. (%)	Hispanic (N=186) No. (%)	White (N=539) No. (%)	Raw p-value	Adjusted p-value[*]
Generalized symptoms					
Unusual fatigue	421 (77.2)	124 (66.7)	385 (71.4)	0.009	0.174
Anxious	279 (51.2)[a]	95 (51.1)[a]	199 (36.9)[b]	<0.001	<0.001
Frequent indigestion	235 (43.1)[a]	50 (26.9)[b]	209 (38.8)[a]	<0.001	0.004
Heart racing	233 (42.8)[a]	68 (36.6)[a b]	153 (28.4)[b]	<0.001	<0.001
New vision problems	217 (39.8)[a]	43 (23.1)[b]	132 (24.5)[b]	<0.001	<0.001
Change in thinking or remembering	202 (37.1)[a]	60 (32.3)[a b]	135 (25.0)[b]	0.001	0.001
Loss of appetite	183 (33.6)[a]	50 (26.9)[a b]	124 (23.0)[b]	<0.001	0.006
Difficulty breathing at night	182 (33.4)[a]	38 (20.4)[a b]	107 (19.9)[b]	<0.001	<0.001
Hand/arms tingling	172 (31.6)	47 (25.3)	125 (23.2)	0.007	0.064
Numbness or burning in hands/fingers	171 (31.4)[a]	45 (24.2)[a b]	104 (19.3)[b]	<0.001	<0.001
Cough	147 (27.0)[a]	59 (31.7)[a]	98 (18.2)[b]	<0.001	<0.001
Increased frequency of headaches	109 (20.0)	29 (15.6)	68 (12.6)	0.005	0.055
Increased intensity of headaches	91 (16.7)[a]	36 (19.4)[a]	48 (8.9)[b]	<0.001	<0.001
Discomfort/pain symptoms					
Centered high in chest	102 (18.7)[a b]	46 (24.7)[a]	76 (14.1)[b]	0.004	0.004
Leg(s)	61 (11.2)[a]	29 (15.6)[a]	22 (4.1)[b]	<0.001	<0.001
Both arms	30 (5.5)	24 (12.9)	33 (6.1)	0.003	0.014
Right arm or shoulder	24 (4.4)[a b]	16 (8.6)[a]	13 (2.4)[b]	0.002	0.004
Jaw/teeth	17 (3.1)[b]	20 (10.8)[a b]	23 (4.3)[b]	<0.001	0.001

Note: Values with same superscript letter indicate non-significant post hoc difference. Bonferroni adjusted ($p \leq 0.003$).

[*] Adjusted for cardiovascular risk factors listed in Table 1.

Table 5

Women's Ten Most Frequent Prodromal Symptoms by Race

Rank	Black (N=545)		Hispanic (N=186)		White (N=539)	
	Symptoms	% (95% CI)	Symptoms	% (95% CI)	Symptoms	% (95% CI)
1	Unusual fatigue	77.2 (73.5, 80.7)	Unusual fatigue	66.7 (59.4, 73.4)	Unusual fatigue	71.4 (67.4, 75.2)
2	Sleep disturbance	52.1 (47.8, 56.4)	Anxious	51.1 (43.7, 58.5)	Sleep disturbance	48.2 (43.9, 52.5)
3	Anxious	51.2 (46.9, 55.5)	Sleep disturbance	50.5 (43.1, 57.9)	Short of breath	43.2 (39.0, 47.5)
4	Short of breath	47.0 (42.7, 51.3)	Any CP/discomfort*	43.5 (36.3, 51.0)	Frequent indigestion	38.8 (34.6, 43.0)
5	Frequent indigestion	43.1 (38.9, 47.4)	Short of breath	40.9 (33.7, 48.3)	Anxious	36.9 (32.8, 41.1)
6	Heart racing	42.8 (38.6, 47.0)	Heart racing	36.6 (29.6, 43.9)	Any CP/discomfort*	30.1 (26.2, 34.1)
7	New vision problems	39.8 (35.7, 44.1)	Change in thinking or remembering	32.3 (25.6, 39.5)	Heart racing	28.4 (24.6, 32.4)
8	Any CP/discomfort*	39.4 (35.3, 43.7)	Cough	31.7 (25.1, 38.9)	Arms weak/heavy	25.2 (21.6, 29.1)
9	Change in thinking or remembering	37.1 (33.0, 41.3)	Loss of appetite	26.9 (20.7, 33.9)	Change in thinking or remembering	25.0 (21.4, 28.9)
10	Loss of appetite	33.6 (29.6, 37.7)	Frequent indigestion	26.9 (20.7, 33.9)	New vision problems	24.5 (20.9, 28.3)

Includes at least one location of generalized chest, centered high in chest, &/or left breast pain/discomfort.

CP – Chest Pain; CI – Confidence Interval

Table 6

Significant Differences in Frequency of Women's Acute Symptoms by Race

	Black (N=545) No. (%)	Hispanic (N=186) No. (%)	White (N=539) No. (%)	Raw p-value	Adjusted p-value[*]
Generalized symptoms					
Unusual fatigue	277 (50.8)[a b]	109 (58.6)[a]	227 (42.1)[b]	<0.001	0.003
Dizzy or faint	269 (49.4)	76 (40.9)	214 (39.7)	0.004	0.028
Hot, flushed	252 (46.2)[a]	51 (27.4)[b]	173 (32.1)[b]	<0.001	<0.001
Indigestion	224 (41.1)[a]	48 (25.8)[b]	154 (28.6)[b]	<0.001	<0.001
Heart racing	194 (35.6)[a]	67 (36.0)[a b]	125 (23.2)[b]	<0.001	0.005
Numbness in hands/fingers	149 (27.3)[a]	50 (26.9)[a b]	97 (18.0)[b]	<0.001	0.007
Vomiting	149 (27.3)[a]	42 (22.6)[a b]	101 (18.7)[b]	0.004	0.014
Loss of appetite	145 (26.6)	53 (28.5)	106 (19.7)	0.008	0.076
New vision problems	145 (26.6)[a]	37 (19.9)[a b]	77 (14.3)[b]	<0.001	<0.001
Headache	125 (22.9)[a b]	50 (26.9)[a]	80 (14.8)[b]	<0.001	0.005
Coughing	89 (16.3)[a]	36 (19.4)[a]	52 (9.6)[b]	<0.001	0.002
Choking sensation	83 (15.2)	34 (18.3)	50 (9.3)	0.001	0.016
Discomfort/pain symptoms					
Centered high in chest	177 (32.5)[b]	87 (46.8)[a]	166 (30.8)[b]	<0.001	<0.001
Left breast	133 (24.4)[a]	44 (23.7)[a b]	73 (13.5)[b]	<0.001	<0.001
Back/between shoulder blades	84 (15.4)[c]	70 (37.6)[a]	112 (20.8)[b]	<0.001	<0.001
Neck/throat	71 (13.0)[b]	44 (23.7)[a]	87 (16.1)[b]	0.003	0.001
Generalized chest	70 (12.8)[b]	41 (22.0)[a b]	110 (20.4)[a]	0.001	0.003
Leg(s)	40 (7.3)[a]	27 (14.5)[a]	9 (1.7)[b]	<0.001	<0.001
Both arms	38 (7.0)[b]	34 (18.3)[a]	77 (14.3)[a]	<0.001	<0.001
Top of shoulders	36 (6.6)[b]	33 (17.7)[a]	57 (10.6)[a b]	<0.001	<0.001
Right arm or shoulder	34 (6.2)[b]	24 (12.9)[a]	25 (4.6)[b]	<0.001	0.001
Jaw/teeth	26 (4.8)[c]	36 (19.4)[a]	54 (10.0)[b]	<0.001	<0.001

Note: Values with same superscript letter indicate non-significant post hoc difference. Bonferroni adjusted ($p \leq 0.003$).

*
Adjusted for cardiovascular risk factors listed in Table 1.

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Table 7

Women's Ten Most Frequent Acute Symptoms by Race

Rank	Black (N=545)		Hispanic (N=186)		White (N=539)	
	Symptoms	%(95% CI)	Symptoms	%(95% CI)	Symptoms	%(95% CI)
1	Shortness of breath	66.2 (62.1, 70.2)	Any CP/discomfort[*]	72.0 (65.0, 78.4)	Any CP/discomfort[*]	58.3 (54.0, 62.5)
2	Any CP/discomfort[*]	61.8 (57.6, 65.9)	Shortness of breath	66.7 (59.4, 73.4)	Shortness of breath	58.1 (53.8, 62.3)
3	Felt weak	54.1 (49.8, 58.4)	Unusual fatigue	58.6 (51.2, 65.8)	Felt weak	55.5 (51.2, 59.7)
4	Unusual fatigue	50.8 (46.5, 55.1)	Felt weak	55.4 (47.9, 62.7)	Unusual fatigue	42.1 (37.9, 46.4)
5	Dizziness	49.4 (45.1, 53.6)	CP/discomfort high chest	46.8 (39.4, 54.2)	Cold sweat	39.7 (35.5, 44.0)
6	Hot/flushed	46.2 (42.0, 50.5)	Left arm sensations[†]	44.1 (36.8, 51.5)	Dizziness	39.7 (35.5, 44.0)
7	Left arm sensations[†]	42.0 (37.8, 46.3)	Cold sweat	44.1 (36.8, 51.5)	Left arm sensations[†]	38.2 (34.1, 42.5)
8	Indigestion	41.1 (36.9, 45.4)	Dizziness	40.9 (33.7, 48.3)	Arms weak/heavy	35.8 (31.8, 40.0)
9	Cold sweat	38.9 (34.8, 43.1)	Discomfort back/shoulder blades	37.6 (30.7, 45.0)	Nausea	35.3 (31.2, 39.4)
10	Nausea	37.4 (33.4, 41.6)	Arms weak/heavy	36.6 (29.6, 43.9)	Arms ache	35.3 (31.2, 39.4)

[*]Includes at least one location of generalized chest, centered high in chest, &/or left breast pain/discomfort.

[†]Includes burning, numbness, &/or pain in at least 1 location: left shoulder, arm, &/or hand.

CP – chest pain. CI - Confidence Interval