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Authors

Fukuoka, Yoshimi
Lisha, Nadra E
Vittinghoff, Eric

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Comparing Asian American Women's Knowledge, Self-Efficacy, and Perceived Risk of Heart Attack to Other Racial and Ethnic Groups: The mPED Trial

Yoshimi Fukuoka, PhD, RN, FAAN,[1] Nadra E. Lisha, PhD,[2] and Eric Vittinghoff, PhD[3]

Abstract

Objective: The aim of the study was to compare knowledge and awareness of heart attacks/heart disease and perceived risk for future heart attack in Asian/Pacific Islander women, compared to other racial and ethnic groups.

Materials and Methods: In this cross-sectional study, 318 women enrolled in a mobile phone-based physical activity education trial were analyzed. Heart attack knowledge, self-efficacy for recognizing and responding to heart attack symptoms, and perceived risk for a future heart attack were measured. Analyses were conducted using logistic, proportional odds, and linear regression models, depending on the outcome and adjusting for age. Pairwise differences between Asian/Pacific Islanders and the other four groups were assessed using a Bonferroni correction ($p < 0.0125$).

Results: Asian/Pacific Islander women had significantly lower total scores for knowledge of heart attack and self-efficacy for heart attack recognition and care seeking behavior compared to the Caucasian women ($p = 0.001$ and $p = 0.002$, respectively). However, perceived risk did not differ among the groups. Forty-six percent of the Asian American women, compared to 25% of Caucasian women, falsely believed ''breast cancer is the number one cause of death for women ($p = 0.002$).'' In addition, Asian/Pacific Islander women were less likely to report ''arm pain, numbness, tingling, or radiating'' as one of the heart attack symptoms compared to the Caucasian and the multiracial group (34%, 63% [$p < 0.001$], and 66% [$p = 0.004$], respectively).

Conclusions: These findings highlight the urgent need to develop effective, tailored campaigns to close the knowledge gap between Asian/Pacific Islander women and Caucasian women.

Keywords: heart attack symptoms, perceived risk, women, cardiovascular risks, Asian/Pacific Islanders

Introduction

Heart disease continues to be the leading cause of death and disability in women in the United States.[1] In 2004, the American Heart Association (AHA) launched the ''Go Red for Women'' campaign to increase awareness of heart disease in women, educate them about the risks of heart disease, and help them reduce their risk for heart disease.[2] A recent survey conducted by the AHA showed that women's heart disease awareness has significantly improved. While only 30% of women were able to identify heart disease as the leading cause of death in 1997, this percentage increased to 56% in 2012.[3] However, knowledge of heart attack risks still lags in African American, Hispanic, and young women. More importantly, fewer data are available regarding heart disease knowledge in U.S. Asian/Pacific Islander women.[4]

Although the knowledge of heart disease/heart attack and its symptoms are not sufficient to reduce delay in seeking medical care, they are necessary for women to identify cardiac symptoms and take prompt action to seek care.[5] Calling 911 and obtaining early access to reperfusion therapy during evolving acute coronary syndromes are associated with a

[1]Department of Physiological Nursing, Institute for Health & Aging, School of Nursing, University of California, San Francisco, San Francisco, California.
[2]Institute for Health & Aging, University of California, San Francisco, San Francisco, California.
[3]Department of Epidemiology & Biostatistics, University of California, San Francisco, San Francisco, California.

significant reduction in mortality and morbidity.[6,7] Despite the benefit of early access to reperfusion therapy, prehospital delay times from the symptom onset to hospital arrival have remained unchanged over the past 20 years.[8] In particular, female sex, racial/ethnic minority status, and younger age appear to be important factors related to longer prehospital time and care-seeking behaviors.[9]

Asian/Pacific Islanders are the fastest growing racial/ethnic group in the United States and represent 5.4% of the U.S. population. By 2050, Asian/Pacific Islanders will make up ~9.3% of the total U.S. population.[10] Despite the rapidly growing number of Asian Americans, health data on Asian Americans are scarce in general[11]; in particular, Asian Americans are underrepresented in cardiovascular health research. It is known that Asian/Pacific Islanders tend to develop heart disease at a much lower body mass index (BMI) than other racial and ethnic groups, and subgroups of Asian/Pacific Islanders have a much higher prevalence of heart disease.[12] Yet, these differences, as well as awareness and knowledge of heart disease among Asian-Pacific Islanders, are not well understood. Given the growing concerns with the health of Asian Americans, in 2009, President Obama signed an Executive Order calling for strategies to improve the health of this group.[13]

Thus, the purpose of this article was to compare the knowledge of heart attack and its symptoms, self-efficacy for recognizing and responding to heart attack symptoms, and perceived risk for a future heart attack in Asian/Pacific Islander women compared to other racial/ethnic groups of women who completed the screening and baseline visit of the mobile phone-based physical activity education (mPED) trial. To our knowledge, this was one of the first studies to describe Asian/Pacific Islander women's awareness, knowledge, and perceived risk for heart attack.[14] Thus, we believe that the findings of this article will provide valuable information in designing a public campaign.

Materials and Methods

Study design and sample

The mPED study was a randomized controlled trial (RCT) designed to evaluate the efficacy of a mobile phone-delivered physical activity intervention for physically inactive women. A detailed description of the study has been described previously.[15–17] The study protocol was approved by the University of California, San Francisco Committee on Human Research, and the mPED Data and Safety Monitoring Board. In this article, the baseline, cross-sectional data of the heart disease knowledge, awareness of heart attack symptoms, and perceived risk of heart attack were analyzed. Physically inactive women were recruited from the San Francisco Bay Area from May 2011 to April 2014. With the aim of recruiting a diverse and representative sample, four broad types of subject recruitment strategies were used: (1) media advertising (*e.g.*, newspaper, radio, Craigslist and Facebook advertisements, commercial email distribution lists, and study, clinic, and ClinicalTrials.gov websites), (2) posting fliers in the community (*e.g.*, stores, bus stops, medical and dental clinics, community centers, university campuses, and churches), (3) random mailing of the study announcement to women aged 25 to 69 who live in San Francisco, California, and (4) referral from friends, family members, healthcare providers, or others contacts. In total, 318 women who were interested in participating in the physical activity intervention trial completed these heart attack questionnaires at the screening/baseline visit. All participants provided written consent before study enrollment.

Preliminary inclusion criteria at the screening/baseline visit were as follows: (1) female, aged 25–69 years; (2) sedentary lifestyle at work and/or during leisure time, based on the Stanford Brief Activity Survey; (3) ability to speak and read English; and (4) BMI of 18.5–43.0 kg/m^2. Exclusion criteria were as follows: (1) known medical conditions or physical problems that require special attention in an exercise program; (2) planning an international trip during the next 4 months (which could interfere with daily server uploads of mobile phone data); (3) pregnant/gave birth during the past 6 months; (4) severe hearing or speech problem; (5) history of eating disorder; (6) current substance abuse; (7) current participation in lifestyle modification programs or research studies that may confound study results; (8) history of bariatric surgery or plans for bariatric surgery in the next 12 months; or (9) mild cognitive impairment as determined by the Mini-Cog test.[15]

Study procedures

Women interested in study participation were screened for preliminary eligibility over the phone by a trained study staff member. Potential participants who met preliminary eligibility criteria were invited to attend a screening/baseline visit to further determine the participant's eligibility. Once written informed consent was obtained, participants were screened for mild cognitive impairment using the Mini-Cog test[18] and were asked to complete baseline questionnaires and anthropometric measurements.

Outcome measures

We adapted the previously published scales to this study population to assess heart attack knowledge, self-efficacy for recognizing and responding to heart attack symptoms, and assessing the perceived risk to a future heart attack.[5,19,20] The adapted scale was pilot-tested previously to see whether the instruments are linguistically and culturally appropriate. The reliability of these scales in the Asian American sample did not differ when compared to the overall study sample (see the footnotes in Tables 3, 4, and 5). The *heart attack knowledge scale* consisted of six statements (four false and two true) with answer choices true, false, or don't know. Examples were ''Hospitals have drugs that reduce the damage done when a heart attack occurs'' and ''Breast cancer is the most common cause of death in women in the United States.'' Only a correct answer received a point. A total knowledge score ranged from 0 (minimally knowledgeable) to 6 (highly knowledgeable).

Self-efficacy for recognizing and responding to heart attack symptoms was assessed by four questions, for example, ''how sure are you that you could recognize the signs and symptoms of a heart attack in yourself?'' Women were asked to respond to the question using a 4-point Likert scale that ranged from 1 (not sure) to 5 (very sure). A total score ranged from 4 to 20 points and higher scores indicated higher levels of self-efficacy.

Perceived risk of heart attack was measured by the following two questions: (1) ''compared to other women your age, how likely do you think it is that you could have a heart attack in the next 5 years?'' and (2) ''compared to other women your age, how likely do you think it is that you could have a heart attack in your lifetime?'' Women were asked to respond to the statement using a 5-point Likert scale that ranged from 1 (much less likely) to 5 (much more likely). The total score ranged from 2 to 10 points and higher scores indicated higher levels of perceived risk.

Heart attack symptom knowledge was assessed by one open-ended question: ''What would you say are the signs and symptoms of a heart attack for women?'' The subjects were encouraged to list all possible answers. All responses were independently coded by two research staff. If there were any discrepancies between the two research staff, the Principal investigator, as a third coder, categorized the responses. The top 10 most common answers were presented.

Other measures

Baseline sociodemographic and cardiovascular risk factors were assessed by trained research staff during the screening and baseline visit. Cardiovascular risk factors, such as smoking status (at least one cigarette in the past week,), high blood pressure, high cholesterol, and type 2 diabetes were assessed based on participants' self-report. To assess family history of heart attack, participants were asked if their father or brother had a heart attack when younger than 55 years or if their mother or sister had a heart attack when younger than 65 years. Because depressive symptoms have been associated with cardiovascular risk, the Center for Epidemiological Studies Depression Scale (CESD)[21] was used to assess depressive symptoms over the past week. The CESD scores ranged from 0 to 60, with higher scores indicating worse depressive symptoms and scores ≥16 indicating high risk for clinical depression. Weight and height were measured in a research office to calculate BMI. All subjects were asked to change to a hospital gown and remove their shoes before the measurement.

Statistical analysis

The five race/ethnicities (Caucasian, Asian/Pacific Islander, African American, Hispanic, and multiracial) were compared on a variety of characteristics. First, demographics and cardiovascular risk factors were compared between groups. Subsequently, we estimated age-adjusted total scores for (1) heart attack knowledge, (2) self-efficacy of symptom for recognizing and responding to heart attack symptoms, (3) perceived risk of heart attack, and (4) heart attack symptom knowledge, using logistic, proportional odds, and linear models depending on the outcome (binary, ordinal, or continuous, respectively). These models did not adjust for education or cardiac risk factors, which we regard as mediators, not confounders of race/ethnicity. The rationale[22] was that fully adjusted differences would estimate between-group differences in awareness if education and cardiac risk factors could be equalized across the five groups. We think this unlikely counterfactual would be less useful to clinicians than the age-adjusted differences we present, which equalize only the distribution of age. Analyses were conducted using Generalized Linear Model Procedures (PROC GLM and PROC GENMOD). The Least Square Means option (LSMeans) was used for multiple comparison testing. In pairwise comparisons between Asian Americans and the other four groups, p-values less than a Bonferroni-corrected 0.0125 were considered statistically significant. All analyses were carried out using Stata Version 14[23] and SAS version 9.4.[24]

Results

Sociodemographic characteristics and cardiovascular risk factors by ethnic/racial group

Sociodemographic characteristics and cardiovascular risks in the sample of 318 women are presented in Table 1. The sample was racially and ethnic/racially diverse, with 56.3% ($n=179$) identifying as Caucasian, 20.7% ($n=66$) as Asian/Pacific Islander, 8.2% ($n=26$) as African American, 6.3% ($n=20$) as Hispanic, or 8.5% ($n=27$) as multiracial. The overall mean age was 51.3 (SD ±11.6) years. Most of the women had completed college (75.8%, $n=241$) and half (49.7%, $n=158$) were married.

There were significant demographic and cardiovascular risk factor differences between several of the racial/ethnic groups. The Asian/Pacific Islander women were younger ($p=0.002$) and had a lower BMI ($p=0.003$) than the Caucasian group. The Asian/Pacific Islander group was more likely to be married or cohabiting ($p<0.001$), have a lower BMI ($p<0.0001$), and lower blood pressure ($p=0.004$) than the African American group. The Asian/Pacific Islander group had lower BMI ($p<0.0001$) than the Hispanic and multiracial groups.

Age-adjusted total mean scores of three outcome scales

Table 2 shows the mean of total scores of three outcome scales: (1) heart attack knowledge, (2) self-efficacy for recognizing and responding to heart attack symptoms, and (3) perceived risk for a future heart attack by ethnic/racial group. Asian/Pacific Islander had significantly lower mean heart attack knowledge ($p=0.001$) as well as lower mean self-efficacy for recognizing and responding to heart attack symptoms scores ($p=0.002$) compared to Caucasian women. Lastly, no differences were found among races/ethnicities on total mean score for perceived heart attack risk ($p>0.0125$).

Age-adjusted heart attack knowledge

Table 3 shows responses to the six heart attack knowledge scale questions among five ethnic/racial groups. Ethnic/racial group differences were evident in the responses to three out of the six questions that assessed their heart attack knowledge. Asian/Pacific Islander women were less likely to answer the question, ''Breast cancer is the number one cause of death for women. Heart disease is the second cause of death for women in the United States today,'' correctly compared to Caucasian women (54% vs. 75% respectively, $p=0.002$). Asian/Pacific Islander women were also less likely to answer, ''Almost all heart attacks are always sudden and severe,'' compared to Caucasian women (71% vs. 92%, $p<0.01$). The item ''Hospitals have drugs that reduce the damage done when a heart attack occurs,'' was answered correctly less often by Asian/Pacific Islander (46%) compared to Caucasian women (65%) ($p=0.012$).

Table 1. Sociodemographic Characteristics and Cardiovascular Risk Factors by Five Racial/Ethnic Groups ($N=318$)

	Caucasian (n=179) Mean (±SD) or % (n)	*Asian/PI (n=66) Mean (±SD) or % (n)*	*African American (n=26) Mean (±SD) or % (n)*	*Hispanic (n=20) Mean (±SD) or% (n)*	*Multiracial (n=27) Mean (±SD) or % (n)*	*Overall p-value*
Sociodemographics						
Mean age (±SD) years	53.5 (±11.6)*	48.3 (±11.0)*	48.8 (10.1)	46.0 (10.7)	50.0 (12.3)	0.002
College/graduate school	83.8 (150)	71.2 (47)	57.7 (15)	55.0 (11)	66.7 (18)	0.001
Full/part-time job	71.5 (128)	75.8 (50)	73.1 (19)	75.0 (15)	70.4 (19)	0.97
Married or cohabitating	55.3 (99)	54.5 (30)†	15.4 (4)†	40.0 (8)	40.7 (11)	0.002
Cardiovascular risk factors						
Mean BMI (±SD) kg/m^2	29.3 (5.8)‡	26.8 (5.0)‡,§,**,††	33.2 (5.6)§	33.1 (6.5)**	32.9 (7.1)††	<0.001
CESD score >16 points or taking antidepressant[a]	43.6 (78)	24.2 (16)	19.2 (5)	60.0 (12)	29.6 (8)	0.002
Menopause	63.7 (114)	43.9 (29)	50.0 (13)	40.0 (8)	55.6 (15)	0.03
High blood pressure	24.0 (43)	24.2 (16)‡‡	53.8 (14)‡‡	26.3 (5)	18.5 (5)	0.02
High total cholesterol	35.2 (63)	33.3 (22)	15.4 (4)	25.0 (5)	11.1 (3)	0.04
Type 2 diabetes/high blood sugar[b]	5.0 (9)	7.6 (5)	19.2 (5)	15.0 (3)	3.7 (1)	0.06
Smoking ≥1 cigarette in past 7 days	1.7 (3)	3.0 (2)	3.8 (1)	0 (0)	3.7 (1)	0.83
Family history of early heart attack[c]	14.3 (25)	8.1 (5)	15.4 (4)	26.3 (5)	22.2 (6)	0.03

Pairwise between-group differences with $p<0.5$ and Bonferroni adjustment used to control for multiple comparisons: *0.002 †0.001 ‡0.003 §$p<0.001$ **$p<0.0001$ ††$p<0.0001$ ‡‡0.004.

[a]The CESD was used to assess depressive symptoms; scores ≥16 are suggestive of depression.

[b]Potential participants with type 2 diabetes on insulin therapy were excluded from the study.

[c]Family history was defined as a father or brother having a heart attack when younger than 55 years or a mother or sister when younger than 65 years.

BMI, body mass index; CESD, Center for Epidemiological Studies Depression Scale; PI, Pacific Islander.

Age adjusted self-efficacy for recognizing and responding to heart attack symptoms

Table 4 shows age-adjusted women's self-efficacy for recognizing and responding to heart attack symptoms among five ethnic/racial groups. Only one of four self-efficacy questions differed between groups. ''How sure are you that you could call an ambulance or dial 911 if you thought you were having a heart attack'' was endorsed less by the Asian/Pacific Islander group compared to the Caucasian (42% vs. 64%, $p=0.002$) group.

Age-adjusted perceived risk of heart attack

Table 5 shows women's responses to the two perceived risks of heart attack questions. We found no statistically significant differences in age-adjusted perceived risk of heart attack between Asian/Pacific Islander women and the other groups.

Age-adjusted most common heart attack symptoms assessed by the open-ended question

Table 6 shows the top 10 most common heart attack symptoms assessed by the open-ended question,

''What would you say are the signs and symptoms of a heart attack for women?'' The most common symptom reported was ''chest pain and discomfort,'' but no differences were found on this symptom ($p>0.05$). Asian/Pacific Islander (34%) women were less likely to report that ''arm pain,

Table 2. Age-Adjusted Total Mean Scores of Knowledge, Self-Efficacy, and Perceived Risk of Heart Attack by Five Racial/Ethnic Groups ($N=318$)

	Caucasian (n=179)	*Asían/PI (n=66)*	*African American (n=26)*	*Hispanic (n=20)*	*Multiracial (n=27)*	*Overall heterogeneity p-value*
Total mean score of women's knowledge of heart disease/heart attack[a]						
Mean (95% CI)	4.3 (4.1–4.5)*	3.6 (3.2–3.9)*	4.3 (3.7–4.8)	3.6 (2.9–4.2)	3.9 (3.4–4.4)	0.006
Total mean score of questions 1–4 for self-efficacy for recognizing and responding to heart attack symptoms[b]						
Mean (95% CI)	9.8 (9.4–10.3)†	8.5 (7.8–9.2)†,‡	9.8 (8.6–11.9)	9.5 (8.2–10.8)	10.8 (9.6–11.9)‡	0.007
Total mean score of questions 1–2 for perceived risk of heart attack[c]						
Mean (95% CI)	5.8 (5.5–6.1)	5.7 (5.2–6.1)	5.7 (4.8–6.5)	5.8 (4.9–6.7)	6.5 (5.8–7.2)	0.286

[a]Possible scores range from 0 (low knowledge) to 6 (high knowledge).

[b]Possible scores range from 4 (low self-efficacy) to 16 (high self-efficacy).

[c]Possible scores range from 2 (much less likely) to 10 (much more likely).

Pairwise between-group differences with $p<0.05$ and Bonferroni adjustment used to control for multiple comparisons: *$p=0.001$ †0.002 ‡$p<0.01$.

Table 3. Age-Adjusted Women's Knowledge of Heart Attack Among Five Racial/Ethnic Groups ($N = 318$)

	Caucasian (n = *179*)	*Asian/PI* (n = *66*)	*African American* (n = *26*)	*Hispanic* (n = *20*)	*Multiracial* (n = *27*)	*Overall heterogeneity* p-*value*
1. Breast cancer is the number one cause of death for women. Heart disease is the second cause of death for women in United States today. (Correct response: False)						
Correct% (95% CI)	75 (68–81)[a]	54 (42–66)[a]	63 (44–81)	63 (42–84)	60 (41–78)	0.041
2. Almost all heart attacks occur in women older than 65 years. (Correct response: False)						
Correct% (95% CI)	63 (56–70)	66 (55–78)	73 (56–90)	50 (28–72)	74 (57–90)	0.446
3. The symptoms of heart attack are always sudden & severe. (Correct response: False)						
Correct% (95% CI)	92 (88–96)[b]	71 (60–82)[b]	88 (75–100)	81 (63–98)	77 (61–93)	0.003
4. Caucasian women face greater threat from heart disease than other women of other races. (Correct response: False)						
Correct% (95% CI)	57 (50–65)	48 (36–60)	62 (44–81)	51 (29–73)	67 (49–85)	0.432
5. The symptoms of heart attack can be mild, take days to develop. (Correct response: True)						
Correct% (95% CI)	78 (72–84)	73 (63–84)	85 (71–99)	71 (51–91)	66 (49–85)	0.518
6. Hospitals have drugs that reduce the damage done when a heart attack occurs. (Correct response: True)						
Correct% (95% CI)	64 (57–71)[c]	46 (34–58)[c]	58 (39–77)	41 (20–63)	44 (26–63)	0.042

Pairwise between-group differences with $p < 0.05$ and Bonferroni adjustment used to control for multiple comparisons: [a]0.002, [b]$p < 0.001$ [c]0.012.

Adjusted Cronbach's alpha = 0.61 in the overall study sample, and adjusted Cronbach's alpha = 0.66 in the Asian American sample.

numbness, tingling, and radiating'' was a symptom compared to the Caucasian (63%) and multiracial (66%) groups ($p < 0.001$ and $p = 0.004$, respectively). No other differences were found between groups.

Discussion

In this analysis of baseline data for 318 women who participated in a single-site RCT of a mobile phone-based exercise intervention, knowledge about heart attack and the relative importance of breast cancer and heart disease as causes of death, as well as self-efficacy for recognizing and responding to heart attack symptoms, were all lower among Asian/Pacific Islanders than among Caucasians. Knowledge of the relative importance of breast cancer and heart disease was particularly low in our sample of Asian/Pacific Islander women, with approximately half believing that breast cancer is the number one cause of death for women, despite a widely disseminated public health campaign pointing out that one in four women die from heart disease, compared to one in 31 from breast cancer.[1] Even in a survey conducted about 20 years ago,[2] only 35% of women believed that breast cancer was a leading cause of death in women.[25] One possible explanation is that the heart disease awareness campaign has been less successful in reaching Asian/Pacific Islanders; the Go Red for Women website[26] includes tailored messages for African American women and Latinas, but none for Asian women. Also, potentially contributing to the confusion is the fact that among Asian/Pacific Islander women, cancer overall is the leading cause of death, not heart disease.[27]

It has been documented that women were more likely than men to report atypical cardiac symptoms, such as arm pain, shortness of breath, and fatigue, during experiencing an acute coronary syndrome.[28] One of the AHA Go Red for Women campaign efforts is to increase awareness of these atypical heart attack symptoms in women as well as typical symptoms such as chest pain.[29,30] In this study, chest pain and discomfort were the most frequently reported symptom among

Table 4. Age-Adjusted Self-Efficacy for Recognizing and Responding to Heart Attack Symptoms Among Five Racial/Ethnic Groups ($N = 318$)

	Caucasian (n = *179*)	*Asian/PI* (n = *66*)	*African American* (n = *26*)	*Hispanic* (n = *20*)	*Multiracial* (n = *27*)	*Overall heterogeneity* p-*value*
1. How sure are you that you could recognize signs & symptoms of heart attack in yourself						
Sure/very sure (95% CI)	32 (25–38)	24 (14–35)	31 (13–49)	37 (15–59)	52 (33–71)	0.157
2. How sure are you that you could tell the difference between the signs or symptoms of a heart attack and other medical conditions?						
Sure/very sure (95% CI)	22 (16–29)	23 (12–33)	31 (13–49)	15 (0–31)	41 (22–59)	0.224
3. How sure are you that you could call an ambulance or dial 911 if you thought you were having a heart attack?						
Sure/very sure (95% CI)	64 (57–72)[a]	42 (30–54)[a]	61 (42–80)	59 (38–81)	70 (53–88)	0.030
4. How sure are you that you could get to an emergency room within 60 minutes after the onset of your symptoms?						
Sure/very sure (95% CI)	68 (61–75)	47 (35–59)	62 (43–80)	71 (51–91)	67 (49–84)	0.055

Pairwise between-group differences with $p < 0.05$ and Bonferroni adjustment used to control for multiple comparisons: [a]0.002.

Adjusted Cronbach's alpha = 0.81 in the overall study sample, and adjusted Cronbach's alpha = 0.83 in the Asian American sample.

Table 5. Age-Adjusted Perceived Risk of Heart Attack by Five Racial/Ethnic Groups ($N = 318$)

	Caucasian (n = *179*)	*Asian/PI* (n = *66*)	*African American* (n = *26*)	*Hispanic* (n = *20*)	*Multiracial* (n = *27*)	*Overall* p-*value*
Compared to other women your age, how likely do you think it is that you could have a heart attack in the next 5 years?						
Much less/somewhat less likely	41.3	37.9	42.3	35.0	18.5	0.301
About the same	32.4	40.9	30.8	50.0	44.4	
Somewhat more/much more likely	26.3	21.2	26.9	15.0	37.0	
Compared to other women your age, how likely do you think it is that you could have a heart attack in your lifetime?						
Much less/somewhat less likely	28.5	28.8	34.6	20.0	18.5	0.404
About the same	38.0	39.4	30.8	35.0	33.3	
Somewhat more/much more likely	33.5	31.8	34.6	45.0	48.1	

Adjusted Cronbach's alpha = 0.86 in the overall study sample, and adjusted Cronbach's alpha = 0.84 in the Asian American sample.

all five racial and ethnic groups, but no difference in the frequency of chest pain and discomfort was found among the groups. In effect, the only difference between self-reported symptom knowledge was for ''arm pain, numbness, tingling, or radiating,'' which was less known by Asian/Pacific Islanders (34%) compared to the Caucasian (63%) and the multiracial group (66%). A recent study reported that >40% of women who experienced an acute coronary syndrome reported arm pain or/and shoulder pain, and these symptoms were reported as chief complains by some women.[31] Therefore, a significant lack of knowledge regarding women's atypical cardiac symptoms could lead to failure to recognize these symptoms as a cardiac origin and promptly seek medical care.

While increasing symptom knowledge is crucial, knowing how to respond to cardiac symptoms (*i.e.*, calling 911) will lead to shortening prehospital and inhospital delay times. The latest large survey conducted in 2012 by the AHA showed that 65% of women reported that they would call 911 if they were experiencing signs and symptoms of a heart attack. In addition, no significant differences were observed among Caucasian, African American, and Latina groups (63%, 65%, and 73%, respectively).[3] Consistent with the results of this 2012 AHA survey, we found that the reported frequency of intent to calling 911 during heart attack was similar among Caucasian, African American, Latina, and multiracial groups, but substantially lower among Asian/Pacific Islanders. One potential reason could be immigration status. We did not assess an immigration status in the study, but the vast majority of Asian Americans (79%) are first-generation immigrants.[32] Undocumented individuals or individuals who live with undocumented family members may hesitate to call 911.[33] In another study, looking at cardiovascular disease in Asian Americans living with HIV, acculturation was a positive predictor of knowledge.[4] Another potential explanation is the lack of knowledge in the medical benefits of calling 911, while experiencing symptoms of a heart attack. Because of the limited published data in the Asian/Pacific Islander population, it may be difficult to compare these reported differences and possible explanations for these differences with other studies.

Table 6. Age-Adjusted Women's Heart Attack Symptom Knowledge Among Five Racial/Ethnic Groups ($N = 318$)

Top 10 most frequently reported symptoms	*Caucasian* (n = *179*) % (95% CI)	*Asian/PI* (n = *66*) % (95% CI)	*African American* (n = *26*) % (95% CI)	*Hispanic* (n = *20*) % (95% CI)	*Multiracial* (n = *27*) % (95% CI)	*Overall heterogeneity* p-*value*
Chest pain, discomfort	80 (74–86)	76 (66–87)	82 (67–98)	88 (73–103)	80 (65–95)	0.851
Arm pain, numbness, tingling, radiating	63 (56–70)[a]	34 (22–45)[a,b]	58 (39–77)	48 (26–70)	66 (49–84)[b]	0.001
Shortness of breath, breathing problems, sleep apnea	57 (50–64)	51 (39–63)	30 (13–47)	42 (21–64)	41 (22–59)	0.077
Fatigue, exhaustion, tired easily, faintness low energy, weakness	22 (16–29)	20 (10–29)	11 (1–22)	9 (3–22)	18 (4–32)	0.500
Nausea, vomiting	21 (15–27)	13 (5–21)	15 (1–28)	26 (6–45)	18 (4–32)	0.611
Dizziness	20 (14–26)	18 (8–27)	21 (5–36)	17 (0–34)	11 (1–24)	0.887
Sweating, cold sweats, or excessive sweating	16 (11–22)	17 (8–27)	13 (0–27)	29 (9–50)	20 (5–35)	0.687
Abdominal pain, heartburn, or indigestion	19 (13–24)	11 (3–19)	8 (−3 to 19)	17 (0–35)	15 (2–29)	0.572
Neck, jaw, or chin pain	16 (1–21)	12 (4–20)	13 (−1 to 25)	18 (0–35)	23 (7–39)	0.730
Back pain, upper and lower; back ache	13 (8–18)	2 (−2 to 5)	12 (−1 to 25)	6 (−5 to 17)	19 (4–34)	0.180

Pairwise between-group differences with $p < 0.05$ and Bonferroni adjustment used to control for multiple comparisons: [a]$p < 0.001$, [b]0.004.

In contrast to the findings for knowledge and self-efficacy, there was no difference in perceived risk for future heart attack between Asian/Pacific Islanders and the other four groups in this study. A study of Korean immigrants in the United States and a large international study both reported that higher levels of knowledge were related to higher levels of perceived risk of heart disease, indicating that improving heart attack symptom knowledge and steps to take in an emergency may increase self-evaluation of their vulnerability for a future heart attack.[5,34] In another large survey study, including Filipino, Korean, and Caucasian women, Latinos, and Latinas, in the United States, family history of a heart attack, higher BMI, and presence of high blood pressure were associated with higher levels of perceived risks of heart attack.[35] However, race and ethnicity and gender were not related to an increase in perceived risks of heart attack.

Lower knowledge and awareness of heart attack in African American women and Latinas, compared to Caucasian women, have been noted in previous reports.[25] However, to the best of our knowledge, this is one of the first studies to systematically describe Asian/Pacific Islander women's heart attack knowledge and self-efficacy for recognizing and responding to heart attack symptoms. This study provides new insights into heart attack knowledge and awareness gaps in Asian/Pacific Islander women, and clearly suggests that despite the ongoing national campaigns, the messages to increase awareness of heart disease in women might not have successfully reached the Asian/Pacific Islander female population in the United States.

Limitations

The findings of this study need to be interpreted in light of the study limitations. First, like most RCTs, this was a convenience sample, in contrast to the large surveys conducted by the AHA,[3,36] and included only women who reported being physically inactive. Furthermore, it is important to note that Asian/Pacific Islander women in this study were proficient in English and highly educated, and that heart attack knowledge and self-efficacy may be lower in women with no or minimal English proficiency or less education. Thus, findings may not be generalizable to non-English speaking or physically inactive women, or women with lower educational attainment. Second, although the overall sample size was reasonably large, African Americans and Latinas comprised only 8% to 6% of the sample, respectively, reducing our power to detect differences between Asian/Pacific Islanders and those groups. Finally, cardiovascular risks vary among subgroups of Asian/Pacific Islander Americans. For example, Filipinos and Indian Americans have much higher prevalence of cardiovascular diseases compared to other Asian/Pacific Islander subgroups. However, because of the limited study data, we were not able to conduct a subgroup analysis for these high-risk samples.

Conclusion

These results from a convenience sample of women enrolled in a single-site randomized trial suggest that Asian/Pacific Islanders have lower heart attack knowledge and self-efficacy for recognizing and responding to heart attack symptoms, compared to their Caucasian counterparts. Given the rapidly growing Asian/Pacific Islander population in the United States, oversampling of Asian/Pacific Islanders in large representative national surveys should be a priority to verify our findings, help with the development of an effective, tailored campaign for this population, and monitor improvements over time.

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Authors' Contributions

Y.F., as principal investigator, designed the study, developed the research questions, collected and analyzed the data, drafted, and revised the article. E.V., as principal biostatistician, assisted in designing the study, conducted data analyses, and reviewed and revised the article. N.E.L. conducted additional analyses, drafted the analysis and results sections, and participated in editing the article. All authors read and approved the final article.

Author Disclosure Statement

No competing financial interests exist.

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Address correspondence to:
Yoshimi Fukuoka, PhD, RN, FAAN
Institute for Health & Aging
3333 California Street, Suite 340
San Francisco, CA 94118

E-mail: yoshimi.fukuoka@ucsf.edu