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Gender Differences in Lay Knowledge of Type 2 Diabetes Symptoms Among Community-dwelling Caucasian, Latino, Filipino, and Korean Adults - DiLH Survey

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Abstract

Purpose—The purpose of this study was to explore gender differences in lay knowledge of type 2 diabetes symptoms among community-dwelling Caucasian, Latino, Filipino, and Korean Americans.

Design and Methods—A cross-sectional survey was administered to a convenience sample of 904 adults (172 Caucasians, 248 Latinos, 234 Koreans, and 250 Filipinos) without diabetes at community events, community clinics, churches, and online in the San Francisco Bay Area and San Diego from August to December 2013. Participants were asked to describe in their own words signs and/or symptoms of diabetes. A multiple logistic regression analysis was performed to examine the association of lay symptom knowledge with gender after controlling for potential confounding factors.

Results—Overall, the average age of the sample populations was 44 (SD ±16.1) years, 36% were male, and 58% were married. Increased thirst/dry mouth following increased urinary frequency/color/odor and increased fatigue/lethargy/low energy were the most frequently reported signs and symptoms (19.8%, 15.4%, and 13.6%, respectively). After controlling for known confounding factors, women were 1.6 (95% confidence interval, 1.2-2.3, $P = .004$) times more likely than men to report at least 1 diabetes symptom. However, this gender difference in knowledge of diabetes signs and symptoms did not significantly differ across Caucasians, Latinos, Filipinos, and Korean Americans ($P = .87$).

Conclusion—The findings underscore the importance of improving public knowledge and awareness of signs and symptoms of diabetes, particularly in men.

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Introduction

The prevalence of type 2 diabetes (T2DM) is rapidly increasing in every country.[1] In 2013, 382 million individuals had diabetes worldwide, but by 2035, this number is projected to rise to 592 million. More importantly, approximately half of those individuals are unaware that they have diabetes.[1] In particular, men and racial and minority groups are significantly more likely to have undiagnosed diabetes compared to women and Caucasians.[2] To date, there have been no declines in this trend despite worldwide public campaigns and educational programs. Thus, this worldwide diabetes epidemic continues to impose a global burden.

Prevention and early detection of diabetes and its risk factors are effective strategies to decrease the burden of diabetes.[3] The American Diabetes Associations recommends that testing to detect T2DM and prediabetes in asymptomatic individuals should be considered in adults who are overweight or obese and who have at least 1 additional risk factor. In individuals without these risk factors, testing should begin at age 45. However, the vast majority of people are unaware of the common diabetes risk factors,[4] and 90% of individuals with prediabetes are not aware of their condition.[5] Therefore, individuals without T2DM living in primarily non–English-speaking minority communities were enrolled.

An understanding of the level of public awareness of prediabetes and T2DM is helpful for health educators to develop more effective programs to stop the global epidemic of diabetes and eliminate health disparities between genders[6-8] and among racial/ethnic minorities.[9,10] Therefore, to assess this public awareness of prediabetes, a cross-sectional survey study was conducted to compare their knowledge about diabetes signs and symptoms and exposure to diabetes screening among community-dwelling men and women without diabetes in San Francisco Bay Area and San Diego. To explore whether gender differences in lay knowledge of diabetes symptoms exists and whether knowledge of diabetes symptoms differ among community-dwelling, monolingual, and bilingual Caucasian, Latino, Filipino, and Korean Americans.

Methods

Study Design and Sample

A total of 904 (172 Caucasian, 248 Latinos, 234 Korean, and 250 Filipino) volunteered to participate in a cross-sectional survey (titled “Digital Link to Health [DiLH] survey) at community events, community clinics, churches, and online in the San Francisco Bay Area and San Diego from August to December 2013. To participate in the survey, subjects had to be 18 years or older and reported no history of type 2 diabetes. The original purpose of the survey was to develop culturally tailored diabetes prevention programs for understudied high-risk racial and ethnic groups: Latino, Filipino, and Korean Americans. Therefore, these high-risk groups were oversampled in this survey study. The survey was available in English, Spanish, and Korean and could be taken online (Craigslist) or on paper in the 3 languages. The study protocol was approved by the University of California, San Francisco Institutional Review Board prior to conducting survey.

Survey and Measures

Knowledge about diabetes signs and symptoms was assessed by the following open-ended question: “What are the signs and symptoms of Type 2 Diabetes? Please describe. If you don’t know, please write ‘Don’t know.’ Do not search for information to answer the question.” All subject responses were independently coded by 2 bilingual staff members. Accuracy of their coding was reviewed among the investigators. An open-ended question, instead of a symptoms checklist, was utilized in order to capture both correctly and falsely identified signs and symptoms among this large and diverse sample. In addition, the following questions were also asked: “Have you discussed diabetes with your health care provider (eg, doctor),” “Do you know your fasting plasma glucose,” and “Do you know your A1C (average blood glucose level over the last 3 months)?” If subjects answered yes, they were instructed to write down the number. The survey administration mode (online or paper survey) was also coded.

Sociodemographic factors (age, gender, education, marital status, racial/ethnic background, primary language, number of years living in the US) and diabetes risk factors (family history of diabetes, physical inactivity, body mass index, and gestational diabetes) and fasting blood glucose and A1C, if known, were also assessed. Physical inactivity was defined as less than 150 minutes per week of moderate or vigorous intensity activity such as brisk walking during the last month.[11] Body mass index (BMI) was calculated based on subjects’ self-reported weight and height estimates. The survey was independently translated into Spanish and Korean by professional translators and reviewed by 2 bilingual staff members. The English survey was pilot tested twice among 10 people for each pilot, with revisions from the first pilot applied to all language-specific surveys. During the second pilot study, all 3 language-specific surveys were tested among 10 people for each language.

Procedures

The bilingual staff attended multiple community events and churches to recruit and screen potential participants prior to providing the survey. Participants completed the survey independently. If participants had questions or preferred verbal administration, bilingual staff were available to answer specific questions or help complete the survey. The online (Craigslist) survey was also created to enroll more diverse samples of community-dwelling adults and participants who did not have time to complete the survey during an event. If participants preferred the online survey during an event, staff provided a link to the online (Craigslist) survey. The online survey was also posted weekly on Craigslist. It took approximately 15 minutes to complete the entire survey. Participants who completed a paper copy of the survey were offered a complimentary tote bag, and those who completed the online survey had the option of entering a $25 gift card raffle.

Data Analysis

All survey data were entered into SPSS 21.0 using a double data entry system. Descriptive statistics were used to compare sample demographics, diabetes risk factors, and diabetes knowledge between men and women. Multiple logistic regressions were performed to explore risk factors associated with knowledge of the signs and symptoms of diabetes among community-dwelling adults and, in particular, whether gender predicted gender

knowledge of the signs and symptoms of diabetes. The open-ended question about identifying signs and/or symptoms of diabetes was coded as binary variable with no indicating no symptom or sign or don't know reported and yes indicating if subject was able to report at least 1 symptom or sign. Risk factors or covariates entered into the regression model were: gender, level of education, US residency, English spoken (at home), race/ethnicity, body mass index, family history of diabetes, history of gestational diabetes, physical inactivity, discussed diabetes with health care provider, and paper or online survey mode. In addition, to test the interaction of gender and racial/ethnicity groups, the interaction variable was entered into a multiple logistic regression model after entering all factors. A 2-tailed level of significance was set at $P < .05$. SPSS Statistics (version 21.0, IBM Corporation, Armonk, New York) was used for analysis.

Results

Subjects' Characteristics

Sociodemographics and related diabetes risk factors for the 904 participants are described in Table 1. Average age was 44.3 (SD ±16.1), with an age range from 18 to 93 years; 35.7% were male, 58.1% were married, and 27.4% had a high school level or lower education. Women were significantly more likely to be single/widowed/divorced and more likely to speak English as a primary language than men ($P = .02$). The average BMI of women and their frequency of physical inactivity were significantly lower than men ($P < .01$). Although one-third of the women (32.8%) and men (30.1%) were born in the United States, the remaining non–native-born participants did not differ by gender in their years of US residency ($P = .52$). The frequency of awareness of the survey participants' own fasting glucose or A1C levels did not significantly differ between men and women ($P > .05$). Similar to men (n = 51), only a limited number of women (n = 98) reported their fasting glucose or A1C levels, with both sexes reporting out of range values for fasting glucose ($P = .56$) and A1C levels ($P = .32$). More women entered extremely low, namely, 0, 1, 5, and 50 or above normal values (>126 mg/dL) for fasting glucose levels, and 2 male participants appeared to mistakenly enter 95 and 135 for A1C values, although these differences were not significant.

Lay Descriptions of Diabetes Signs and Symptoms and Gender Differences

Only 44.7% (n = 404) of the participants were able to report at least 1 of the signs and symptoms of diabetes. Among these participants, 26.8% (n = 242) reported 1 or 2 symptoms with the remaining 17.9% (n = 162) identifying 3 or more symptoms. The most frequently to least reported diabetes signs and symptoms between men and women are presented in Table 2. Overall, increased thirst/dry mouth following increased urinary frequency/color/odor and increased fatigue/lethargy/low energy were the most frequently reported signs and symptoms (19.8%, 15.4%, and 13.6%, respectively). Women were better than men at recognizing the following 3 signs and symptoms of diabetes: (1) increased thirst/dry mouth, (2) urinary frequency/color/ odor, and (3) appetite increase or decrease ($P < .05$).

In English, lay descriptions for increased thirst ranged from "overactive thirst," "excessive thirst"; in Spanish as "sed, mucha sed" (thirst, very thirsty); and in Korean as "목마름, 갈증" (thirst).

Lay descriptions for frequent urination included “pee too much,” “frequent trips to the bathroom”; in Spanish as “al bano, muchas ganas de hacer pipi cada rato” (bathroom, the need to go pipi all the time); and Korean as “소변 자주 봄” (urinating frequently). Fatigue associated with diabetes was described as “low energy,” “always tired”; in Spanish as “cansancio, cuerpo desmayado, debilidad, sin of strength, sin energia” (fatigue, body feels like it’s fainting/fading, lack of strength, no energy); and in Korean “몸에 기운이 죽 빠진다” (completely feeling tired).

Other descriptions of symptoms included dizziness, weight loss/gain, shakiness, fainting, mood changes, “food-dependent moods,” and sweet smelling and “fruity” breath and “strange” body odors. Less than 1% of the participants reported diabetes risk factors, namely, “bad diet” or “sedentary lifestyle” as symptoms. More women than men misattributed symptoms of other disease conditions to diabetes, namely, “night sweats, swollen legs, tachycardia, and high cholesterol,” although this gender bias in symptom recognition was not significant ($P = .72$). Only 1.9% of the 904 participants falsely identified symptoms such as “purple skin, loss of hair and teeth, and one improbable entry for fish intestines” as a diabetes symptom. One male participant did not describe symptoms of diabetes but simply said “it is a rotter disease.”

Multiple Logistic Regression Analysis in Predicting Recognition of Signs and Symptoms of Diabetes

In the multiple regression analysis, women were significantly more likely to be able to report at least 1 diabetes sign and symptom compared to men, even after controlling for all potential confounding variables (adjusted odds ratio [AOR] = 1.61; 95% CI, 1.16-2.25; $P = .004$) (see Table 3). In addition, a family history of diabetes, speaking English at home, discussion of diabetes with a health care provider, and survey mode (via online) were also significantly associated with diabetes symptom recognition ($P < .05$). In contrast, participants with a high school or less education were less likely to be able to report at least 1 symptom of diabetes, compared to those with graduate degree education (AOR = .40; 95% CI, .23-.69; $P = .001$).

However, the sample’s diverse multi-ethnic background did not influence their diabetes symptom recognition ($P = .18$), nor was the interaction between gender and race and ethnicity significant ($P = 87$).

Discussion

The purpose of this study was to explore gender differences in lay knowledge of T2DM symptoms among Caucasian, Latino, Filipino, and Korean Americans without diabetes. One of the striking findings was that approximately 55% of participants who could not identify any signs or symptom associated with diabetes and that even among the symptom reporters most identified only 1 to 2 symptoms despite the efforts to educate the public about the growing epidemic of diabetes. In particular, racial/ ethnic minority groups suffer from the early onset of T2DM and high prevalence of T2DM, but their awareness was not better than Caucasians in this survey. These disappointing numbers may be due to the lack of culturally

appropriate educational strategies that can reach out to monolingual and bilingual ethnic communities.

Women were significantly more knowledgeable about signs and symptoms associated with diabetes and were also better than men at identifying the cardinal symptoms of diabetes: increased thirst, frequent urination, and increased appetite. Gender differences in diabetes knowledge were also present among Mexican American women with diabetes (n = 67)[12] and Spanish-speaking women (n = 161); a diabetes intervention study[8] reported on average more symptoms associated with diabetes then men. These common acute diabetes symptoms were similarly recounted by rural white women newly diagnosed with diabetes (n = 15).[13] However, although the women recalled experiencing polydipsia, polyuria, polyphagia, weight loss, fatigue, and visual changes, they attributed the symptoms to hot weather, aging, hard work, or a room heater. Rural Caucasian women and men (n = 39) in Arcury et al's[6] 2005 study seldom referred to common diabetes symptoms; instead, they mentioned diabetes-related fatigue, weakness, dizziness, mood swings, and depression. Using the Diabetes Symptom Self-Care Inventory (DSCCI)[12] checklist, Mexican American women with diabetes (n = 67) reported more symptoms than men and complained of excessive fatigue, feeling nervous or shaky, and dizziness than men.

However, this symptom knowledge expressed by women appeared to be limited and did not extend to their knowledge and understanding of fasting glucose or A1C levels.

Also predictive of positive symptom knowledge was English fluency. English language fluency may have been an important contributing factor in symptom reporting for the majority of participants in this study who spoke languages other than English as their primary language. Perhaps this was a reflection of the fewer opportunities for the non–English speaker to benefit from public health campaign messages. Women, who are fluent in English and knowledgeable about diabetes, may be the chief beneficiaries of these public health campaigns. It has been suggested that as a result of this increased knowledge and sensitivity to illnesses women are apt to have more physical and somatic complaints and seek more medical care than men.[7,14]

Unlike exploratory studies on the racial/ethnic differences in symptom recognition among minorities, this study did not find significant differences in the symptom reports between the Caucasian, Latino, Filipino, and Korean participants. The interaction between gender and race and ethnicity was not significant. Participants with lower educational levels (high school or less) and competed paper versus online surveys were also significantly less likely to express knowledge of diabetes symptoms. The authors were not able to assess the relationship between the participants' educational level and health literacy.[15]

Participants with a family history of diabetes were 2.5 times more likely to be knowledgeable about symptoms of T2DM and more influential than female gender or English fluency. Family history of diabetes is one of the most recognized risk factor for diabetes. The study finding supports the immense impact of family history on an individual's understanding the symptoms and complications associated with diabetes. Additionally, results demonstrate the significance of health provider–initiated discussions on

diabetes on individuals without diabetes. Not to be overlooked was the high percentage (55%) of participants who could not identify any symptom associated with diabetes and that even among the symptom reporters, most identified only 1 to 2 symptoms despite the efforts to educate the public about the growing epidemic of diabetes. These disappointing numbers may be due to the lack of culturally appropriate educational strategies that can reach out to monolingual and bilingual ethnic communities.

Several limitations and strengths of this survey study need to be acknowledged. First, since this was a cross-sectional survey, the identified associations between gender and lay knowledge of signs and symptoms associated with diabetes cannot be used to infer causation. Second, the sampling of participants were recruited from the Bay Area and San Diego in California, and high-risk racial and ethnic minority groups who were understudied were intentionally over-recruited. Therefore, generalizability of the results is limited. Asian Americans, such as Korean and Filipino Americans, are a fast growing part of the American population, but they have largely been overlooked. This was the first study to demonstrate that knowledge of signs and symptoms between men and women did not differ in community-dwelling, monolingual and bilingual Caucasian, Latino, Filipino, and Korean adults.

Implication for Diabetes Educators

Findings underscore the importance of improving public knowledge and awareness of signs and symptoms of diabetes, particularly in men and individuals with risk factors. Diabetes educators play an important role to reduce financial and personal burden of undiagnosed diabetes and prediabetes by increasing awareness of signs and symptoms of diabetes and encouraging individuals with risk factors or are over the age of 45 to be screened. In addition, key to the early recognition of undiagnosed diabetes and prediabetes may lie with diabetes educators' ability to translate the lay-person's often limited understanding of diabetes into an effective diabetes risk management strategy that will promote a healthy, sustainable partnership.

Acknowledgment

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What Is Already Known About This Topic?

- Women with diabetes appear to be more knowledgeable about the symptoms and management of diabetes than men.
- Gender differences in diabetes knowledge have been identified in African and Latino Americans with diabetes.

What This Study Adds?

- Gender differences did not influence the recognition and knowledge of symptoms of diabetes among Caucasian, Latino, Filipino, and Korean Americans without diabetes. However, the presence of a family history of diabetes, female gender, and English fluency were predictive of greater diabetes symptom recognition for the 4 racial/ethnic groups.
- Findings support the beneficial effect of health care providers' prediabetes discussion on symptom recognition and knowledge of diabetes among at-risk and undiagnosed adults.

Table 1

Sociodemographics and Diabetes Risk Factors (n = 904)

Demographics and Risk Factors	Total N = 904 (M ± SD) or % (n)	Women (n = 581) (M ± SD) or % (n)	Men (n = 323) (M ± SD) or % (n)	*P*
Age (years)	44.3 (±16.1)	45.1 (±16.0)	43.0 (±16.1)	.07
Education				
High school or less	27.4 (247)	27.5 (159)	27.3 (88)	.12
College or less	57.2 (515)	58.9 (341)	54.0 (174)	
Graduate school	15.4 (139)	13.6 (79)	18.6 (60)	
Marital status				
Married/cohabitating	58.1 (524)	55.5 (322)	62.7 (202)	.04
Single/divorced/widowed	41.9 (378)	44.5 (258)	37.3 (120)	
US residency				
Born in US	31.9 (287)	32.8 (190)	30.1 (97)	.52
<10 years	12.5 (113)	11.7 (68)	14.0 (45)	
>10 years	55.6 (501)	55.4 (321)	55.9 (180)	
English primary language				
Yes	44.7 (404)	47.7 (277)	39.3 (127)	.02
No	55.3 (500)	52.3 (304)	60.7 (196)	
Ethnicity/race				
Caucasian	19.0 (172)	21.5 (125)	14.6 (47)	.01
Latino	27.4 (248)	28.1 (163)	26.3 (85)	
Filipino	27.7 (250)	27.5 (160)	27.9 (90)	
Korean	25.9 (234)	22.9 (133)	31.3 (101)	
Body mass index (kg/m^2)	25.5 (±5.3)	25.0 (±5.5)	26.3 (±4.9)	<.001
Gestational diabetes	6.0 (54)	9.4 (54)	0	<.001
Family member with diabetes				
Yes	35.3 (317)	35.9 (208)	34.1 (109)	.58
No	64.7 (582)	64.1 (371)	65.9 (211)	
Physical inactivity				
Yes	44.8 (404)	47.7 (276)	39.6 (128)	.02
No	55.2 (498)	52.3 (303)	60.4 (195)	
Discussed diabetes with health care provider				
Yes	35.0 (314)	34.1 (197)	36.6 (117)	.47
No	65.0 (583)	65.9 (380)	63.4 (203)	
Knows diabetes sign/symptoms				
Yes	44.7 (404)	48.5 (282)	37.8 (122)	.002
No	55.3 (500)	51.5 (299)	62.2 (201)	
Knows fasting glucose				
Yes	16.6 (149)	16.9 (98)	16.0 (51)	.73
No	83.4 (750)	83.1 (482)	84.0 (268)	

Demographics and Risk Factors	Total N = 904 (M ± SD) or % (n)	Women (n = 581) (M ± SD) or % (n)	Men (n = 323) (M ± SD) or % (n)	*P*
Knows A1C level (%)				
Yes	3.8 (34)	3.6 (21)	4.1 (13)	.75
No	96.2 (861)	96.4 (555)	95.9 (306)	
Survey mode				
Online	27.7 (250)	29.9 (174)	23.5 (76)	.04
Paper	72.3 (654)	70.1 (407)	76.5 (247)	

Table 2

Reported Diabetes Signs and Symptoms Between Women And Men[a]

	Total (N = 904)	Women (n = 581)	Men (n = 323)	*P*
Diabetes symptoms	% (n)	% (n)	% (n)	
Increased thirst/dry mouth	19.8 (179)	15.6 (141)	4.2 (38)	<.001
Increased urinary frequency, color, odor	15.4 (139)	11.2 (101)	4.2 (38)	.03
Increased fatigue, lethargy, low energy	13.6 (123)	8.5 (77)	5.1 (46)	.68
Weight gain or loss	12.6 (114)	8.8 (80)	3.8 (34)	.16
Blood sugar or insulin problems	9.6 (87)	7.1 (64)	2.5 (23)	.06
Dizziness or fainting	5.3 (48)	3.9 (35)	1.4 (13)	.20
Appetite increase or decrease	5.0 (45)	4.0 (36)	1.0 (9)	.02
Vision problems	3.9 (35)	3.0 (27)	0.9 (8)	.11
Skin/infection/poor wound healing/weakened immunity	3.4 (31)	2.2 (20)	1.2 (11)	.98
Loss in sensation (neuropathy)	2.8 (25)	2.2 (20)	0.6 (5)	.10
Blood pressure problems	1.9 (17)	1.3 (12)	0.6 (5)	.58
Mood changes	1.8 (16)	1.4 (13)	0.3 (3)	.15
Sweating or shaking	1.5 (14)	0.9 (8)	0.7 (6)	.58
Headache/lightheadedness/fainting	1.3 (12)	1.1 (10)	0.2 (2)	.17
Diabetic risk factors	0.9 (8)	0.8 (7)	0.1 (1)	.17
Diabetic test procedures	0.4 (4)	0.3 (3)	0.1 (1)	.65
Sweet breath or body odor	0.3 (3)	0.2 (2)	0.1 (1)	.93
Symptoms of other disease conditions[b]	4.3 (39)	2.6 (24)	1.7(15)	.72
Other unrelated signs and symptoms[c]	1.9 (17)	1.0 (9)	.9 (8)	.33

[a] Each subject could list more than 1 symptom.

[b] Symptoms of other disease conditions: night sweats, swollen legs, high cholesterol.

[c] Other unrelated signs and symptoms: purple skin, fish intestines, loss of hair and teeth.

Table 3

Multiple Logistic Regression in Predicting "Knew Diabetes Signs and Symptoms" (N = 857)[a]

	Adjusted Odds Ratio	95% Confidence Interval	*P* Value
Gender			
Women	1.61	1.16-2.25	.004
Age (years)	.99	.99-1.01	.64
Education			
Graduate school	Reference	—	<.001[b]
High school or less	.40	.23-.69	.001
College or less	.88	.58-1.36	.57
Marital status			
Married/cohabitating	1.19	.85-1.67	.32
US residency (years)			
Born in US	Reference	—	.86[b]
<10 years	.91	.49-1.68	
>10 years	1.02	.63-1.64	
Speaking English at home	1.61	1.0-2.60	.05
Race/ethnicity[c]			
Caucasian	Reference	—	.18[b]
Latino	.56	.31-1.03	
Filipino	.57	.34-.97	
Korean	.63	.34-1.18	
Body mass index (kg/m^2)	.99	.96-1.02	.38
Family history of diabetes	2.51	1.82-3.47	<.001
Gestational diabetes	.88	.46-1.70	.71
Physical inactivity	.78	.57-1.08	.14
Discussed diabetes with health care provider	1.86	1.33-2.59	<.001
Survey mode[d]			
Paper	.46	.32-.67	<.001

[a] Forty-seven cases excluded due missing values.

[b] Overall *P* value.

[c] Interaction term between gender and race/ethnicity was not statistically significant in the final model (*P* = .87).

[d] Paper versus online.