



Gender and ethnic differences in the prevalence of type 2 diabetes among Asian subgroups in California ☆,☆☆

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ABSTRACT

Aims: To investigate gender and ethnic type 2 diabetes (DM) prevalences among California Asian subgroups versus other ethnic groups and if risk factors explain these differences.

Methods: We identified the prevalence of DM and associated risk factors, stratified by gender, among Chinese, Filipino, South Asian, Japanese, Korean, Vietnamese, Mexican, Other Hispanic, African-American, Caucasian, and Native American adults in a large survey conducted in 2009 ($n = 46,091$, projected $n = 26.6$ million).

Results: The highest age-adjusted DM prevalence was seen in Native Americans (32.4%), Filipinos (15.8%), and Japanese (11.8%) among men and in Native Americans (16.0%) and African-Americans (13.3%) among women. Caucasian and Mexican men had higher DM prevalences than women. Age and risk factor-adjusted logistic regression showed DM more likely (relative to Caucasians) among women in Koreans ($OR = 4.6$, $p < 0.01$), Native Americans ($OR = 3.0$, $p < 0.01$), and Other Hispanics ($OR = 2.9$, $p < 0.01$) and among men in Filipinos ($OR = 7.0$, $p < 0.01$), South Asians ($OR = 4.7$, $p < 0.01$), and Native Americans ($OR = 4.7$, $p < 0.01$). No specific risk factors accounted for the gender differences.

Conclusions: Ethnic and gender differences in DM prevalence persist, even after adjusting for lifestyle and other risk factors; prevalence is high among certain Asian American subgroups. Different diabetes prevention approaches may be needed across ethnic/gender groups.

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1. Introduction

The prevalence of type 2 diabetes (DM) is higher in racial/ethnic minorities than in Caucasians (Centers for Disease Control & Prevention, 2011). However, to date, Asian Americans remain underrepresented in most population-based epidemiological studies, either being excluded due to small sample sizes or included only in aggregate as an Asian American Pacific Islander “AAPI” or “others” group. As a result, despite the rapid population growth and rising incidence of DM among Asian American subgroups (Caballero, 2005; Lee, Brancati, & Yeh, 2011; U.S. Census Bureau, 2009), data on the prevalence and risk factors of DM among Asian subgroups, compared with that of other racial/ethnic groups (e.g., African-Americans or

Hispanics), lag behind, and the scarcity of Asian subgroup-specific data makes it difficult to identify potentially critical subgroup differences in this most diverse racial group in the United States (Terrance & Bennett, 2003).

In addition, while gender differences in DM risk factors and prevalence have been shown among African-Americans, Hispanics, and Caucasians in previous studies using national datasets (Cowie et al., 2010; Hertz, Unger, & Ferrario, 2006; Signorello et al., 2007), gender differences have not been adequately investigated among Asian American subgroups using a population-based representative sample. Previous studies included only one major Asian subgroup (e.g., Filipinos, Chinese) (Araneta & Barrett-Connor, 2005; Lakoski et al., 2006), limiting the ability to compare gender differences in risks and prevalence of DM with other Asian subgroups and other racial/ethnic groups, or used Asian subgroups within a specific healthcare care setting (Palaniappan, Wong, Shin, Fortmann, & Lauderdale, 2011; Wang et al., 2011).

Asian Americans are racial/ethnically diverse and each subgroup has distinct culture, lifestyle habits, and health behaviors and practices (Islam, Trinh-Shevrin, & Rey, 2009). Evidence suggests that health behaviors and practices, such as diet and exercise, are directly linked to risk factors and prevalence of DM (Mann, 2002; Perez-Escamilla & Putnik, 2007; Schenk & Horowitz, 2007; Uusitupa, 2002). Thus, treating diverse Asian Americans as a single group may

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mask important heterogeneity in DM risk factor profiles and prevalence among Asians and obstruct the identification of high risk subgroups that may require different prevention and intervention approaches (e.g., screening at younger age, gender-specific prevention protocols).

Data comparing multiple subgroups within a single data source/dataset simultaneously remains scarce, and gender stratification may reveal further differences in DM prevalence. Therefore, we examined the prevalence of DM within a sample of California adults for six Asian subgroups along with three other racial/ethnic minority groups relative to Caucasians and stratified the results by gender. Our specific aims were (1) to investigate the gender difference in the prevalence of DM among California Asian subgroups in comparison with Caucasians and other racial/ethnic groups; (2) to describe gender differences in the prevalence of lifestyle and clinical DM risk factors among the same groups; and (3) to examine whether gender differences in risk factors explain the gender differences in the prevalence of DM in certain Asian subgroups compared to Caucasians and other racial/ethnic groups.

2. Methods

2.1. Study population

Using the California Health Interview Survey (CHIS) 2009 (California Health Interview Survey, 2011), we examined California adults aged 18 and older ($n=46,091$ projected to 26.6 million) to determine DM likelihood among different racial/ethnic groups relative to Caucasians, African-Americans, and Hispanics, stratified by gender. These racial/ethnic groups include: Chinese, Filipino, South Asian, Japanese, Korean, Vietnamese, Mexican, Other Hispanic, and African-American. Due to the insufficient number of the Cambodian/other Asian subgroups with prevalent diabetes ($n=13$), we omitted this group from the study.

2.2. Data source and definitions

The CHIS is a biennial population-based telephone interview health survey of individuals residing in households in California. The survey collects a variety of health information including diseases, lifestyle and health behaviors, health status, socioeconomic status, and access to healthcare. The CHIS sample was drawn from all of California's 58 counties and was designed to be representative of the diversity of the California population. The sample was weighted to represent the non-institutionalized population state-wide. The weighting procedure used for CHIS 2009 compensates for differential probabilities of selection for households and persons, reduces biases occurring from the differing characteristics of respondents and non-respondents, adjusts for under-coverage in the sampling frames, and reduces the variance of the estimates by using auxiliary information.

One randomly selected adult was interviewed per household. Interviews were conducted in multiple languages (English, Spanish, Mandarin, Cantonese, Vietnamese, and Korean). Questions covered included health conditions, health behaviors (e.g., smoking, daily fruit and vegetable consumption, and vigorous exercise), poverty level, and health insurance coverage. Body Mass Index (BMI) was calculated in kg/m^2 based on self-reported height and weight without shoes. Race/ethnicity was determined by participants' self-report. DM was defined by the respondents' self-reported answer choice to the question, "Were you told that you had type 1 or type 2 diabetes?" The respondent was provided with a description of type 1 and type 2 diabetes if needed. Those who responded with type 1 diabetes were excluded from the study. Additionally, high blood pressure, coronary heart disease (CHD), and heart failure (HF) were

defined by either self-report or indication of the doctor's saying they had the condition.

Risk factors for DM by the American Diabetes Association include age, BMI, exercise habits, history of hypertension, and dyslipidemia (American Diabetes Association, 2012b). Past research has also focused extensively on the documentation of demographic risk factors for racial/ethnic minority populations, identifying socioeconomic and cultural factors such as health insurance, poverty level, and acculturation as correlates to DM prevalence (Centers for Disease Control & Prevention, 2007; Perez-Escamilla & Putnik, 2007; Signorello et al., 2007). Poverty level in the United States is determined by the Department of Health and Human Services and refers to federal poverty level (FPL), which is the set minimum amount of gross income that a family needs for food, clothing, transportation, shelter, and other necessities. FPL varies according to family size and public assistance programs define eligibility income limits as some percentage of FPL (U.S. Department of Health & Human Services, 2012). Therefore, we selected risk factors available from CHIS for this analysis to include: gender, age, whether or not the subject was US-born, time living in US, health insurance status, FPL (0–99%, 100–299%, and 300%), current smoker, high blood pressure, vegetable consumption, level of vigorous physical activity, BMI, and use of cholesterol medication. The presence of comorbidities of HF and CHD were also included.

2.3. Statistical analysis

The chi-squared test of proportions was used to compare the prevalence of DM and risk factors across the different racial/ethnic groups for both genders. For continuous variables, the Student's t-test was used for comparisons between genders and analysis of variance (ANOVA) between racial/ethnic groups. Multivariable logistic regressions were used to determine which risk factors and racial/ethnic subgroups (relative to Caucasian), stratified by gender, remained independently associated with an increased likelihood of having DM. Additionally, using individual multivariable logistic regression models, we sequentially added clinical and lifestyle covariates to a base model with only gender and race/ethnicity to determine if they explained gender differences within racial/ethnic groups regarding the odds of DM. SAS version 9.1.3 (SAS institute, Cary, NC) and SUDAAN software (RTI International, Research Triangle Park, North Carolina) were used for analysis and computation of weighted estimates for projection to the California population.

3. Results

An analysis of the prevalence of DM in Californian adults (Fig. 1) demonstrates that among men, the age-adjusted prevalence of DM was highest in Native Americans (32.4%), Filipinos (15.8%), Japanese (11.8%), and Mexicans (10.0%). Among women, Native Americans (16.0%), African-Americans (13.3%) and Other Hispanic (10.7%) had the highest DM prevalence. In all racial/ethnic groups, except African-Americans and Other Hispanics, men had higher DM prevalence than women. Among men, Vietnamese (2.5%) and Chinese (5.0%) had lower prevalence than Caucasians (6.1%). Among women, Vietnamese (2.1%), South Asian (2.7%), and Chinese (3.6%) had lower prevalence than Caucasians (4.9%). Significant gender differences were observed only in Caucasians ($p<0.01$) and Mexicans ($p<0.05$), where men had a higher DM prevalence than women. The differences across ethnic groups among all males and females are significant ($p<.0001$).

In our sample of male adults with DM (Table 1A, B), the independent variables US-born, duration of US residence, insurance, poverty level, smoking, high blood pressure, BMI (overweight/obesity), HF, and CHD were significantly different across the different racial/ethnic groups ($p<0.01$); among female adults with DM

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