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Using appropriate body mass index cut points for overweight and obesity among Asian Americans

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ABSTRACT

Objective. Asian Americans have low prevalence of overweight/obesity based on standard BMI cut points yet have higher rates of diabetes. We examined the prevalence of overweight/obesity, using lower BMI cut points recommended by the World Health Organization (WHO) for Asians, and diabetes in Asian American subgroups in California.

Method. Secondary analysis of the 2009 adult California Health Interview Survey ($n = 45{,}946$) of non-Hispanic Whites (NHW), African Americans, Hispanics and Asians (Vietnamese, Chinese, Korean, Filipino, South Asian and Japanese). WHO Asian BMI cut points (overweight = 23–27.5 kg/m^2; obese ≥ 27.5 kg/m^2) were used for Asian subgroups. Standard BMI cut points (overweight = 25–29.9 kg/m^2; obese ≥ 30 kg/m^2) were applied for other groups.

Results. Among Asian subgroups, overweight/obesity was highest among Filipinos (78.6%), which was higher than NHWs ($p < 0.001$) but similar to African Americans and Hispanics. Compared to NHW, diabetes prevalence was higher for Vietnamese, Koreans, Filipinos and South Asians with BMI = 23–24.9 kg/m^2 and Koreans, Filipinos and Japanese with BMI = 27.5–29.9 kg/m^2, the ranges WHO recommends as overweight or obese for Asians but not for other groups.

Conclusions. Filipinos should be a priority population for overweight/obesity screening. Filipinos, Vietnamese, Korean, South Asians and Japanese have higher diabetes prevalence at lower BMI cut points. WHO Asian BMI cut points may have clinical utility to identify at-risk Asian Americans.

Introduction

Overweight/obesity is a global and growing public health problem associated with type 2 diabetes and cardiovascular disease (Manson and Bassuk, 2003; Must et al., 1999). Recent recognition of obesity as a disease by the American Medical Association underscores the importance of appropriate identification and treatment of obesity in clinical settings (American Medical Association, 2013). Body mass index (BMI) is a convenient surrogate measure of body fatness in clinical settings and has strong associations with health risks and mortality across populations. The standard BMI cut points that World Health Organization (WHO) has recommended since 1993 are 25–29.9 kg/m^2 for overweight and ≥30 kg/m^2 for obese, which have been adopted by most countries as the standard overweight/obesity cut points (World Health Organization, 1995).

For the same amount of body fat, age and sex, Asians tend to have a consistently lower BMI by about 2–3 kg/m^2 in comparison to Whites, partly due to differences in body build and muscularity (Deurenberg et al., 2002). Moreover, conventional cut points for overweight/obesity do not correspond to similar absolute or relative metabolic risk in all ethnic groups (Pan et al., 2004; Simmons et al., 1991; World Health Organization, 2004; World Health Organization et al., 2000). Based on these shortcomings of the BMI measure in Asian populations, a WHO Expert Consultation panel, using all available data from Asian countries, in 2002 proposed lowering BMI cut points to trigger public health

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action for Asians, categorizing 23–27.5 kg/m^2 as overweight and BMI ≥ 27.5 kg/m^2 as obese (World Health Organization, 2004). However, there has been debate on the adoption of Asian specific BMI cut points, particularly in Westernized countries (Low et al., 2009; Pan and Yeh, 2008; Razak et al., 2007; Stevens, 2003).

In the United States (US), Asian Americans have low rates of overweight/obesity defined by the standard BMI cut points compared to non-Hispanic Whites (NHW), African Americans and Hispanics (Bates et al., 2008; Lauderdale and Rathouz, 2000; Ogden et al., 2013; Wang and Beydoun, 2007). Despite a relatively favorable body weight profile, Asian Americans suffer from a disproportionate burden of type 2 diabetes and associated metabolic abnormalities (Karter et al., 2013; King et al., 2012; Lee et al., 2011; Palaniappan et al., 2011). Consistently, type 2 diabetes has been found to develop at a lower BMI in Asians (Chan et al., 2009; Chiu et al., 2011; Karter et al., 2013; Lee et al., 2011; McNeely and Boyko, 2004; Steinbrecher et al., 2012; Wander et al., 2013). The application of the WHO Asian BMI cut points may provide better estimates of health conditions attributable to overweight/obesity using more population-appropriate cut points (Karter et al., 2013; King et al., 2012; Palaniappan et al., 2011) but are currently not recommended as screening guidelines for clinical use (American Diabetes Association, 2013; Moyer, 2012; National Institutes of Health, 1998). Using standard BMI cut points to examine overweight/obesity among Asians American subgroups may underestimate its impact in these populations.

Few studies have examined overweight/obesity in Asian Americans, defined by the WHO Asian BMI cut points, compared to rates seen in other major racial/ethnic groups. We compared the prevalence of overweight/obesity among Asian Americans subgroups using the WHO Asian BMI cut points to its prevalence among NHW, African American and Hispanic respondents, using the standard cut points. We also examined the prevalence of self-reported diabetes among respondents with BMI of 23–24.9 kg/m^2 or 27.5–29.9 kg/m^2, the two BMI ranges differentially classified by the WHO for Asians and compared to other groups.

Methods

Study design and sample

We used publicly available cross-sectional data from the 2009 California Health Interview Survey (CHIS), a population-based random-dial telephone survey of non-institutionalized Californians administered since 2001 by the University of California Los Angeles Center for Health Policy and Research. CHIS was conducted in English, Spanish, Mandarin, Cantonese, Korean and Vietnamese languages. The 2009 survey oversampled Korean and Vietnamese populations. The CHIS uses complex weighting to provide representative population estimates that account for the differential sampling rates and participant non-response (California Health Interview Survey, 2011) and imputes missing responses on specific items. The response rate for the adult extended survey was 49% in 2009 (California Health Interview Survey, 2011).

We restricted our analysis to non-pregnant adults aged 18 and older who self-reported solely as NHW, non-Hispanic African American, Hispanic or non-Hispanic Asian. We further restricted attention to 6 major non-Hispanic Asian subgroups (Chinese, Filipino, Japanese, Korean, South Asian and Vietnamese) among respondents that reported only one Asian ethnic group. The overall non-Hispanic Asian sample includes other Asian subgroups and respondents who report more than one Asian ethnicity.

Measures

All measures were based on self-report by respondents. BMI was calculated by self-report of height and weight and provided by CHIS. We examined overweight/obesity by using standard BMI cut points in NHW, African American and Hispanic populations, and the WHO Asian BMI cut points in Asian groups. Using the standard cut points, the 3 BMI categories are as follows: 18.5–24.9 kg/m^2 (normal weight), 25–29.9 kg/m^2 (overweight) and ≥30 kg/m^2 (obese) (World Health Organization, 1995). Using the WHO Asian BMI risk cut points, the 3 categories are 18.5–22.9 kg/m^2 (normal weight), 23–27.5 kg/m^2 (overweight) and ≥27.5 kg/m^2 (obese) (World Health Organization, 2004). We also examined BMI using 5 categories (18.5–22.9, 23–24.9, 25–27.49, 27.5–29.9 and ≥30 kg/m^2) incorporating cut points from the standard and WHO Asian BMI scale. Respondents with BMI < 18.5 kg/m^2 were restricted from analysis.

We also examined select socio-demographic characteristics including age, sex, nativity, years lived in the US for those foreign born and language spoken at home. The self-reported prevalence of tobacco use (current smoker, never smoker and prior smoker), type 2 diabetes, hypertension and heart disease were assessed.

Statistical analysis

We used complex survey methods available in Stata Version 12.1 [Stata Corp, College Station, TX]. Following CHIS guidelines, we incorporated the survey weights in all analyses and used jackknife methods to obtain standard errors, confidence intervals and *p*-values. Statistical significance was set at $p < 0.05$ level.

We used a multinomial logit model in combination with regression standardization to estimate age, sex and nativity adjusted prevalence of overweight and obesity by race/ethnicity. For each Asian subgroup, an overall test of equality of the prevalence of overweight and obesity was performed relative to NHW, African American and Hispanic groups.

We also used a logistic model with regression standardization to estimate age, sex and nativity adjusted prevalence of type 2 diabetes, hypertension and heart disease by race/ethnicity in each of the 5 BMI categories described earlier. In particular, we focused on prevalence of diabetes in the category 23–24.9 kg/m^2, in which Asians are considered overweight by the WHO guidelines while non-Asians are not, and in the category 27.5–29.9 kg/m^2, in which Asians are considered obese but the other the groups are classified as overweight.

In addition, we examined the sensitivity, specificity, percent correctly classified and the area under receiver operating characteristic curve (AUROC) of standard and WHO Asian BMI cut points for overweight/obesity for detecting prevalent type 2 diabetes, hypertension and heart disease. AUROC estimates were compared using bootstrap resampling.

In both models, we accommodated violations of the linearity assumption for age using a restricted cubic spline transformation. In sensitivity analyses, given the association between smoking and obesity (Mackay et al., 2013) and the great variability in smoking prevalence by sex and racial subgroups across Asian populations (Maxwell et al., 2012), we checked for differences in the effect of race/ethnicity by smoking status on the measures of overweight and obesity.

Given that we used publicly available de-identified data for all analyses, it was determined that our study did not meet the definition of human subject research based on guidelines provided by our institution's Committee on Human Research.

Results

The 2009 CHIS sample included 45,946 respondents eligible for analysis. Table 1 illustrates weighted unadjusted sociodemographic and health characteristics for each racial/ethnic group.

Among the 6 Asian subgroups, mean BMI was highest among Filipinos (25.5 kg/m^2), but this was lower than the means for the NHW, African Americans and Hispanic groups. Filipinos also reported the highest prevalence of type 2 diabetes (12.7%) across all groups, while Vietnamese and Chinese had the lowest prevalence of diabetes overall.

Fig. 1 shows the age, sex and nativity adjusted prevalence of overweight/obesity for each racial/ethnic group, using the WHO cut points for Asians and the standard cut points for the other three groups. Across all groups, the combined adjusted prevalence of overweight/obesity was highest among Filipinos (78.6%) followed by Hispanics (69.7%) and African Americans (64.9%). The prevalence of overweight/obesity was not statistically different between Filipinos and Hispanics ($p = 0.15$) and African Americans ($p = 0.06$). However, Filipinos had significantly higher prevalence of overweight/obesity than NHW ($p < 0.001$).

Among the other Asian ethnicities, in addition to Filipinos, the prevalence of reported overweight/obesity was over half among South