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RESEARCH LETTER

Vitamin D Status among Women of Different Asian Subgroups Initiating Osteoporosis Therapy

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Among the 1,866 Asian women (901 Filipina women, 654 Chinese women, and 311 Japanese women) who had vitamin D assessment prior to initiation of osteoporosis therapy, Filipina women had a lower prevalence of vitamin D deficiency compared to Chinese women, despite higher body mass index (BMI). In multivariable analyses that adjusted for age, BMI, and smoking status, the relative risk (RR) of low vitamin D was significantly higher for Chinese women (RR 1.4, 95% confidence interval 1.1–1.7) but not for Japanese women (RR 1.2, 95% confidence interval 0.9–1.6). The 40% higher risk of low vitamin D in Chinese women compared to Filipina women emphasizes the importance of disaggregating the Asian race when examining nutritional health attributes.

Key Words: vitamin D ▪ osteoporosis ▪ women ▪ Chinese ▪ Japanese ▪ Filipina ▪ ethnicity

Optimizing vitamin D status is an integral component of osteoporosis and fracture prevention care.[1] In a previous study, we observed that one in five US women who initiated osteoporosis therapy with an oral bisphosphonate drug had a recent history of low vitamin D level and that the prevalence of low vitamin D varied by race and ethnicity.[2] Compared to non-Hispanic White women where the prevalence of low vitamin D was 19%, the relative risk (RR) of low vitamin D was 1.2 [95% confidence interval (CI): 1.1–1.3] for Asian women, 1.7 (95% CI: 1.6–1.8) for Hispanic/Latina women, and 2.2 (95% CI: 2.0–2.4) for black women.[2] However, fewer studies have examined variation in vitamin D status among Asian subgroups, where there is now recognition that ethnic differences among Asian adults may impact care delivery and outcomes.[3]

Recognizing that Asian Americans comprise a heterogeneous group for whom fracture prevention care should be individualized, we further identified Asian ethnicity among those classified by Asian race and examined whether vitamin D status varied across the primary Asian subgroups identified among women who subsequently initiated osteoporosis treatment.

METHODS

This retrospective observational study examined the prevalence of low vitamin D among 2,679 Asian women identified from Kaiser Permanente Northern California (KPNC) members who were aged 50–89 years, initiated oral bisphosphonate therapy during 2010–2013, had body mass index (BMI) measured and were not underweight, and had a 25OH-Vitamin D (25OHD) level measured within the prior 2 years.[2] The study was approved by the KPNC Institutional Review Board with a waiver of informed consent.

Health plan databases were used to identify the subset of Asian women who were of Chinese, Filipina, or Japanese ethnicity, comprising 70% of the overall Asian cohort (1,866 of 2,679 women). Asian ethnicity was determined from self-reported data in electronic health records or administrative databases. The primary outcome was a low 25OHD level defined as <20 ng/mL.[4] BMI was classified as healthy (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2), or obese (≥30 kg/m^2) using standard cut-points and as healthy (18.5–22.9 kg/m^2), overweight (23–27.4 kg/m^2), or obese (≥27.5 kg/m^2) using lower BMI intervention thresholds for adults of Asian race.[5] Smoking status was classified based on self-reported data from the prior 5 years (current smoker, prior smoker, never smoked).

Differences between groups were examined using the chi-squared or Fisher's exact test. Log-binomial regression was used to examine the association of ethnicity and low 25OHD level as previously conducted for the source cohort.[2]

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POPULAR SCIENTIFIC SUMMARY

- Filipina women had a lower prevalence of vitamin D deficiency compared to Chinese women
- When adjusted for age, BMI, and smoking status, risk of low vitamin D was 40% higher in Chinese women compared to Filipina women

RESULTS

There were 1,866 Asian women of Filipina (901 women, 48%), Chinese (654 women, 35%), and Japanese (311 women, 17%) ethnicity included in these analyses. Compared to Filipina women, Chinese women were similar in age, but Japanese women were slightly older (Table 1). Chinese and Japanese women also had slightly lower mean BMI, with about three-fourths classified as healthy weight and one-fourth as either overweight or obese using standard BMI thresholds and about half as healthy weight and half as either overweight or obese using Asian-specific BMI thresholds. In contrast, 59% of Filipina women had healthy weight, 32% of Filipina women had overweight, and 9% of Filipina women had obesity using standard BMI cut-points, and one-third of Filipina women had healthy weight and two-thirds of Filipina women had overweight or obesity using Asian-specific cut-points. Chinese women (1%) were less likely to report current smoking when compared to Filipina women (3%), whereas Japanese women were similar (3%). Differences in smoking prevalence between Chinese and Japanese women did not reach statistical significance (P = 0.06). A significantly higher proportion of Chinese women (21%, P = 0.02) had 25OHD level <20 ng/mL compared to Filipina women (16%), but the proportions did not differ significantly for Japanese women (19%).

Adjusting for age, BMI (as a continuous measure), and smoking status, the RR of low 25OHD level was significantly higher for Chinese (RR 1.4, 95% CI: 1.1–1.7) but not for Japanese (RR 1.2, 95% CI: 0.9–1.6) women, when compared to Filipina women (Table 1). These results were unchanged when adjusting for BMI as a categorical variable using standard or lower Asian-specific thresholds.

DISCUSSION

This contemporary report compares vitamin D status among a large population of Filipina, Chinese, and Japanese American women who subsequently initiated osteoporosis therapy. Despite a higher proportion of overweight and obesity, Filipina women had a lower prevalence of vitamin D deficiency (16%) compared to Chinese women (21%). In analyses that adjusted for age, BMI, and smoking status, the risk of low vitamin D was 40% higher in Chinese women.

Data comparing Asian ethnic groups that include Filipina women in the same US clinical population are limited. In a Hawaii study of 223 older adults of White, East Asian, Native Hawaiian/Pacific Islander, or Filipino ethnicity, Filipino adults were least likely to be

Table 1. Age, weight, and vitamin D status of Filipina, Chinese, and Japanese women.

Patient characteristics	Filipina women *N* = 901	Chinese women *N* = 654	Japanese women *N* = 311
Age, mean ± SD	69.5 ± 8.0	69.1 ± 9.5	74.3 ± 8.7*
BMI, mean ± SD (kg/m^2)	24.9 ± 3.9	23.4 ± 3.4*	23.3 ± 3.1*
BMI category (standard thresholds, kg/m^2)			
Healthy (18.5 to <25)	529 (59%)	494 (76%)*	228 (73%)*
Overweight (25.0 to <30)	291 (32%)	132 (20%)	76 (24%)
Obese (≥30.0)	81 (9%)	28 (4%)*	7 (2%)*
BMI category (lower Asian thresholds)			
Healthy (18.5 to <23)	300 (33%)	354 (54%)*	160 (51%)*
Overweight (23.0 to <27.5)	419 (46%)	222 (34%)	120 (39%)
Obese (≥27.5)	182 (20%)	79 (12%)*	31 (10%)*
Current smoker$^\Delta$	28 (3%)	7 (1%)*	9 (3%)
25-OHD <20 ng/mL	147 (16%)	138 (21%)*	58 (19%)
Relative risk (low vitamin D)†	Referent	1.4 (1.1–1.7)	1.2 (0.9–1.6)

BMI, body mass index.

*P < 0.05 versus Filipina women. For BMI comparisons, significant differences by ethnicity were seen for overweight and obese versus healthy BMI and for obese versus non-obese BMI.

$^\Delta$Smoking status examined for the study cohort was classified as current smoker (2%), former smoker (10%), never smoker (83%), or unknown smoking status (5%).

†Relative risk (outcome low vitamin D) adjusted for age, smoking status, and BMI as a continuous variable.

vitamin D insufficient, and East Asian adults were most likely,[6] supporting observations in this study. In the Philippines, up to half of all working urban Filipinos (52% of 1,446 adults in Metropolitan Manila) were reported to have 25OHD level <20 ng/mL,[7] whereas in a separate study of 70 women with osteoporosis examined in Manila, 36% had 25OHD level between 10 and <32 ng/mL and 64% had 25OHD level ≥32 ng/mL.[8] In China, the majority of postmenopausal women identified across seven geographic regions had 25OHD level <20 ng/mL (61%), with a higher prevalence of low vitamin D noted in urban areas.[9] However, multiple factors may contribute to country-specific differences, including geography, sun exposure, supplement use, dairy and fish consumption, lifestyle, health, genetic factors, and health-related perspectives and attitudes.[7–10] Data from the United States indicate a lower prevalence of vitamin D deficiency among older compared to younger adults and among those taking vitamin D supplements.[11]

While our data are limited by a lack of information on dietary and supplemental vitamin D intake as well as other health behaviors, these findings underscore the importance of disaggregating Asians when examining health attributes and the potential role of culturally specific nutritional assessment and counseling in osteoporosis care. Future studies should include an examination of other Asian subgroups including South Asians, other East and Southeast Asians, and Native Hawaiian and Pacific Islanders. A greater understanding of Asian health, ethnic differences, and contributing factors may inform approaches to optimizing skeletal outcomes for these women.

ARTICLE INFORMATION

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Author contributions

Samantha Ho, Christina Li, Malini Chandra, and Joan Lo designed the study. Malini Chandra and Joan Lo acquired the data, and Malini Chandra conducted the data analyses. All authors contributed to the interpretation of data. Samantha Ho, Christina Li, and Joan Lo drafted the initial version of the article. All authors revised the manuscript for important intellectual content and approved the final draft for submission.

Sponsors role

None.

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