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Racial and Ethnic Differences in Chronic Kidney Disease and its Risk Factors Among Asian-Americans and Pacific Islanders in Hawaii

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Abstract

Background: Several studies suggest that Asian-American and Native Hawaiian and Other Pacific Islander (NHOPI) racial/ethnic groups have heightened risk of chronic kidney disease (CKD), but provide limited inference due to aggregation of these groups into a single racial/ethnic category. We thus examined the association of granularly-defined racial/ethnic groups with specific CKD-indicators among a diverse group of participants from the National Kidney Foundation of **Hawaii's** Kidney Early Detection Screening (KEDS) Program.

Methods: Among 1243 participants enrolled in 19 KEDS screening events over 2006–2009, we examined the association between Asian-American and NHOPI groups and specific

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CKD-indicators, defined as self-reported CKD, microalbuminuria, and macroalbuminuria using multivariable logistic regression. We then examined associations of race/ethnicity with various CKD risk factors.

Results: The most predominant racial/ethnic groups were White (22.0%), Multi-Racial (18.9%), Japanese (19.2%), Filipino (13.4%), NHOPI (8.4%), and Chinese (4.5%) participants. NHOPI and Chinese participants had higher risk of microalbuminuria (adjusted ORs [aORs] [95% CIs] 2.48 [1.25–4.91] and 2.37 [1.07–5.27], respectively), while point estimates for all other minority groups suggested higher risk (reference: Whites). NHOPI participants also had higher risk of macroalbuminuria and self-reported CKD. While most minorities had higher risk of diabetes and hypertension, NHOPI and Multi-Racial participants had higher risk of obesity, whereas the East Asian groups had lower risk.

Conclusions: In this community-based cohort, compared with Whites, Asian-Americans had higher risk of early CKD-indicators whereas NHOPIs had higher risk of more severe CKD-indicators. Further studies are needed to elucidate the distinct pathways leading to CKD across diverse racial/ethnic groups in Hawaii.

Keywords

Hawaii; Asian; Native Hawaiian; Pacific Islander; minorities; chronic kidney disease

Introduction

In the United States (US), Asian-Americans and Pacific Islanders are the fastest growing racial groups, expanding over four times more rapidly than that of the total US population.[1, 2] As of 2016, the Census Bureau reported that there are 21.4 million Asian-American and 1.5 million Native Hawaiian and Other Pacific Islander residents in the US.[3] Several large population-based studies have suggested that Asian-Americans and Pacific Islanders have a heightened risk of end-stage renal disease (ESRD),[4–7] and sparse data indicate a higher risk of pre-dialysis chronic kidney disease (CKD) as well.[8–10] While there have been an increasing number of studies examining CKD disparities and their underpinnings amongst US minority populations such as African-Americans,[11–17] Hispanics,[18–20, 15] and Native Americans,[21–23] the Asian-American, Native Hawaiian, and Other Pacific Islander communities are among the most under-studied racial/ethnic groups with respect to kidney disease in the nation. [24]

In the US, Asian-Americans are a heterogenous population, comprised of individuals originating mostly from East Asia, Southeast Asia, and South Asia. In addition, Pacific Islanders, who include individuals originating from Hawaii, Micronesia, and the South Pacific Islands, are also a racially/ethnically diverse group, and similar to Asian-Americans are comprised of persons of broad socio-economic backgrounds, comorbidity burden, health care behaviors, and with varying access to medical care. However, to date most prior studies that have examined disparities in kidney disease in these minority populations have aggregated Asian-Americans (and sometimes also Pacific Islanders) into a single group.[4, 5, 7, 8, 25, 10] Hence there remain major knowledge gaps with respect to individual Asian-American and Pacific Islander racial/ethnic groups and risk of kidney disease.

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Among the fifty US states, Hawaii has the third largest representation of Asian-Americans following that of California and New York,[3] making it an important geographic focus for examining CKD disparities amongst Asian-Americans, Native Hawaiians, and Other Pacific Islanders. In 2005, the National Kidney Foundation of Hawaii (NKFH) established the Kidney Early Detection Screening (KEDS) program in order to promote early kidney disease screening among residents in the state of Hawaii.[9, 10] Previous work by our group has shown that KEDS participants of Asian-American, Pacific Islander, and Multi-Racial background had higher likelihood of elevated albuminuria compared to those who were White.[10] However, there remain knowledge gaps as to whether distinct Asian-American subgroups (e.g., Japanese, Chinese, Filipino) who are prevalent in Hawaii manifest differential patterns of association with CKD-related markers and risk factors. Thus, to better inform we field, we leveraged rich individual-level data collected from a racially/ethnically diverse group of participants in NKFH KEDS health screening events, we examined the association between granular Asian-American and Pacific Islander racial/ethnic groups with specific markers of early CKD, as well as major risk factors for kidney disease.

Materials and Methods

Source Population

We examined data from participants in the ongoing NKFH KEDS health screening program.[9, 10] The KEDS program was developed with the core objectives of raising awareness of CKD and promoting early CKD screening through health screening events conducted throughout the state of Hawaii including the islands of Maui, Oahu, Kauai, and Hawaii (the “Big Island”) in settings that included the Hawaii State Capitol grounds and shopping malls, community colleges, community health centers, hospitals, and community centers. Each KEDS health screening event had the capacity to accommodate up to 150 participants; community participants interested in undergoing screening were enrolled in the KEDS Program irrespective of health insurance status, sex, race/ethnicity, and underlying comorbidities.

Participants were included in the study provided that they were ages 18 years or older, participated in Wave 1 (2006–2009) of the KEDS program, had available race/ethnicity data, and signed an informed consent form. The study was approved by the Institutional Review Boards and Committee on Human Studies at the University of California Irvine and University of Hawaii.

Race/Ethnicity, Comorbidity, and Laboratory Data Collection

Socio-demographic, comorbidity, and laboratory data examined in this study were collected over the course of 19 KEDS health screening events during which participants rotated through the following five stations:

1. *Registration:* Participants completed a health assessment form that assessed socio-demographics (e.g., age, sex, self-reported race/ethnicity), presence or absence of self-reported comorbidities (e.g., hypertension, diabetes, hyperlipidemia, cardiovascular disease, kidney disease), smoking history, and

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family history of comorbidities (e.g., hypertension, diabetes, hyperlipidemia, cardiovascular disease, kidney disease);

2. *Physical Measurements:* Health care professional and student volunteers measured blood pressure, height, and weight measurements, the latter of which were used to calculate body mass index (BMI);
3. *Urine Testing:* Participants submitted "clean-catch" urine specimens that were processed utilizing either a Clinitek 50 or Clinitek Status Analyzer. Bayer/Siemens Diagnostics Microalbumin Reagent test strips were utilized;
4. *Exit Interview:* Participants concluded the health screening event with exit interviews with volunteer health care professionals (e.g., physicians, physician assistants, nurse practitioners, registered nurses) which involved review of test results as well as counseling and education of CKD risk factors. Participants with abnormal, non-critical test results were advised to promptly follow-up with their primary care providers.

Exposure and Outcome Ascertainment

Among the diverse KEDS cohort, the objective of our study was to examine the relationship between granular racial/ethnic categories with specific indicators of kidney disease, as well as major CKD risk factors. Our primary exposure of interest was self-reported race/ethnicity, which was categorized according to the seven largest groups which included participants of White, Native Hawaiian and Other Pacific Islander, Japanese, Chinese, Filipino, Multi-Racial, and Other/Missing race/ethnicity background. Participants who reported at least 50% Pacific Islander race/ethnicity were categorized as "Pacific Islander."[10] Individuals who listed two or more race/ethnicities were categorized as "Multi-Racial" unless they indicated they were at least 50% Pacific Islander.

Our primary outcomes of interest were (1) specific indicators of kidney disease which included self-reported kidney disease, microalbuminuria (urine-to-albumin creatinine ratio [UACR] >30mcg/mg), macroalbuminuria (UACR >300mcg/mg), and elevated urine spot albumin levels (>30mg/L). [26–28] Our secondary outcomes of interest were (2) major CKD risk factors which included overweight BMI status (>30kg/m^2), obese BMI status (>30kg/m^2), and self-reported comorbidities (e.g., diabetes, hypertension, hyperlipidemia, and cardiovascular disease).

Statistical Analyses

We examined the association of race/ethnicity with the aforementioned co-primary endpoints using logistic regression models with the following levels of covariate adjustment:

1. *Model 1:* Unadjusted model which included race/ethnicity;
2. *Model 2:* Adjusted for covariates in Model 1, as well as age and sex;
3. *Model 3:* Adjusted for covariates in Model 2, as well as diabetes, hypertension, and BMI;

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4. *Model 4:* Adjusted for covariates in Model 3, as well as hyperlipidemia, active smoking status, and cardiovascular disease.

5. *Model 5:* Adjusted for covariates in Model 4, as well as family history of cardiovascular disease and family history of kidney disease.

We *a priori* defined Model 5 as our primary model, which included core socio-demographic measures and other confounders of the association between race/ethnicity and the pre-specified endpoints. There were no missing data for age, sex, comorbidities, and family history. BMI, UACR, and urine spot albumin data were available in 97.7% (N=1215), 93.6% (N=1163), and 93.6% (N=1164) of the cohort, respectively. In analyses that adjusted for BMI, missing values were addressed using multiple imputation. Analyses and figures were generated using SAS version 9.4 (SAS Institute Inc., Cary, NC) and Stata version 14 (Stata Corporation, College Station, TX).

Results

Study Cohort

Among 1243 KEDS participants who participated in KEDS screening events, 22.0%, 8.4%, 19.2%, 4.5%, 13.4%, 18.9%, and 13.3% were of White, Native Hawaiian/Other Pacific Islander, Japanese, Chinese, Filipino, Multi-Racial, and Other/Missing racial/ethnic background, respectively (Supplementary Figure 1); among these, 1163 had complete data on the primary outcomes of interest. Crude examination of baseline characteristics across race/ethnicity showed that the youngest mean±SD age was observed among participants of Native Hawaiian/Other Pacific Islander and Multi-Racial background whereas the oldest mean±SD age was seen in those of Japanese background (Table 1). Compared to all other racial/ethnic groups, participants of Native Hawaiian/Other Pacific Islander background had higher BMI values, as well as the highest prevalence of self-reported diabetes, hypertension, cardiovascular disease, hyperlipidemia, smoking, and kidney disease. With respect to family history, Native Hawaiian/Other Pacific Islanders were more likely to have a family history of kidney disease; Native Hawaiian/Other Pacific Islanders and Multi-Racial participants were also more likely to have a family history of diabetes, and Native Hawaiian/Other Pacific Islander, White, and Multi-Racial participants were more likely to have a family history of cardiovascular disease. Crude examination of laboratory data showed that Native Hawaiian/Other Pacific Islander participants had the highest prevalence of macroalbuminuria, and that those of Native Hawaiian/Other Pacific Islander as well as Chinese background had the highest proportions of microalbuminuria. Participants of Native Hawaiian/Other Pacific Islander, Chinese, Japanese, and Multi-Racial background also had the highest median (IQR) spot urine albumin levels.

Race/Ethnicity and Specific Indicators of Kidney Disease

We observed a strong association between Native Hawaiian/Other Pacific Islander race/ethnicity and various indicators of kidney disease independent of age, sex, comorbidities, and BMI status. Among 1243 participants with available comorbidity data, across Models 1–4, we found that Native Hawaiian/Other Pacific Islander race/ethnicity was associated with an over three-fold higher risk of self-reported kidney disease (ref: White race/ethnicity):

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adjusted OR (aOR) (95% CI) 3.60 (1.14–11.4), p=0.03, in analyses adjusted for Model 4 covariates (Figure 1A and Supplementary Table 1). Following adjustment for family history of cardiovascular and kidney diseases in Model 5, point estimates suggested higher risk although associations were no longer significant: aOR (95% CI) 2.42 (0.61–9.58), p=0.20.

We then examined objective markers of kidney disease among 1163 participants with UACR data. We observed that Native Hawaiian/Other Pacific Islanders and Chinese racial/ethnic groups had a ~2.3- to 2.5-fold higher risk of microalbuminuria (UACR >30mcg/mg) (ref: Whites): aORs (95% CIs) 2.45 (1.23–4.87), p=0.01, and 2.33 (1.05–5.21), p=0.04, respectively, in analyses adjusted for Model 5 covariates (Figure 1B and Supplementary Table 1). While Filipino, Japanese, and Multi-Racial racial/ethnic groups did not demonstrate significant associations, it should be noted that point estimates suggested higher risk of microalbuminuria among these racial/ethnic groups: aORs (95% CIs) 1.80 (0.96–3.37), p=0.07, 1.42 (0.79–2.56), p=0.24, and 1.56 (0.86–2.83), p=0.15, for Filipino, Japanese, and Multi-Racial participants, respectively, in Model 5 analyses. Examination of macroalbuminuria (UACR >300mcg/mg) as a more severe degree of kidney damage also showed that the Native Hawaiian/Other Pacific Islander group was associated with a significantly higher risk, while the Multi-Racial group point estimates suggested higher risk but did not achieve statistical significance (Figure 1C and Supplementary Table 1).

We also examined elevated urine spot albumin levels (>30mg/L) as the outcome of interest among 1164 participants with available data. We found that Chinese, Japanese, and Multi-Racial racial/ethnic groups were associated with significantly higher risk in analyses adjusted for Model 5 covariates (ref: Whites): aORs (95% CIs) 1.86 (1.03–3.35), p=0.04, 1.51 (1.04–2.20), p=0.03, and 1.59 (1.09–2.32), p=0.02, respectively (Figure 1D and Supplementary Table 1). Similar to the race/ethnicity—microalbuminuria analyses, point estimates suggested higher risk of associations among all minority racial/ethnic groups as compared to Whites.

Race/Ethnicity and Body Mass Index

Among 1215 KEDS participants who had BMI data, we observed a potent association between Native Hawaiian/Other Pacific Islander and Multi-Race race/ethnicity and higher risk of overweight (BMI >25kg/m^2) status in analyses adjusted for Model 5 covariates (ref: Whites): aORs (95% CIs) 3.66 (1.97–6.81), p<0.001, and 1.52 (1.03–2.24), p=0.04, respectively (Figure 2A and Supplementary Table 2). In contrast, Japanese race/ethnicity was associated with a lower risk of overweight status in Model 5 analyses: aOR (95% CI) 0.65 (0.45–0.95), p=0.03. Upon examining a higher threshold of BMI, we similarly observed that Native Hawaiian/Other Pacific Islander and Multi-Racial racial/ethnic groups were associated with a significantly higher risk of obesity (BMI >30kg/m^2), whereas Chinese, Filipino, and Japanese groups were associated with lower risk in analyses adjusted for Model 5 covariates (Figure 2A and Supplementary Table 2).

Race/Ethnicity and Self-Reported Comorbidities

We also sought to examine the association of race/ethnicity with several specific self-reported comorbidities considered to be major risk factors for CKD. In analyses adjusted for

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age, sex, BMI, and hypertension (i.e., Model 3 covariates), we found that Native Hawaiian/Other Pacific Islander racial/ethnic groups were associated with a higher risk of diabetes compared to Whites (aOR [95% CI] 1.80 [1.06–3.08], p=0.03), although associations were attenuated to the null with further adjustment for Model 4 and Model 5 covariates (aORs [95% CIs] 1.61 [0.91–2.87], p=0.10, and 1.52 [0.85–2.72], p=0.16, respectively) (Figure 3A and Supplementary Table 3). Notably, point estimates for the associations of Filipino, Japanese, Multi-Racial, and Other/Missing groups with diabetes also suggested higher risk, although associations did not achieve statistical significance.

Upon examining of the outcome of hypertension, Chinese, Filipino, Native Hawaiian/Other Pacific Islander, Japanese, and Multi-Racial racial/ethnic groups were each associated with higher risk compared to Whites in Model 5 analyses: aORs (95% CIs) 1.92 (1.02–3.63), p=0.04, 2.53 (1.59–4.01), p<0.001, 1.95 (1.11–3.43), p=0.02, 1.75 (1.15–2.65), p=0.009, and 1.71 (1.11–2.63), p=0.01, respectively (Figure 3B and Supplementary Table 3). With respect to cardio-metabolic diseases, Native Hawaiian/Other Pacific Islander racial/ethnic groups were associated with higher risk of hyperlipidemia in analyses adjusted for age and sex (i.e., Model 2 covariates); however, associations were attenuated to the null with incremental adjustment for Model 3–5 covariates (Figure 3C and Supplementary Table 3). Notably, point estimates of the relationship between Native Hawaiian/Other Pacific Islander and Multi-Racial racial/ethnic groups trended towards a higher risk of cardiovascular disease compared to Whites, although associations did not achieve statistical significance in Model 5 analyses: aORs (95% CIs) 2.01 (0.71–5.72), p=0.19, and 1.47 (0.63–3.40), p=0.37 (Figure 3D and Supplementary Table 3).

Discussion

In this diverse cohort of community-based participants from the NKFH KEDS Program in Hawaii, we observed differential associations between the distinct racial/ethnic groups with markers of kidney disease, as well as heterogenous representation of CKD risk factors among the various Asian-American and Pacific Islander races/ethnicities. Whereas the point estimates for all minority groups suggested a higher risk of microalbuminuria independent of socio-demographics and underlying comorbidities, compared to their White peers only the Native Hawaiian/Other Pacific Islander and Chinese groups showed significant “fully adjusted” associations. Furthermore, only the Native Hawaiian/Other Pacific Islander group demonstrated a significantly higher risk of macroalbuminuria. With respect to major CKD risk factors, all or nearly all minority racial/ethnic groups were associated with a higher risk of hypertension and diabetes, respectively. However, while Native Hawaiian/Other Pacific Islander and Multi-Racial racial/ethnic groups were associated with a significantly higher risk of obesity, minorities of East and Southeast Asian descent (e.g., Chinese, Filipino, and Japanese) were associated with lower risk.

While there has been comparatively less examination of CKD disparities amongst Asian-Americans and Pacific Islanders vs. other race/ethnicities, there have been several studies that have indicated a substantially higher risk of ESRD in these minority groups. For example, in an analysis of US male participants from the Multiple Risk Factor Intervention Trial (MrFIT), Asian-Americans had higher age-adjusted rates of ESRD compared with

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Whites. [4] In two separate studies of patients receiving care from Kaiser Permanente Northern California, Asian- Americans also demonstrated a higher risk of ESRD compared with their White counterparts.[5, 7] In contrast, limited data examining risk of pre-dialysis CKD have shown mixed findings. Crude data from the US Kidney Early Evaluation Program (KEEP) has shown a higher prevalence of early kidney disease (i.e., microalbuminuria) amongst Asian-Americans vs. Whites,[8] whereas longitudinal data from Kaiser Permanente Southern California has shown that Asian-Americans had the slowest decline in estimated glomerular filtration rate over time as compared with Whites, Hispanics, and African-Americans.[25] Notably, there have been relatively few studies that have examined CKD risk among Asian-Americans and Pacific Islanders specifically residing in Hawaii.[9, 10] However, separate examination of these minority subgroups in Hawaii is warranted, given that (1) this state has the third largest representation of Asian-Americans and Pacific Islanders across the US, and (2) limited data have shown that ESRD-related outcomes differ among Asian-Americans and Pacific Islanders based in Hawaii vs. mainland states (i.e., lower transplantation rates, worse nutritional parameters).[29]

As such, there remain major knowledge gaps with respect to CKD disparities amongst distinct Asian-American and Pacific Islander subgroups.[24] To our knowledge, this is the first study that has granularly examined associations of Asian-American, Native Hawaiian, and Other Pacific Islander racial/ethnic categories with specific indicators of kidney disease among residents in Hawaii. Whereas all racial/ethnic minority groups demonstrated higher likelihood of early kidney disease (i.e., microalbuminuria) relative to Whites, only the Native Hawaiian/Other Pacific Islander and Multi-Racial groups were associated with higher risk of more severe grades of kidney damage (i.e., macroalbuminuria).

Another novel finding of our study was the differential pattern of kidney disease risk factors across granular Asian-American and Pacific Islander subgroups. While prior studies have shown that Asian-Americans and Pacific Islanders in Hawaii have greater burden of CKD-related comorbidities (e.g., diabetes,[30] obesity,[31] cardiovascular disease,[31] etc.), some[30] but not all[31] studies have parsed minorities into their distinct countries of origin. Observations from our study showed that while almost all minority groups were associated with a higher risk of diabetes, there were striking differences in the presence of obesity. Whereas Native Hawaiian/Other Pacific Islander and Multi-Racial groups were associated with a four-fold and two-fold higher risk of obese BMI status, respectively, those of East and Southeast Asian descent (e.g., Chinese, Filipino, and Japanese) had markedly lower risk. In addition, while all racial/ethnic minority groups were associated with higher risk of hypertension, the most potent associations were observed in those of Filipino background. While there are sparse data of CKD risk factors in Filipino-Americans, one prior study has shown that hypertension was more frequently associated with ESRD among Filipino vs. Native Hawaiian and Japanese dialysis patients receiving care in the Trans-Pacific Renal Network (i.e., ESRD Network 17).[6] Given these observations, further studies are urgently needed to uncover the modifiable and non-modifiable socio-demographic (e.g., language barriers,[6] health care literacy [32]), biologic/genetic (e.g., epigenetic, allostatic load, group cluster of CKD risk polymorphisms), cultural (e.g., lifestyle behaviors, diet,[33, 34] use of herbal nephrotoxins[35, 36, 24]), and health care related (e.g., access to medical care,[37] provider biases[6]) CKD risk factors amongst Asian-Americans, Native Hawaiians, and

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Other **Pacific Islanders. Rather than applying a** "one- size-fits-all" approach, elucidating the heterogenous underpinnings of CKD across the distinct Asian-American and Pacific Islander subgroups will allow for more precise screening, targeted interventions and management, efficient resource allocation, and greater likelihood of ameliorating risk of CKD and its progression in these populations.

The strengths of our study include its examination of a large cohort of community-based participants across multiple islands of Hawaii; availability of granular Asian-American and Pacific Islander subgroup data; collection of measured BMI and laboratory data in nearly all participants; and comprehensive adjustment for key covariates. However, several limitations of our study should be acknowledged. First, although KEDS health screening events were open to all residents of Hawaii, participants may be inherently different than the broader state population, resulting in potential selection bias. Second, while our study leverages the rich diversity of Hawaii, we had small participant sample sizes across racial/ethnic subgroups and our findings may not be generalizable to Asian-Americans, Native Hawaiians, and Other Pacific Islanders living in the US mainland.[29] It also bears mention that our study population did not include South Asian participants (e.g., Indian, Pakistani, Bangladeshi) who may demonstrate differential patterns of kidney disease markers and CKD risk factors than those of East and Southeast Asian background. Thus, future studies are needed to compare CKD and related outcomes amongst a broader population of Asian-American and Pacific Islander minorities in Hawaii and other disparate geographic locations. Third, given that data **on participants' migration status and/or** duration of residence in Hawaii was not collected, we were not able to determine whether adaptation to Western lifestyles had a impact on their CKD parameters. Fourth, given that socio-demographic, medical history, and laboratory data were cross-sectionally collected at a single-point-in-time, it is possible that certain outcomes (e.g., UACR and urine spot albumin) may have been vulnerable to misclassification due to definition using a single measurement. Hence, corollary longitudinal studies with repeated outcome measures are needed to examine the distinct Asian-American and Pacific Islander subgroups and trajectory of kidney disease and CKD risk factors. Fifth, hypertension and other selected comorbidities were self-identified, which may have identified a subset with more severe disease. However, we opted to use self-reported hypertension in lieu of measured blood pressure to achieve greater specificity of comorbidity status (i.e., most participants underwent a single measurement of blood pressure). Sixth, as data on educational level was not collected, we cannot exclude the possibility that those with higher educational levels may have greater self-awareness of disease. Finally, as with all observational studies our findings do not indicate a causal association between racial/ethnic groups and the outcomes of interest.

In conclusion, our study has found that nearly all Asian-American and Pacific Islander subgroups have higher risk of early kidney damage, whereas Native Hawaiian/Other Pacific Islanders had the highest risk of more severe forms of kidney disease. We also observed heterogeneous manifestation of CKD risk factors amongst the distinct Asian-American and Pacific Islander populations. Further studies are needed to elucidate the specific mechanistic pathways leading to kidney disease amongst individual racial/ethnic minority subgroups in

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order to define targeted interventions that can prevent CKD and its progression in these high-risk populations.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Statement of Ethics:

Study participants have given their written informed consent. The study was approved by the Institutional Review Boards and Committee on Human Studies at the University of California Irvine and University of Hawaii.

Data Availability

The data that support the findings of this study are not publicly available due to containing information that could compromise the privacy of research participants. Further inquiries can be directed to the corresponding author.

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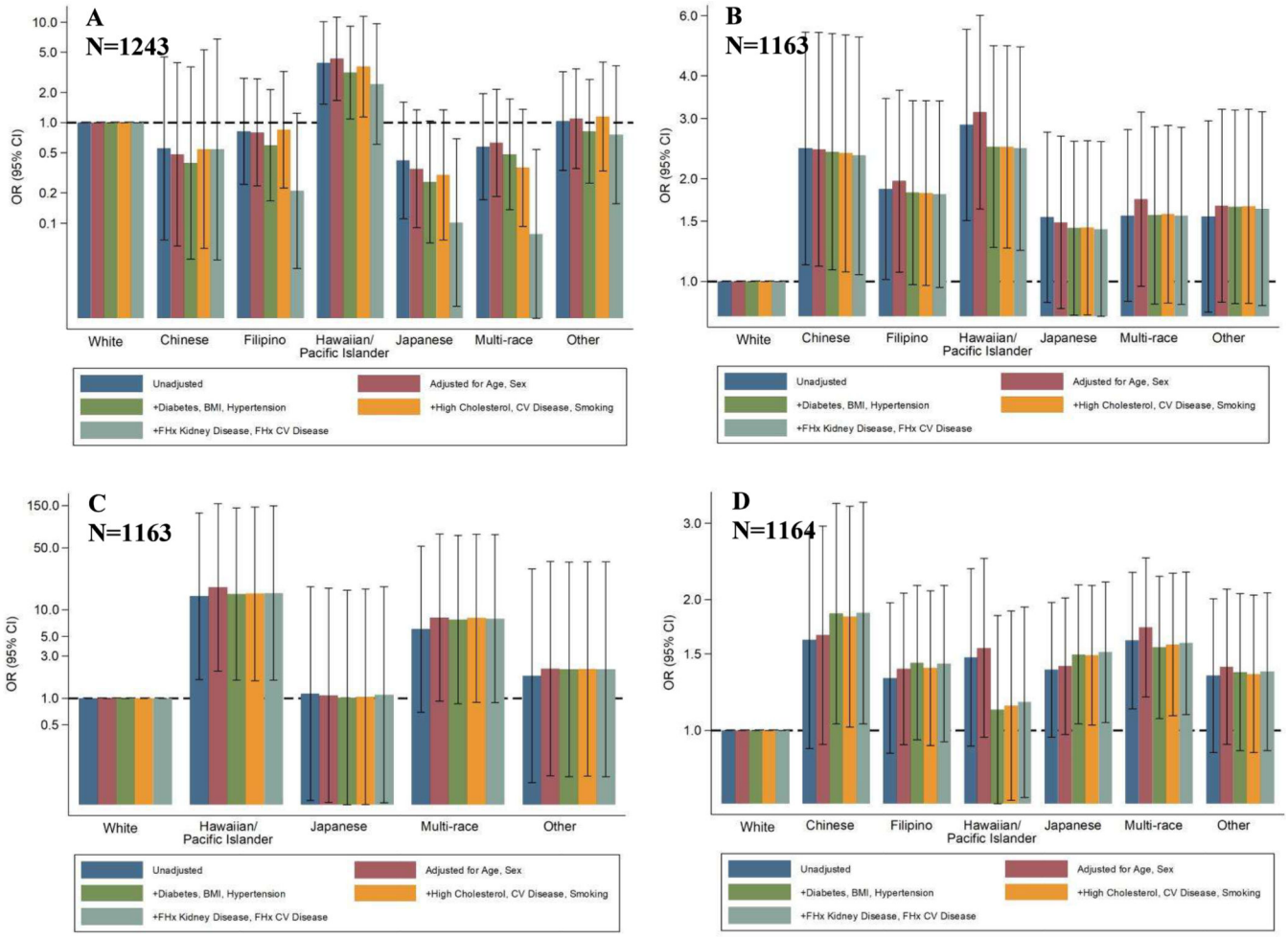

Figure 1.

Association between race/ethnicity and various markers of kidney disease in Kidney Early Detection Screening (KEDS) Program participants: (A) self-reported kidney disease, (B) albumin-to-creatinine ratio (ACR) ≥30 mcg/mg, (c) ACR ≥300 mcg/mg, and (D) spot urine albumin ≥30 mg/L.

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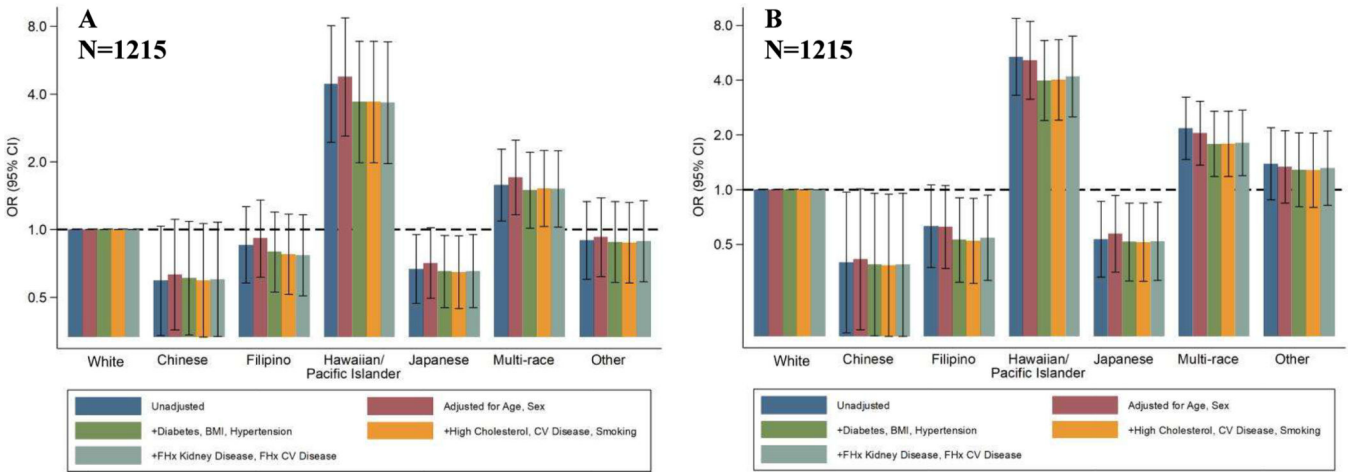

Figure 2.

Association between race/ethnicity and (A) likelihood of body mass index (BMI) >25 kg/m^2 (reference: BMI ≤25 kg/m^2) and (B) likelihood of body mass index (BMI) >30 kg/m^2 (reference: BMI ≤30 kg/m^2) among Kidney Early Detection Screening (KEDS) Program participants.

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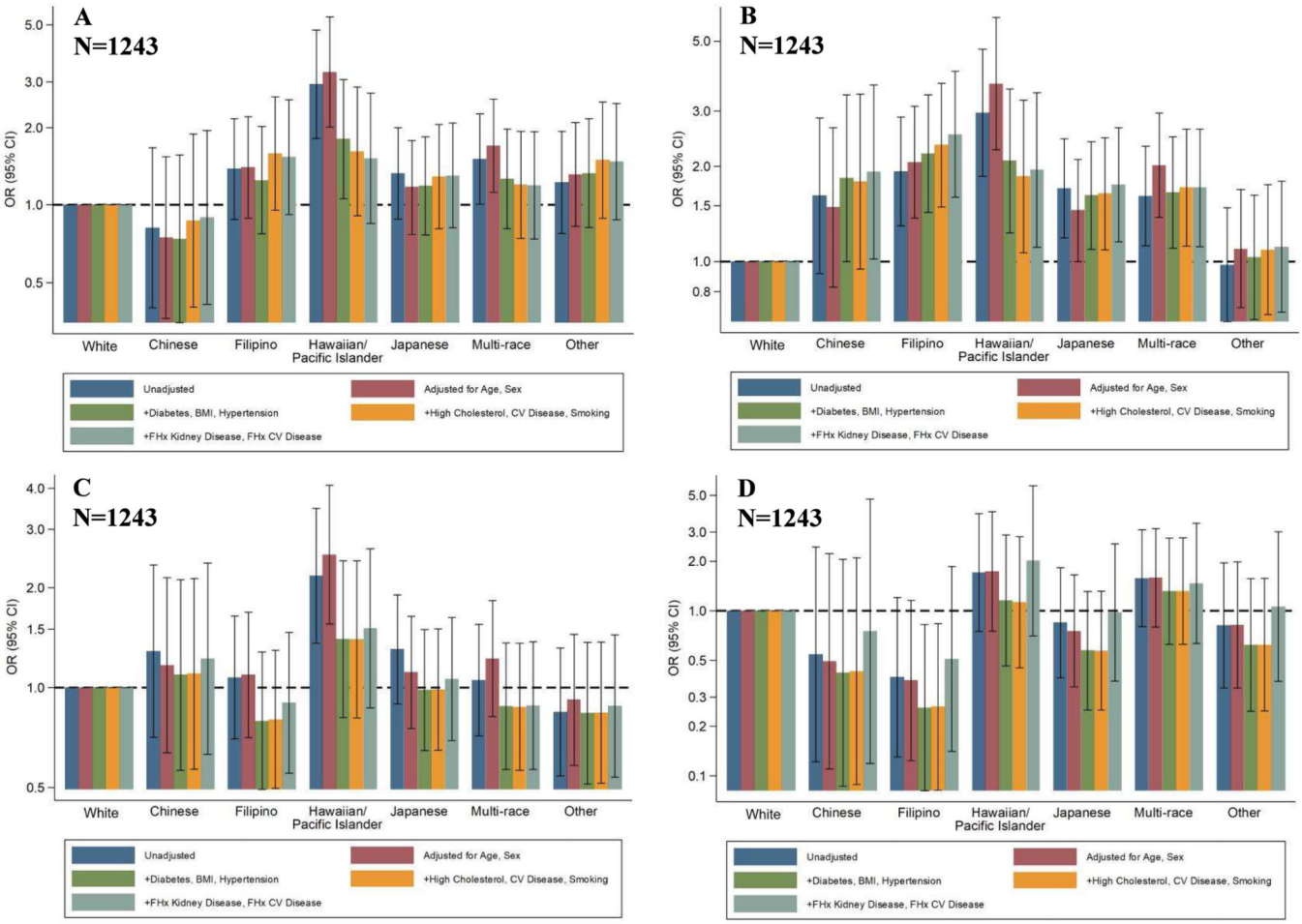

Figure 3.

Association between race/ethnicity and various self-reported chronic kidney disease risk factors: (A) diabetes, (B) hypertension, (C) hyperlipidemia, and (D) cardiovascular disease among Kidney Early Detection Screening (KEDS) Program participants.

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Table 1.

Baseline characteristics among Kidney Early Detection Screening (KEDS) Program participants.

	Overall	White	Chinese	Filipino	Native Hawaiian & Other Pacific Islander	Japanese	Multi-Racial	Other or Missing Race/ Ethnicity	P*
N (%)	1243 (100.0)	273 (22.0)	61 (4.9)	166(13.4)	104 (8.4)	239(19.2)	235 (18.9)	165(13.3)	N/A
Age, mean ± SD	55.5 ± 16.2	56.5 ± 15.1	59.9± 15.9	55.0 ± 15.4	51.2 ± 16.1	62.9 ± 14.9	49.4 ± 16.2	52.4 ± 16.2	<0.001
Female (%)	62	54	66	65	63	64	67	61	0.08
BMI, median (IQR)	26.0 (23.0, 30.0)	25.8 (22.7, 29.1)	24.1 (21.8, 27.4)	25.4 (23.2, 28.0)	32.2 (27.4, 37.8)	24.8 (21.5,27.1)	28.0 (24.1,33.5)	25.4 (22.8, 30.5)	<0.001
Active smoking (%)	7	6	2	5	11	7	9	5	0.23
COMORBIDITIES									
Diabetes (%)	27	21	18	27	44	26	29	25	<0.001
Hypertension (%)	41	32	43	47	58	44	43	31	<0.001
CV disease (%)	6	6	3	2	10	5	9	5	0.07
Hyperlipidemia (%)	30	27	33	29	45	33	29	24	0.01
Kidney Disease (%)	3	3	2	2	11	1	2	3	<0.001
FAMILY HISTORY									
Family history of diabetes (%)	42	34	33	37	53	44	54	36	<0.001
Family history of CV disease (%)	32	38	25	21	35	27	41	28	<0.001
Family history of kidney disease (%)	11	9	8	14	19	10	11	8	0.06
Family history of hypertension (%)	<1	1	0	0	0	0	<1	<1	0.44
LABORATORY TESTS & VITAL SIGNS									
Urine albumin-to-creatinine ratio (%) <30 mcg/mg 30–300 mcg/mg >300 mcg/mg	87 12 1	91 8 <1	81 19 0	85 15 0	78 17 5	87 13 <1	87 11 2	87 12 <1	0.002
Urine spot albumin (mg/L), median (IQR)	10(10,30)	10(10,30)	30 (10,30)	10(10,30)	30 (10, 80)	30 (10,30)	30 (10,30)	10(10,30)	0.09
SBP, mean ± SD	139.9± 18.5	136.2 ± 17.0	137.3 ±11.0	145.0 ± 19.5	137.0 ±27.8	143.9 ± 17.8	139.7 ± 15.8	137.6 ± 15.6	0.02
DBP, mean ± SD	87.0 ±6.8	86.2 ±6.1	85.4 ±4.9	88.6 ±8.6	86.1 ± 5.0	87.0 ±6.0	88.1 ±8.1	86.5 ±6.3	0.18

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Abbreviations: SD, standard deviation; BMI, body mass index; IQR, interquartile range; CI ‘ cardiovascular; mcg/mg, micrograms per milligram; SBP, systolic blood pressure; DBF, diastolic blood pressure.