



Prevalence of Albuminuria Among Adults With Diabetes and Preserved Estimated Glomerular Filtration Rate by Race and Ethnicity

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Diabetic kidney disease develops in approximately 20–40% of adults with diabetes and is a primary cause of chronic kidney disease (CKD) (1). Albuminuria can be an early sign of CKD and is also associated with CKD progression and cardiovascular events (1). Hence, practice guidelines recommend that adults with diabetes be screened annually for albuminuria and estimated glomerular filtration rate (eGFR) (1). Black, Hispanic, and Asian American individuals are disproportionately affected by diabetic kidney disease and its complications (2–4), but less is known about disparities in early diabetic kidney disease. This study characterizes racial and ethnic differences in albuminuria among adults with diabetes who have preserved eGFRs, including Asian/Pacific Islander (PI) populations.

Using retrospective data from Kaiser Permanente Northern California (KPNC), we examined 151,834 adult members aged 45–74 years with diabetes in the KPNC Diabetes Registry, of whom 90.8% had serum creatinine and 80.5% had urine albumin (or protein) measured in 2015. Within this source population, 98,861 had a preserved eGFR ≥ 60 mL/min/1.73 m² (calculated from 2015 serum creatinine using the refitted Chronic Kidney Disease Epidemiology Collaboration equation) (5) and measurement of urine

albumin-to-creatinine ratio (ACR) (95%), urine protein-to-creatinine ratio (1%), or urine protein dipstick (4%) converted to ACR if urine ACR was not measured in 2015. The analytic cohort was restricted to 79,184 (80.5%) adults with diabetes first identified ≥ 1 year after initial KPNC enrollment so that diabetes duration could be estimated.

Race and ethnicity were determined from self-reported data in health record/administrative sources. A neighborhood deprivation index (NDI) was calculated using 2015 U.S. Census data to estimate neighborhood socioeconomic status. Hypertension was identified by clinical diagnosis in 2013–2015 or medical problem list diagnosis (94% had both). Recent angiotensin-converting enzyme inhibitor (ACEi) or angiotensin receptor blocker (ARB) use was identified from filled prescriptions in 2013–2015 (prior to urine ACR assessment). BMI was calculated from 2015 weight and height measurement, and glycemic control was assessed by the first HbA_{1c} measurement in 2015. Modified Poisson regression with robust variance was used to examine the association of ethnicity and albuminuria, reporting relative risk (RR) with 95% CI.

Among 79,184 adults with diabetes, preserved eGFR, and albuminuria assessment (mean age 60.5 \pm 7.7 years, 54.0% male),

40.3% were non-Hispanic White, 9.6% Black, 26.3% Asian/PI, and 21.0% Hispanic. Overall, 81.7%, 13.8%, and 4.6% had urine ACR <30 (normal), 30 to <300 (microalbuminuria), and ≥ 300 mg/g (macroalbuminuria), respectively (Table 1), with albuminuria being higher in men than in women. The prevalence of albuminuria was higher for Asian/PI (21.1%), Black (18.6%), and Hispanic (17.6%) adults than for White (16.8%) adults with diabetes. Among Asian/PI adults, prevalence was higher for Filipino (25.3%) and Native Hawaiian/PI (27.9%) adults and lower for South Asian (14.6%) adults but was not significantly different for Japanese (18.8%) and Southeast Asian (19.7%) adults compared with Chinese (18.1%) adults with diabetes.

After adjusting for age, sex, diabetes duration, hypertension, NDI, HbA_{1c}, BMI, and ACEi/ARB use, Asian/PI (RR 1.45, CI 1.39–1.50) adults had higher albuminuria risk than White adults, but Black (RR 1.00) and Hispanic (RR 1.01) adults did not. Among Asian/PI adults, Filipino adults (RR 1.16, CI 1.07–1.24) had higher risk and South Asian (RR 0.72, CI 0.64–0.82) and Japanese adults (RR 0.83, CI 0.72–0.96) had lower risk than Chinese adults. Southeast Asian, Native Hawaiian/PI, and Chinese adults had similar risk of albuminuria.

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Table 1—Characteristics of 79,184 adults with diabetes aged 45–74 years, stratified by race, ethnicity, and Asian subgroups

	Overall	NHW	Black	Hispanic	Asian/PI	Chinese	Japanese	Filipino	SE Asian	S Asian	NHPI
Total number ^a	79,184	31,872	7,622	16,612	20,845	4,253	885	8,757	1,009	1,984	824
Age in years, mean ± SD	60.5 ± 7.7	61.9 ± 7.4	59.6 ± 7.6 ^d	58.9 ± 7.9 ^d	60.1 ± 7.6 ^d	61.8 ± 7.2	63.0 ± 7.2	60.1 ± 7.5 ^e	59.2 ± 7.8 ^e	59.1 ± 7.6 ^e	57.5 ± 7.6 ^e
Male sex	54.0%	58.1%	45.8% ^d	52.7% ^d	51.4% ^d	52.4%	50.5%	45.4% ^e	57.4% ^e	60.9% ^e	56.0%
NDI quartile ^b											
First	25.2%	30.7%	14.3%	14.6%	29.3%	40.9%	42.0%	19.7%	22.3%	40.8%	16.2%
Second	25.5%	28.4%	21.2%	20.2%	26.8%	28.1%	29.0%	27.8%	24.4%	25.2%	20.2%
Third	25.5%	24.5%	25.2%	27.6%	25.3%	19.1%	18.2%	30.8%	26.5%	21.6%	26.9%
Fourth	23.9%	16.5%	39.3% ^d	37.6% ^d	18.6% ^d	11.9%	10.7%	21.8% ^e	26.8% ^e	12.4%	36.8% ^e
Diabetes duration (years), median (IQR)	6.4 (2.9–11.0)	6.3 (2.9–10.8)	6.8 (2.9–11.0) ^d	6.8 (3.0–11.3) ^d	6.2 (2.7–10.9)	6.0 (2.7–10.9)	7.9 (3.6–12.7) ^e	6.5 (2.9–11.1)	5.7 (2.3–9.9)	6.9 (2.9–11.6) ^e	6.4 (2.9–10.9)
HbA _{1c} (%) ^a	7.7 ± 1.5	7.5 ± 1.5	7.8 ± 1.8 ^d	7.9 ± 1.7 ^d	7.6 ± 1.4 ^d	7.4 ± 1.2	7.5 ± 1.3	7.7 ± 1.4 ^e	7.6 ± 1.4	7.6 ± 1.3 ^e	8.1 ± 1.7 ^e
BMI (kg/m ²) ^a	31.7 ± 6.8	33.4 ± 6.9	33.7 ± 7.3 ^d	32.7 ± 6.3 ^d	27.6 ± 4.8 ^d	26.2 ± 4.3	29.1 ± 5.4 ^e	27.9 ± 4.6 ^e	25.9 ± 3.8	27.9 ± 4.6 ^e	31.4 ± 6.6 ^e
Hypertension	77.1%	79.6%	84.5% ^d	72.4% ^d	74.7% ^d	68.9%	80.6% ^e	82.0% ^e	66.2%	75.7%	76.2% ^e
ACEI/ARB use	75.9%	77.7%	76.0% ^d	73.9% ^d	74.9% ^d	71.2%	80.2% ^e	79.7% ^e	68.2%	70.4%	76.5% ^e

Urine ACR (mg/g)^c

<30	81.7%	83.1%	81.4% ^d	82.3%	78.9% ^d	81.9%	81.2%	74.7% ^e	80.4%	85.3% ^e	72.1% ^e
30 to <300	13.8%	12.8%	13.8%	13.1%	15.7%	14.5%	13.6%	18.2%	15.0%	11.2%	19.5%
≥300	4.6%	4.1%	4.8%	4.5%	5.4%	3.6%	5.2%	7.1%	4.7%	3.4%	8.4%

All percentages represent column percent. ACEI/ARB therapy occurred in 2013–2015 before 2015 urine ACR. Urine ACR was from measured ACR (95%) or conversion to urine ACR from urine protein measures (5%). IQR, interquartile range; NHPI, native Hawaiian or Pacific Islander; NHW, non-Hispanic White; S, South; SD, standard deviation; SE, Southeast. ^aAmong the total cohort of 79,184 adults with diabetes, 0.34% did not have an HbA_{1c} and 12.5% did not have measured BMI in 2015 (derived from median height and weight in those with multiple measurements). In subsequent multivariable analyses, the mean BMI and mean HbA_{1c} value for each race and ethnicity in the full cohort or for each ethnicity in the Asian/PI subset were used to impute missing values. ^bThe NDI is an index derived from neighborhood U.S. Census data for income and poverty, education, housing, employment, and occupation (6). The highest NDI quartile represents the most deprived, and the lowest NDI quartile represents the least deprived. ^cFor 5% of the study cohort without urine ACR in 2015, urine protein-to-creatinine ratio (1%) or urine protein dipstick (4%) in 2015 was used to estimate urine ACR (7). ^d*P* < 0.05 compared with NHW adults. ^e*P* < 0.05 compared with Chinese adults.

Our study identified racial and ethnic differences in the risk of early diabetic kidney disease, including higher risk among Asian/PI adults than White adults with diabetes and preserved eGFR. Among Asian/PI adults, albuminuria risk was higher among Filipino adults and lower among South Asian and Japanese adults than for Chinese adults, accounting for diabetes duration, HbA_{1c}, weight status, hypertension, and ACEi/ARB use. These trends in early diabetic kidney disease support prior reports demonstrating ethnic variation in proteinuric diabetic kidney disease among Asian adults (3). Observed differences in albuminuria may be multifactorial and may relate to biologic, health behavior, and/or social factors (3,4).

Our study has some limitations, including urine ACR classified by a single measurement with known inherent variability (1) and lack of detail on hypertension duration, control, and treatment beyond recent ACEi/ARB use, glycemic history, and social determinants of health factors. Nonetheless, the strengths of our study include a large, community-based Asian/PI population in an integrated health care system (with one central laboratory) and extremely high rates of albuminuria screening among patients with diabetes.

In summary, a greater understanding of ethnic differences in albuminuria among adults with diabetes and preserved eGFR is important for targeting screening and early prevention efforts. Future studies should disaggregate Asian/PI groups and identify potential factors associated with diabetic kidney disease and approaches that prevent CKD progression.

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