

Clinical Characteristics and Lifestyle Behaviors in a Population-Based Sample of Chinese and South Asian Immigrants With Hypertension

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BACKGROUND

Asian Americans are the fastest growing racial/ethnic group in the United States. Chinese Americans and their counterparts in Chinese countries have been shown to have an elevated risk of stroke compared to non-Hispanic Whites, while South Asian Americans and their counterparts in South Asian countries have an elevated risk of heart disease. Exactly how cardiovascular disease morbidity varies by Asian subgroup, however, is not well understood. The purpose of this analysis was to identify differences in clinical presentation and lifestyle behaviors between Chinese and South Asian American immigrants vs. non-Hispanic Whites in a representative sample of adults with self-report of physician-diagnosed hypertension.

METHODS

Data on adults with self-reported hypertension were obtained from the New York City Community Health Survey 2009–2013 (Chinese: $n = 555$; South Asian: $n = 144$; non-Hispanic White: $n = 5,987$).

RESULTS

Compared to non-Hispanic Whites with hypertension, foreign-born Chinese adults with hypertension were of a much lower

socioeconomic profile and less likely to have private health insurance, and foreign-born Chinese and South Asian adults with hypertension had lower body mass index (BMI) values (25.3, 26.0 vs. 28.7 kg/m²; $P < 0.001$). South Asians were younger than non-Hispanic Whites (mean age: 49.5 vs. 62.1 years; $P < 0.001$) and had poorer diet quality. BMI and diet quality results persisted in multivariable regression models.

CONCLUSIONS

Findings from this study highlight important clinical distinctions in hypertensive Chinese and South Asian immigrant communities with respect to age and body size. Whether targeted and culturally appropriate approaches would reduce cardiovascular disease-related mortality in these groups needs further study.

Keywords: Asian Americans; blood pressure; body mass index; health disparities; hypertension; immigrant health; urban health.

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Nationwide, there are 80 million adults with hypertension, accounting for nearly one-third (32.6%) of the population.¹ Federal efforts such as the Million Hearts initiative have prioritized identifying, characterizing, and addressing hypertension risk. Numerous studies have established that minority populations, including African American, Latino, and Asian American groups, face disparities in hypertension and related cardiovascular disease compared to the non-Hispanic White population.^{2–8} Despite these findings, there is limited research on risk factors associated with hypertension among certain minority groups, particularly Asian Americans. Recent studies suggest that declines in cardiovascular disease mortality observed in the broader US population in the past decade have not been as great in Asian American populations, indicating that current activities may not be reaching these groups.^{9,10}

According to the most recent Census data, Asian Americans comprise 5.6% of the overall US population, and in major metropolitan areas such as New York City (NYC),

up to 14% of the citywide population.¹¹ Between 2000 and 2010, Asian Americans were the fastest growing racial/ethnic group in the United States,¹¹ and projections suggest that these numbers will continue to rise in the coming decades.¹² Nationally, Asian Americans will double in size to more than 41 million and make up 9% of the population by 2050.¹² Because the majority of the Asian American population is concentrated in major metropolitan cities, characterizing health conditions in Asian Americans in these areas, particularly disaggregated by Asian subgroup, is of critical importance for program planning and intervention design.

Currently, national and regional data on Asian Americans are reported in the aggregate, in part because Asian Americans make up a small proportion of the overall US population. This tends to mask potentially significant social and health disparities across diverse Asian American ethnic groups. Chinese American immigrants make up the largest Asian American subgroup nationally and in NYC.^{13,14} Immigrants from South Asia (India, Pakistan, Bangladesh,

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Nepal, Burma) make up the third largest Asian subgroup nationally and the second largest subgroup in NYC.¹⁴ There are nuanced differences in health profiles for Chinese and South Asian American communities here in the United States and abroad. For example, studies in China and Taiwan have revealed a higher risk of hemorrhagic stroke in Chinese adults compared to non-Hispanic Whites.^{15,16} Similar results have been observed in a community-based sample of Chinese Americans compared to non-Hispanic Whites in NYC.¹⁷ In addition, Chinese American adults who had experienced stroke were more likely to have a history of hypertension and left ventricular hypertrophy compared to non-Hispanic White adults.¹⁷ In contrast to stroke, Chinese American adults appear to be at a lower risk for coronary heart disease than non-Hispanic White adults.¹⁸ South Asian adults, on the other hand, have been shown to have an elevated risk of coronary heart disease and diabetes compared to other racial/ethnic groups in both international and US-based studies, and differences may exist even across South Asian subgroups.^{19–23} Cardiovascular disease is the leading cause of death in Asian Indians in the United States, and stroke mortality rates have been increasing over time in this subgroup.⁹ Interestingly, the prevalence of recognized cardiovascular disease risk factors, such as hypertension, smoking, elevated low-density lipoprotein cholesterol, and coronary artery calcification, are similar or lower in South Asian Americans compared to non-Hispanic White adults, though the diabetes disparity is consistently higher.^{20,24} A few studies have documented elevated behavioral risk factors associated with cardiovascular disease in Chinese and South Asian adults in the United States, including physical inactivity and low consumption of fruits and vegetables.^{8,25,26}

New strategies to address cardiovascular disease risk in specific Asian American subgroups are needed.

The objective of this analysis was to identify if demographic and clinical characteristics and lifestyle behaviors differed in Chinese and South Asian immigrants with hypertension compared to non-Hispanic White adults, with the goal of identifying specific factors that can be targeted in clinical and community interventions to improve hypertension management and related outcomes in Asian American immigrant subgroups.

METHODS

Data were from the NYC Community Health Survey (CHS), an annual random-digit dial, cross-sectional survey conducted since 2002 by the NYC Health Department in English, Spanish, Russian, and Chinese. The CHS includes self-reported health data on approximately 9,000 New Yorkers each year.²⁷ Data from the years 2009–2013 were combined ($n = 44,886$) and were weighted to account for probability of selection and nonresponse. Observations were excluded if self-report of hypertension was missing ($n = 136$), resulting in an unweighted sample size of $n = 44,750$. The current analysis was restricted to 2 Asian subgroups, Chinese American adults (self-report of being born in China, Hong Kong, and Taiwan; $n = 1,875$; $n = 555$ with hypertension) or South Asian American adults (self-report of being born

in India, Pakistan, Bangladesh, Nepal, or Burma; $n = 592$; $n = 144$ with hypertension). Asian ancestry was assessed in US-born Asian adults in the 2012–2013 survey years of the CHS only; therefore, analyses by design are restricted to foreign-born Chinese and foreign-born South Asian adults. Non-Hispanic White adults ($n = 18,508$; $n = 5,987$ with hypertension) irrespective of place of birth were included for comparison as a referent group. A sensitivity analysis was repeated using only US-born White adults as the referent group because one previously published study identified hypertension prevalence to be high in foreign-born Whites in NYC.²⁸ Results did not differ widely with this alternative referent group and are therefore not presented in the current manuscript.

Measurement and definition of covariates

Hypertension status was defined as an affirmative response to the question: “Have you ever been told by a doctor or other health care professional that you have hypertension, also called high blood pressure?” Clinical characteristics included body mass index (BMI) calculated from self-reported height and weight. Diabetes was defined as an affirmative response to the question: “Have you ever been told by a doctor, nurse or other health professional that you have diabetes?” High cholesterol was defined as an affirmative response to the question: “Have you ever been told by a doctor, nurse or other health professional that your blood cholesterol is high?” Current use of antihypertensive medication was assessed among those who self-reported a diagnosis of hypertension who had been previously told to take medication (86% overall of those with hypertension; 89% non-Hispanic Whites, 88% of Chinese Americans, 81% of South Asian Americans).

Lifestyle behaviors assessed included current smoking status, having performed exercise in the last 30 days, and mean number of self-reported fruits and vegetables consumed in the prior day. Diet quality was measured on a 5-point Likert Scale: “In general, how healthy is your overall diet? Would you say (1) excellent, (2) very good, (3) good, (4) fair, or (5) poor?” Diet quality was collapsed into 3 categories (excellent/very good, good, and fair/poor) in the current analysis. The question on diet quality was only included in the 2010 and 2012 survey waves, thus analyses of that question are restricted to those years, and were analyzed using weights specific to that 2-year combination ($n = 2,611$ with hypertension; $n = 2,336$ non-Hispanic Whites, $n = 50$ South Asians, $n = 225$ Chinese). Poverty was based on annual combined household income and was grouped according to federal poverty guidelines (<200%, 200%–400%, >400% of the federal poverty level). Neighborhood poverty was defined as the percent of the zip code’s residents that lived below the federally defined poverty threshold²⁹ and was categorized as very high (30%+ of neighborhood residents living in poverty) and low (<30% living in poverty). All other individual-level covariates (age, sex, education, insurance type, years in the United States, language spoken at home) were self-reported using the same methodology in all years of CHS from 2009 to 2013.

Statistical analyses

All results were weighted to be representative of the NYC population. The age-adjusted prevalence of self-reported hypertension was assessed overall and in each racial/ethnic subgroup of interest. A subpopulation statement was then used to restrict data to non-Hispanic White, foreign-born Chinese, and South Asian adults with hypertension. Demographic and clinical characteristics, cardiovascular disease-related comorbidities, and lifestyle behaviors were assessed in the 3 racial/ethnic subgroups, and differences assessed using *t*-tests for continuous outcomes and *t*-tests for proportions for categorical outcomes. Separate multivariable logistic regression models for each clinical characteristic and lifestyle behavior comparing both foreign-born Chinese and foreign-born South Asian to non-Hispanic Whites adults were run among those with hypertension, adjusting for age, sex, education, poverty level, neighborhood poverty, insurance type, and language spoken at home. Data were analyzed by using SUDAAN software (version 11.0.1; Research Triangle Institute, Research Triangle Park, NC).

RESULTS

Age-adjusted prevalence of hypertension was 27.1% (95% confidence interval (CI): 22.8, 31.9) in South Asian immigrants, 23.1% (95% CI: 22.3, 23.9) in non-Hispanic White adults, and 22.2% (95% CI: 20.3, 24.3) in Chinese immigrants, equating to approximately 27,000 South Asian and 94,000 Chinese immigrant New Yorkers with hypertension. Differences between groups were not statistically significant.

Demographically, South Asian and Chinese immigrant adults with hypertension were both more likely than non-Hispanic White adults with hypertension to be at a higher individual poverty level and were less likely to speak English at home (Table 1). Compared to non-Hispanic White adults

with hypertension, foreign-born Chinese with hypertension were 3 times less likely to have a college education (14.7 vs. 43.2, *P* < 0.001) and were less likely to have private health insurance (20.3 vs. 47.4, *P* < 0.001). Foreign-born South Asian adults with hypertension were significantly younger in age than non-Hispanic White adults (49.5 years old vs. 62.1 years old, *P* < 0.001) and were less likely to be female (29.2 vs. 51.5, *P* < 0.001).

In terms of behaviors and health conditions, foreign-born Chinese and South Asian adults with hypertension had a lower mean BMI (25.3 kg/m², 26.0 kg/m², respectively, vs. 28.7 kg/m², *P* < 0.001 for both) and were less likely to rate their overall diet quality positively (23.8, 16.4, respectively, vs. 39.8, *P* < 0.001 for both) compared to non-Hispanic White adults (Table 2). In addition, hypertensive Chinese immigrants were less likely to report having exercised in the previous 30 days (60.3 vs. 70.4, *P* < 0.001). South Asian immigrants with hypertension reported eating less servings of fruits and vegetables in the prior day (2.1 vs. 2.6 servings/day, *P* < 0.001) compared to non-Hispanic White adults. Though not statistically different, foreign-born South Asians compared with non-Hispanic Whites with hypertension (27.4 vs. 20.4, *P* = 0.13) had a higher prevalence of self-reported diabetes. Diabetes prevalence did not differ between foreign-born Chinese and non-Hispanic White adults.

Results from multivariable regression analyses, run per outcome for each Asian subgroup, are displayed in Table 3. After adjustment for demographic factors including age, sex, education, individual-level poverty, neighborhood-level poverty, insurance type, and education, foreign-born Chinese adults with hypertension had a lower average BMI (−4.22 kg/m², *P* < 0.001) and were more likely to have self-reported comorbidity of high cholesterol (odds ratio (95% CI): 5.44 (1.21, 24.52)) compared to hypertensive non-Hispanic White adults. After the same adjustments, foreign-born South Asian adults with hypertension had a lower

Table 1. Demographic characteristics of non-Hispanic Whites and South Asian and Chinese immigrants with hypertension, NYC CHS 2009–2013

	Non-Hispanic Whites <i>n</i> = 5,987		Foreign-born Chinese <i>n</i> = 555		Foreign-born South Asians <i>n</i> = 144	
	Weighted mean or %	95% CI	Weighted mean or %	95% CI	Weighted mean or %	95% CI
Age, mean (SE)	62.1	61.4, 62.8	61.3	59.8, 62.9	49.5***	46.6, 52.3
Female sex, %	51.5	49.5, 53.4	54.5	48.6, 60.2	29.2***	20.3, 40
College educated, %	43.2	41.3, 45.1	14.7***	11.5, 18.6	51.4	40.5, 62.1
Individual poverty level, <200% FPL, %	33.4	31.4, 35.4	60.9***	54.8, 66.7	50.8***	39.9, 61.7
Neighborhood poverty level, 30%+, %	4.7	3.6, 6.1	6.5	3.2, 12.6	9.4	3.4, 23.4
Private insurance, %	47.4	45.5, 49.4	20.3***	16, 25.5	38.4	28.2, 49.7
10+ years in the United States, %	89.8	86.6, 92.3	86.1	81.6, 89.7	85.9	45.9, 92.2
English spoken at home, %	83.7	82.2, 85.1	4.0***	2.6, 6.2	33.0***	23.8, 43.7

Abbreviations: CHS, Community Health Survey; CI, confidence interval; FPL, federal poverty level; NYC, New York City. ****P* < 0.001, determined by *t*-test (continuous) or *t*-tests for proportions (categorical).

Table 2. Clinical characteristics and lifestyle behaviors of non-Hispanic Whites and South Asian and Chinese immigrants with hypertension, NYC CHS 2009–2013

	Non-Hispanic Whites		Foreign-born Chinese		Foreign-born South Asians	
	Weighted mean or %	95% CI	Weighted mean or %	95% CI	Weighted mean or %	95% CI
Clinical characteristics						
Body mass index, mean	28.7	28.4, 28.9	25.3***	24.6, 26	26.0***	25.1, 26.9
Diabetes, %	20.4	18.8, 22.1	21.7	17.6, 26.5	27.4	19.4, 37.2
High cholesterol, %	59.1	56.8, 61.4	55.8	49.3, 62	52.9	40.7, 64.8
Currently taking antihypertensive medication, % ^a	90.3	88.7, 91.7	91.1	85.7, 94.5	94.8	87.4, 97.9
Lifestyle behaviors						
Fruits and vegetables yesterday, mean	2.6	2.5, 2.7	2.7	2.5, 2.9	2.1***	1.9, 2.3
Current smoker, %	14.0	12.6, 15.6	10.7	7.4, 15.2	24.7	15.3, 37.4
Exercise in last 30 days, %	70.4	68.3, 72.4	60.3***	53.2, 66.9	63.3	50.7, 74.3
Excellent/very good self-rated diet quality, % ^b	39.8	36.8, 42.8	23.8***	17.8, 31.8	16.4***	8.0, 30.6

Abbreviations: CHS, Community Health Survey; CI, confidence interval; NYC, New York City.

^aAmong those told to take antihypertensive medication (86% overall; 89% non-Hispanic Whites, 88% of foreign-born Chinese, 81% of foreign-born South Asians). ^bAnalyses of diet quality were performed in combined CHS 2010 and 2012 datasets only (*n* = 2,611). ****P* < 0.001, determined by *t*-test (continuous) or *t*-tests for proportions (categorical).

Table 3. Multivariable regression outputs for characteristics among non-Hispanic Whites and South Asian and Chinese immigrants with hypertension, NYC CHS 2009–2013

	Non-Hispanic Whites	Foreign-born Chinese			Foreign-born South Asians		
		β or odds ratio	95% CI	<i>P</i> value	β or odds ratio	95% CI	<i>P</i> value
Clinical characteristics							
Body mass index (continuous) ^a	Referent	-4.22	-6.33, -2.10	<0.001	-4.14	-6.03, -2.25	<0.001
Diabetes	Referent	0.83	0.15, 4.48	0.83	2.08	0.92, 4.74	0.08
High cholesterol	Referent	5.44	1.21, 24.52	0.03	0.44	0.15, 1.30	0.14
Currently taking antihypertensive medication ^b	Referent	1.11	0.18, 6.85	0.91	5.66	1.17, 27.28	0.03
Lifestyle behaviors							
Fruits and vegetables yesterday (continuous) ^a	Referent	-0.16	-0.71, 0.40	0.58	-0.44	-1.07, 0.18	0.16
Current smoker	Referent	0.44	0.15, 1.36	0.16	0.18	0.08, 0.43	<0.001
Exercise in last 30 days	Referent	0.75	0.19, 2.90	0.67	1.18	0.49, 2.88	0.71
Excellent/very good self-rated diet quality ^c	Referent	0.26	0.02, 3.22	0.29	0.08	0.01, 0.46	0.01

Bold indicates statistical significance at *P* < 0.05. Adjusted for age, sex, education, individual-level poverty, neighborhood-level poverty, insurance type, and language spoken at home. Abbreviations: CHS, Community Health Survey; CI, confidence interval; NYC, New York City.

^aLinear regression results: β coefficients represent difference in continuous variables; all other analyses result from logistic regression models: corresponding estimates are odds ratios. ^bAmong those told to take antihypertensive medication (85.5% overall; 88.6% non-Hispanic Whites, 87.7% of foreign-born Chinese, 80.7% of foreign-born South Asians). ^cAnalyses of diet quality were performed in combined CHS 2010 and 2012 datasets only (*n* = 2,611).

average BMI (-4.14 kg/m² BMI, *P* < 0.001), had a higher prevalence of self-reported antihypertensive medication use (odds ratio (95% CI): 5.66 (1.17, 27.28)), and were less likely to positively rate their diet (odds ratio (95% CI): 0.08 (0.01, 0.46), *P* = 0.0) compared to non-Hispanic White adults with hypertension.

DISCUSSION

In this analysis comparing a large, population-based sample of non-Hispanic White and foreign-born Asian American adults with hypertension, we identified some demographic, behavioral, and clinical characteristics that were shared by

each Asian subgroup and others that were unique to one only. Most importantly, we confirmed strikingly lower mean BMI values in both foreign-born subgroups with hypertension compared to non-Hispanic White adults, particularly among the foreign-born Chinese. A substantial age disparity was also observed between non-Hispanic White and foreign-born South Asian adults; on average, foreign-born South Asian adults with hypertension were younger than non-Hispanic White adults with hypertension. Foreign-born South Asian adults with hypertension reported having poorer diet quality than non-Hispanic White adults with hypertension. These factors point to differing and important opportunities for hypertension management in these populations and will be discussed in detail below.

Foreign-born South Asians with hypertension were, on average, 12.6 years younger *than* their non-Hispanic White counterparts. This finding has been previously identified in a limited number of studies among South Asians in Asia³⁰ and in young Asian Indian men in the United Kingdom³¹ but has not been established for South Asians in the United States. This finding is a new contribution in the understanding of hypertension for South Asian Americans. While it is unclear why South Asian and South Asian American adults are developing hypertension at younger ages, some researchers have pointed to an overall greater prevalence of inflammation-related conditions in these groups.²⁰ Immediate and conservative interpretation of findings from the current analysis point to the potential for broadening the age and BMI ranges of South Asian and/or Chinese American adults for inclusion in intervention trials around hypertension and/or clinical screening.

Both foreign-born South Asians and Chinese adults with hypertension had a lower mean BMI than non-Hispanic Whites with hypertension. On average, foreign-born Chinese and foreign-born South Asians with hypertension had mean BMI values 3.4 kg/m² and 2.7 kg/m² lower, respectively, than non-Hispanic White adults. Largely driven by the diabetes literature, a lower cutoff to define obesity in Asians has been put forth by the World Health Organization (BMI \geq 27.5 kg/m²) and assessed in relation to mortality³² and cardiovascular disease mortality³³ in Asian populations and also in relation to mortality in Asian Americans. In a recent analysis of the California Behavioral Risk Factor Survey, authors demonstrated that the risk of hypertension for Asian American adults with a BMI of \geq 22 kg/m² was equivalent to the risk in non-Hispanic Whites with a BMI of \geq 27.5 kg/m², and a 1-unit change in BMI conferred a greater odds of hypertension in Asian American adults (15% increase) compared to a 1-unit change in non-Hispanic White adults (11% increase).³⁴ The consensus as to the use of lower BMI cutoffs with regards to hypertension screening or for broader use in the Asian American population is yet to be determined, though has been advocated for diabetes screening in this population.³⁵

Our analysis also demonstrates that the Chinese immigrant population with hypertension had lower education levels, the South Asian immigrant population with hypertension had higher education levels, and both had higher poverty levels than their non-Hispanic White counterparts. This is consistent with what is observed in other data

sources; Asians have both high poverty rates and high levels of education and/or median income—owing to a bimodal income distribution.^{36,37} However, owing in part to the pervasive model minority stereotype, the portion of the Asian American population that are low income are often overlooked.³⁸ Furthermore, both Chinese and South Asian immigrants with hypertension were much less likely to speak English at home compared to non-Hispanic White adults with hypertension. Foreign-born South Asians with hypertension reported a poorer diet quality, and foreign-born Chinese adults with hypertension were less likely to have private health insurance. These findings point to a broad need for targeted hypertension management programs in Asian American immigrant populations. Such programs should account for cultural differences in diet and social norms, ensure that health education materials are developed at appropriate low-literacy levels and translated into Asian languages, and consider targeting under-insured patients or patients served by safety-net providers to address the needs of these populations.

The strengths of the current analysis include the fact that results are population based, and that the sample included a substantial number of foreign-born Chinese and South Asians with hypertension. However, the sample size also proved to be a limitation for this analysis. Within the 2 Asian subgroups examined, results could not be further disaggregated by other covariates such as by sex nor could other Asian subgroups be examined. For example, despite the fact that a high prevalence and burden of hypertension has been noted in Filipino Americans nationally,⁸ the sample size of Filipino adults with hypertension in the current dataset was prohibitively small. Another limitation of this work is the primary measure of hypertension being captured by self-report and not by measured blood pressure, thereby making results susceptible to both selection and measurement bias. Local analyses in NYC have demonstrated the validity of self-reported hypertension in Asian Americans in the NYC CHS, although results were not stratified by Asian subgroup.³⁹ Lastly, the nature of the dataset (i.e., combined over 5 years, Asian ancestry assessed only in foreign born) is a further limitation. Hypertension prevalence however has not changed substantially over time in NYC,⁴⁰ so combined years of data are a minor limitation only. Further, findings may be less generalizable to US-born Asian Americans.

The current analysis highlights potential avenues for intervention design and approaches to address hypertension management in Chinese and South Asian immigrants in NYC. Characteristics such as younger age in South Asians and lower BMI in both Chinese and South Asian immigrants with hypertension suggest a need to alter clinical screening criteria for hypertension in these populations, though data are preliminary and warrant confirmation in longitudinal studies. If future studies yield consistent findings of significant demographic, anthropometric, and clinical differences in the NYC population, then a rethinking of strategies to narrow the gap becomes warranted. In practical terms, electronic health record-based interventions that incorporate such revised criteria may help providers more efficiently identify and manage hypertension in Chinese and South Asian patients. Further, results highlight that despite

ideas such as the “healthy immigrant effect,” many Chinese and South Asian immigrants with hypertension have poorer diets and live in low socioeconomic conditions. Targeted and culturally appropriate approaches and their effectiveness in reducing cardiovascular disease morbidity and mortality in these groups needs further study.

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DISCLOSURE

The authors declared no conflict of interest.

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