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ORIGINAL RESEARCH

CARDIOMETABOLIC

Cardiovascular Disease Risk in South Asians in the Baylor Scott and White Health DILWALE Registry

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ABSTRACT

BACKGROUND Despite implementation of preventive interventions targeting cardiovascular disease (CVD), atherosclerotic CVD (ASCVD) remains a major public health concern in the South Asian (SA) population.

OBJECTIVES The purpose of this study was to assess the risk factor prevalence and ASCVD outcomes in SA population in the United States.

METHODS The DIL Wellness and Arterial health Longitudinal Evaluation registry collected data retrospectively on SA adult patients receiving care in the Baylor Scott & White Healthcare system. Overall and sex stratified analyses were performed to assess the prevalence of traditional CVD risk factors and adverse ASCVD events.

RESULTS A total of 31,781 individuals were included (16,644 men, 15,137 women). ASVCD risk factor profile included hyperlipidemia (43.0%), hypertension (22.2%), diabetes mellitus (15.5%), and current smoking (3.6%). ASCVD risk factors were more prevalent among men compared to women; hyperlipidemia (55.0% vs 29.9%), hypertension (26.9% vs 17.1%), diabetes mellitus (18.5% vs 12.3%), and current smoking (6.18% vs 0.71%), all $P < 0.001$, respectively. The prevalence of ASCVD and premature ASCVD was 7.1% and 2.5%, respectively. The median age of ASCVD diagnosis was 65 (Q1, Q3: 53, 74) years in the overall cohort, 64 (Q1, Q3: 52, 73) years for men, and 70 (Q1, Q3: 60, 77) years for women. Risk factors were more prevalent in those with premature ASCVD as compared to those without ASCVD: hyperlipidemia (89.3% vs 39.4%), hypertension (68.3% vs 17.8%), and diabetes mellitus (39.2% vs 12.7%), all $P < 0.001$, respectively. Hypertension and hyperlipidemia were most strongly associated with ASCVD in both men and women (OR: 3.48 [95% CI: 3.06-3.96] and 3.53 [95% CI: 3.01-4.17]), respectively. Women with premature ASCVD were less likely to be prescribed lipid-lowering therapy (statins 80.5% vs 92.1%, $P < 0.001$; ezetimibe 8.6% vs 16.2%, $P = 0.009$).

CONCLUSIONS ASCVD and premature ASCVD are prevalent among SA adults residing in the United States. Efforts toward risk factor treatment optimization are needed to slow the risk of ASCVD in this higher risk population. (JACC Adv. 2024;3:101349) © 2024 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

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ABBREVIATIONS AND ACRONYMS

ASCVD = atherosclerotic cardiovascular disease

CVD = cardiovascular disease

DILWALE = DIL Wellness and Arterial health Longitudinal Evaluation

ICD = International Classification of Diseases

SA = South Asian

Cardiovascular disease (CVD) among South Asian (SA) individuals (ancestry from Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka) is a public health concern.[1] Atherosclerotic CVD (ASCVD) among SAs occurs earlier in life as compared to other racial and ethnic groups with a mean age of ~53 years.[2,3] Despite implementation of preventive interventions, ASCVD risk in SA adults is nearly double compared to individuals of European ancestry.[4,5] Furthermore, mortality rates from CVD are higher among individuals of SA ethnicity[1] compared to those of non-Hispanic White origin.[5,6]

With the widespread adoption of electronic medical records, there exists an exceptional opportunity to develop and leverage a system-wide registry capable of providing comprehensive insights into specific understudied populations, surpassing the capabilities of traditional community-based cohorts. By capturing nuanced data on disease trajectories and health care disparities, data from electronic medical records (EMRs) offer insight into real-world clinical practice, patient outcomes, and care gaps. They are particularly well suited for populations that are underrepresented in clinical trials and community-based registries.

We aim to develop the DIL Wellness and Arterial health Longitudinal Evaluation (DILWALE) registry that will be uniquely positioned to delve into the health care differences and disease trajectories within the SA community, offering a more comprehensive understanding of ASCVD in this population. In this study, we aim to examine a real-world cohort of SA men and women to better understand the prevalence of traditional risk factors and ASCVD outcomes in this population to better inform future preventive interventions.

METHODS

STUDY DESIGN. We conducted a retrospective multicenter analysis on SA adult patients ≥18 years with at least one clinical encounter within the Baylor Scott & White Health system, the largest nonprofit health care system in Texas comprising of 51 hospitals. The analysis period spanned from August 2008 to December 2023 to create an EMR-based registry. Due to the retrospective, noninterventional nature of the cohort, a waiver of consent was obtained by the Institutional Review Board. We utilized our EMR, Epic's reporting data warehouse—clarity, clinical documentation, reporting, and population health modules (all from Epic Systems) for this registry.

IDENTIFICATION OF SOUTH ASIAN INDIVIDUALS. Individuals of SA ethnicity were identified by searching the electronic health record by 2 methods. The first was using a validated list of SA surnames obtained through the Institute for Clinical Evaluative Sciences that was created with funding from The Heart and Stroke Foundation of Ontario. Second, individuals who listed themselves as being Asian on the clinical intake form were identified as potential participants. Two independent reviewers of SA ethnicity then identified surnames that were SA. Concordance on SA origin of the surname between the 2 independent reviewer assessments was required for the individual to be included. Based on this process, a total of 31,781 SA adults were included in the registry.

DEMOGRAPHIC DATA AND MEDICAL HISTORY. Deidentified clinical information on patient's demographics, vitals, diagnoses, laboratory tests and results, imaging tests and results, procedures, medications, comorbid conditions, clinical outcomes, International Classification of Diseases-10th Revision-Clinical Modification (ICD-10-CM) codes available in problems list, visit diagnosis and discharge diagnosis, the Current Procedural Terminology codes listed in the professional billing transactions were obtained directly from the EMR for inpatient and ambulatory visits and stored in the server database. Information regarding ASCVD and risk factors (hypertension, hyperlipidemia, and diabetes mellitus) was based on ICD-10 codes as well as medication use pertaining to the diagnosis (Supplemental Material). Laboratory measurements were reported as the most recent on-treatment values. A history of ASCVD was defined through objective testing for coronary, peripheral, and/or cerebrovascular disease or a cardiovascular event, including angina, myocardial infarction, coronary angioplasty, peripheral arterial surgery, claudication, peripheral angioplasty, transient ischemic attack, stroke, and/or carotid endarterectomy and was ascertained via ICD-10 and Current Procedural Ter-

The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

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TABLE 1 Characteristics of South Asian Men and Women and Prevalence of ASCVD Risk Factors

	All Individuals (N = 31,781)	Men (n = 16,644)	Women (n = 15,137)	*P* Value[a]
Age (y)	40.0 (33.0, 49.0)	41.0 (34.0, 50.0)	39.0 (32.0, 47.0)	<0.001
BMI (kg/m2)[a]	26.4 ± 4.58	26.6 ± 4.19	26.3 ± 4.97	<0.001
Hyperlipidemia	13,677 (43.0%)	9,150 (55.0%)	4,527 (29.9%)	<0.001
Hypertension	7,056 (22.2%)	4,474 (26.9%)	2,582 (17.1%)	<0.001
Current smoking	1,131 (3.57%)	1,024 (6.18%)	107 (0.71%)	<0.001
Diabetes mellitus	4,934 (15.5%)	3,079 (18.5%)	1,855 (12.3%)	<0.001
Family history of cardiovascular disease	3,350 (10.5%)	1,816 (10.9%)	1,534 (10.1%)	0.025
Atherosclerotic cardiovascular disease	2,262 (7.12%)	1,675 (10.1%)	587 (3.88%)	<0.001
Premature atherosclerotic cardiovascular disease	802 (2.52%)	582 (3.50%)	220 (1.45%)	<0.001

Values are median (Q1,Q3), mean ± SD, or n (%). Premature atherosclerotic cardiovascular disease is defined as age <55 years in men and age <65 years in women. [a]*P* value comparison is for men vs women.

ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index.

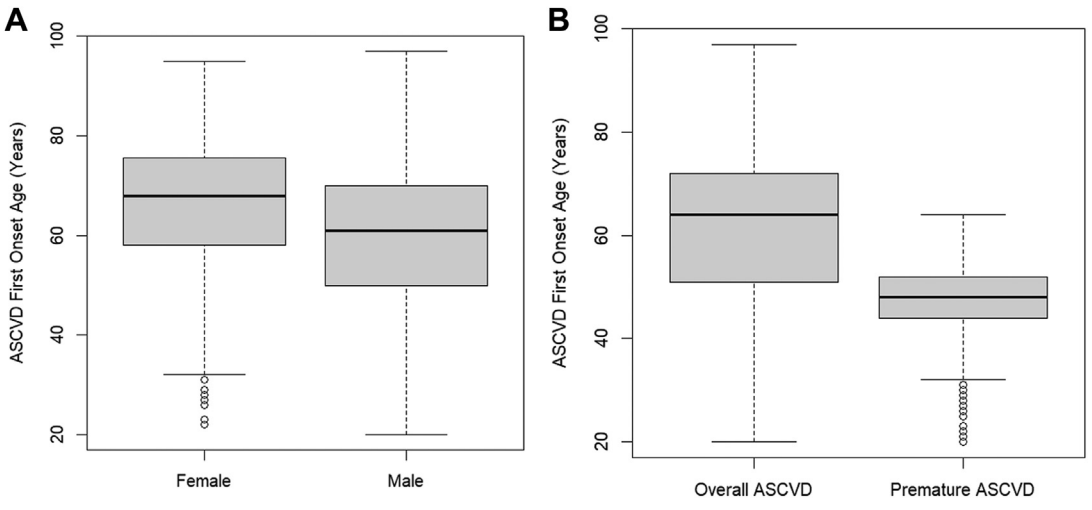
minology codes (Supplemental Material). Premature ASCVD was defined as incident diagnosis before age 55 years in men and 65 years in women. Family history and smoking status were self-reported.

STATISTICAL ANALYSIS. The prevalence of ASCVD and premature ASCVD was evaluated. Group comparison of demographic and clinical variables was performed using the chi-squared test or Fisher exact test for categorical variables and *t*-test or Mann-Whitney *U* test for continuous variables. Sex-stratified analyses were performed with the same methods. Association of ASCVD and premature ASCVD in all SA patients or patients stratified by sex was performed with multivariate logistic regression model. Covariates included age, sex (only in association of ASCVD or premature ASCVD in all patients), body mass index, hyperlipidemia, diabetes mellitus, hypertension, and current smoking status. A *P* value of <0.05 was considered significant. The analyses were performed using R version, 4.2.3.

RESULTS

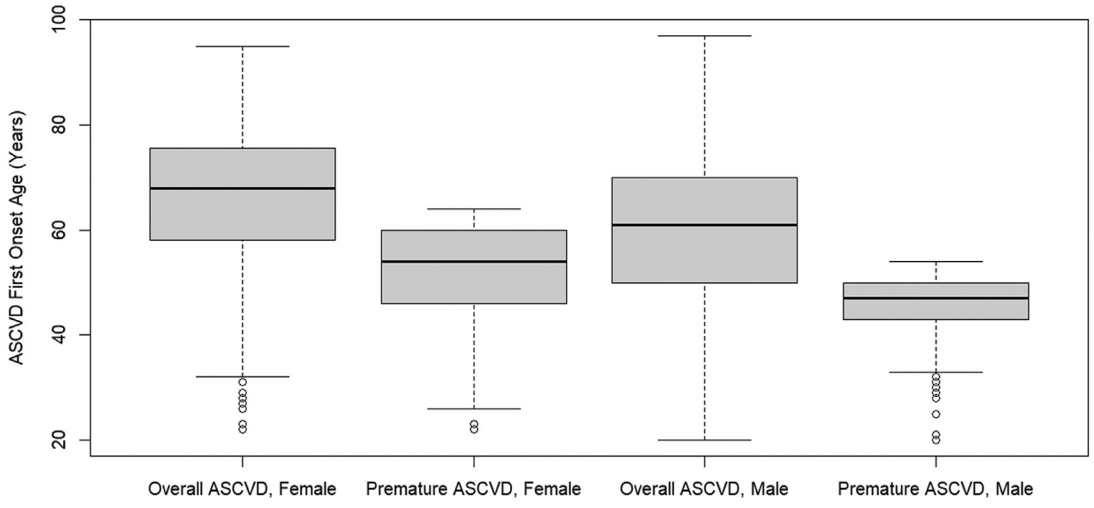
PATIENT POPULATION. A total of 31,781 individuals (women 47.6%, n = 15,137; age 40 [Q1, Q3: 33, 49] years in the overall cohort) were included. Characteristics are shown in Table 1. Forty-three percent of individuals had hyperlipidemia, 22.2% had

FIGURE 1 Boxplot of ASCVD Onset Age by Sex (All ASCVD Types Included) and Type (Overall vs Premature ASCVD)



(A) First onset of ASCVD onset by sex. (B) First onset of ASCVD overall and premature ASCVD. ASCVD = atherosclerotic cardiovascular disease.

FIGURE 2 Boxplot of ASCVD Onset Age by Sex and ASCVD



First onset of overall and premature ASCVD by sex. ASCVD = atherosclerotic cardiovascular disease.

hypertension, 15.5% had diabetes mellitus, and 3.6% were current smokers. Traditional ASCVD risk factors were more prevalent in men compared to women: hyperlipidemia (55% vs 29.9%), hypertension (26.9% vs 17.1%), diabetes mellitus (18.5% vs 12.3%), and current smoking (6.18% vs 0.7%) (all $P < 0.001$). A comparison of traditional ASCVD risk factors across various SA cohorts across the United States is shown in Supplemental Table 1.

ATHEROSCLEROTIC CARDIOVASCULAR DISEASE. The prevalence of ASCVD and premature ASCVD was 7.1% and 2.5%, respectively. ASCVD (10.1% vs 3.9%, $P < 0.001$) and premature ASCVD (3.5% vs 1.5% $P < 0.001$) were more prevalent in men (**Table 1**). **Figures 1 and 2** depict the age distribution of onset of ASCVD overall and by sex. The median age of ASCVD diagnosis was 64 (Q1, Q3: 51, 72) years in the overall cohort, 61 (Q1, Q3: 50, 70) years for men, and 68 (Q1, Q3: 58, 75.5) years for women, respectively. The median age at premature ASCVD diagnosis was 50.0 (Q1, Q3: 45.0, 54.0) in the cohort. Among 2,262 individuals with ASCVD, 79 (3.5%) had a diagnosis before age 40 years; of these 56 were men and 23 were women. The prevalence of the different types of ASCVD diagnoses is depicted in Supplemental Table 2. Risk factors of hypertension, hyperlipidemia, and diabetes mellitus were more prevalent in those with premature ASCVD when compared to those without ASCVD. Individuals with premature ASCVD were more likely to have a family history of

TABLE 2 Characteristics of South Asian Individuals Without ASCVD, With Premature ASCVD, and With Overall ASCVD

	No ASCVD (N = 29,519)	Premature ASCVD (n = 802)	Overall ASCVD (n = 2,262)	*P* Value[a]	*P* Value[b]
Age	39.0 (33.0, 47.0)	50.0 (45.0, 54.0)	65.0 (53.0, 74.0)	<0.001	<0.001
BMI (kg/m^2)	26.4 ± 4.58	27.5 ± 4.82	25.7 ± 4.32	<0.001	0.147
Hyperlipidemia	11,621 (39.4%)	716 (89.3%)	2,056 (90.9%)	<0.001	<0.001
Hypertension	5,242 (17.8%)	548 (68.3%)	1,814 (80.2%)	<0.001	<0.001
Current smoking	1,059 (3.60%)	35 (4.38%)	72 (3.19%)	0.288	0.337
Diabetes mellitus	3,736 (12.7%)	314 (39.2%)	1,198 (53.0%)	<0.001	<0.001
Family history of cardiovascular disease	2,906 (9.84%)	180 (22.4%)	444 (19.6%)	<0.001	<0.001
Statin use	6,014 (20.4%)	713 (88.9%)	2,074 (91.7%)	<0.001	<0.001

Values are median (Q1, Q3), mean ± SD, or n (%). Premature atherosclerotic cardiovascular disease is defined as age <55 years in men and age <65 years in women. Overall includes all patients with ASCVD (premature and nonpremature). [a]*P* value comparison is for premature ASCVD vs no ASCVD. [b]*P* value comparison is for overall ASCVD vs no ASCVD.

Abbreviations as in **Table 1**.

TABLE 3 Characteristics of South Asian Men With and Without Premature Atherosclerotic Cardiovascular Disease

	No ASCVD (n = 14,969)	Premature ASCVD (n = 582)	Overall ASCVD (N = 1,675)	*P* Value[a]	*P* Value[b]
Age (y)	40.0 (34.0, 47.0)	49.0 (44.0, 52.0)	64.0 (52.0, 73.0)	<0.001	<0.001
BMI (kg/m^2)	26.6 ± 4.18	27.2 ± 4.83	26.1 ± 4.26	0.003	<0.001
Hyperlipidemia	7,592 (50.7%)	542 (93.1%)	1,558 (93.0%)	<0.001	<0.001
Hypertension	3,143 (21.0%)	395 (67.9%)	1,331 (79.5%)	<0.001	<0.001
Current smoking	956 (6.42%)	32 (5.51%)	68 (4.06%)	0.429	<0.001
Diabetes mellitus	2,210 (14.8%)	217 (37.3%)	869 (51.9%)	<0.001	<0.001
Family history of cardiovascular disease	1,494 (9.98%)	138 (23.7%)	322 (19.2%)	<0.001	<0.001
Statin use	4,084 (27.3%)	536 (92.1%)	1,568 (93.6%)	<0.001	<0.001
Ezetimbe use	204 (1.36%)	94 (16.2%)	216 (12.9%)	<0.001	<0.001
PCSK9 inhibitor use	25 (0.17%)	25 (4.30%)	49 (2.93%)	<0.001	<0.001

Values are median (Q1, Q3), mean ± SD, or n (%). Premature atherosclerotic cardiovascular disease is defined as age <55 years in men and age <65 years in women. Overall includes all patients with ASCVD (premature and nonpremature). [a]*P* value comparison is for premature ASCVD vs no ASCVD. [b]*P* value comparison is for Overall ASCVD vs no ASCVD.

PCSK9 = proprotein convertase subtilisin/kexin type 9; other abbreviations as in Table 1.

CVD compared to those without ASCVD (22.4% vs 9.8%, $P < 0.001$) (Table 2).

SEX DIFFERENCES. Men and women with ASCVD and premature ASCVD had a higher prevalence of hypertension, hyperlipidemia, diabetes mellitus, and family history of CVD (Tables 3 and 4). Women with premature ASCVD were less likely to receive prescriptions for lipid-lowering therapy with statins (80.5% vs 92.1%, $P < 0.001$) and ezetimibe (8.6% vs 16.2%, $P = 0.009$). Proprotein convertase subtilisin/kexin type 9 inhibitor prescription was similar among men and women; 4.3% in men and 3.6% in women (Table 5).

ASSOCIATION OF RISK FACTORS WITH ASCVD. Hypertension, hyperlipidemia, and diabetes mellitus were most strongly associated with ASCVD (OR: 3.48 [95% CI: 3.06-3.96], 3.53 [95% CI: 3.01-4.17], and 1.50 [95% CI: 1.34-1.68], respectively) Table 6. Similarly, hypertension, hyperlipidemia, and diabetes mellitus were significantly associated with premature ASCVD (Table 7) and remained significantly associated in sex-specific analyses.

DISCUSSION

Utilizing the DILWALE registry, the present analysis demonstrates a high prevalence of ASCVD and premature ASCVD among individuals of SA descent. The median age of ASCVD and premature ASCVD diagnosis was 64 years and 50 years, respectively. Traditional risk factors were highly prevalent and strongly correlated with risk of an ASCVD event. Differences in risk factor burden, age of ASCVD onset, and prescriptions for lipid-lowering therapy between SA men and women were seen (Central Illustration).

TABLE 4 Characteristics of South Asian Women With and Without Premature Atherosclerotic Cardiovascular Disease

	No ASCVD (n = 14,550)	Premature ASCVD (n = 220)	Overall ASCVD (N = 587)	*P* Value[a]	*P* Value[b]
Age (y)	38.0 (32.0, 46.0)	56.0 (48.0, 62.0)	70.0 (60.0, 77.0)	<0.001	<0.001
BMI (kg/m^2)	26.2 ± 4.95	28.0 ± 4.78	26.9 ± 5.34	<0.001	0.002
Hyperlipidemia	4,029 (27.7%)	174 (79.1%)	498 (84.8%)	<0.001	<0.001
Hypertension	2,099 (14.4%)	153 (69.5%)	483 (82.3%)	<0.001	<0.001
Current smoking	103 (0.71%)	3 (1.38%)	4 (0.68%)	0.208	1.000
Diabetes mellitus	1,526 (10.5%)	97 (44.1%)	329 (56.0%)	<0.001	<0.001
Family history of cardiovascular disease	1,412 (9.70%)	42 (19.1%)	122 (20.8%)	<0.001	<0.001
Statin use	1,930 (13.3%)	177 (80.5%)	506 (86.2%)	<0.001	<0.001
Ezetimbe use	115 (0.79%)	19 (8.64%)	54 (9.20%)	<0.001	<0.001
PCSK9 inhibitor use	7 (0.05%)	8 (3.64%)	18 (3.07%)	<0.001	<0.001

Values are median (Q1, Q3), mean ± SD, or n (%). Premature atherosclerotic cardiovascular disease is defined as age <55 years in men and age <65 years in women. Overall includes all patients with ASCVD (premature and nonpremature). [a]*P* value comparison is for premature ASCVD vs no ASCVD. [b]*P* value comparison is for overall ASCVD vs no ASCVD.

Abbreviations as in Tables 1 and 3.

TABLE 5 Comparison of South Asian Men vs Women With Premature Atherosclerotic Cardiovascular Disease

	Men (n = 582)	Women (n = 220)	*P* Value
Age (y)	49.0 (44.0, 52.0)	56.0 (48.0, 62.0)	<0.001
BMI (kg/m^2)	28.0 ± 4.78	27.2 ± 4.83	0.051
Hyperlipidemia	542 (93.1%)	174 (79.1%)	<0.001
Hypertension	395 (67.9%)	153 (69.5%)	0.711
Current smoking	32 (5.51%)	3 (1.38%)	0.019
Diabetes mellitus	217 (37.3%)	97 (44.1%)	0.093
Statin use	536 (92.1%)	177 (80.5%)	<0.001
PCSK9 inhibitor use	25 (4.30%)	8 (3.64%)	0.826
Ezetimibe use	94 (16.2%)	19 (8.64%)	0.009

Values are median (Q1,Q3), mean ± SD, or n (%). Premature atherosclerotic cardiovascular disease is defined as age <55 in men and age <65 in women.
Abbreviations as in Tables 1 and 3.

The findings of this study emphasize the potential for earlier and intensive preventive interventions that specifically target the American Heart Association's Life's Essential Eight metrics that have been shown to be suboptimal among SA individuals.[1,7-9] Consistent with global data, SA have multiple risk factors at ages younger than 60 years.[10] Our findings emphasize the similar prevalence of traditional risk factors when compared to other U.S.-based SA cohorts that have leveraged electronic health care data.[11-13] The burden of ASCVD among SA individuals argues for greater diligence in primary prevention efforts to screen and treat modifiable risk factors and underscores the importance of risk assessment earlier in life than traditionally recommended by guidelines.[1] Indeed, attaining and maintaining optimal cardiovascular health metrics is associated with lower coronary calcium incidence and progression over a 5-year time period.[14]

Hypertension is a key driver of ASCVD among men and women of SA ethnicity. The overall prevalence of hypertension was found to be 22.2% and is consistent with other cohorts of SA adults, considering a national age-adjusted prevalence ranging between 20% and 43%.[11,15,16] Compared to other Asian subgroups, in Asian Indian, the prevalence of hypertension is highest for men and women aged <40 and 50 years, respectively.[17] Undertreatment and discordant treatment of hypertension has been noted in the Mediators of Atherosclerosis in South Asians Living in America (MASALA) cohort[18] such that application of the 2017 hypertension guidelines identified that more than half of participants would qualify for lifestyle modifications and 17% were recommended pharmacotherapy compared to only 8% by the Joint National Commission 7 ($P < 0.001$).[15] Our findings demonstrate that hypertension contributes to the development of ASCVD (OR: 3.48), consistent with previous global studies estimating a 1.9- to 2.9-fold higher risk of ASCVD in the presence of hypertension among SA adults.[4,10]

SA adults experience a disproportionately high prevalence of diabetes mellitus when compared to other racial and ethnic groups at a similar body mass index, ranging between 8.9% and 25%; in DILWALE registry, the prevalence was noted to be 15.5%.[11-13,19] In addition to a high prevalence of prediabetes in the MASALA study, other evidence suggests shorter duration glycemic conversion from normal glucose tolerance to prediabetes and finally diabetes mediated mainly by ectopic and hepatic fat, respectively.[20] A high prevalence of visceral adiposity, increased insulin resistance, and decline in beta-cell function are likely explanatory factors as well. Importantly, the presence of diabetes was associated with a roughly 1.5-fold increased risk of an ASCVD event in DIWALE, consistent with previously published data, ranging from 1.9 to 2.5 times higher.[10] The prevalence of smoking was lower among DILWALE participants as compared to individuals of other racial/ethnic

TABLE 6 Risk Factors Associated With Atherosclerotic Cardiovascular Disease (vs No ASCVD)

	All South Asian Individuals		Men		Women	
	OR (95% CI)	*P* Value	OR (95% CI)	*P* Value	OR (95% CI)	*P* Value
Age	1.08 (1.08-1.09)	<0.001	1.08 (1.08-1.09)	<0.001	1.09 (1.078-1.10)	<0.001
BMI	0.99 (0.99-1.00)	0.706	0.99 (0.98-1.01)	0.397	1.00 (NA-1.00)	0.934
Current smoking	0.97 (0.72-1.28)	0.824	0.94 (0.70-1.26)	0.701	1.75 (0.48-5.06)	0.342
Diabetes mellitus	1.50 (1.34-1.68)	<0.001	1.38 (1.21-1.58)	<0.001	1.85 (1.50-2.28)	<0.001
Sex (M vs F)	2.77 (2.455-3.125)	<0.001	-	-	-	-
Hyperlipidemia	3.53 (3.01-4.17)	<0.001	4.33 (3.52-5.37)	<0.001	2.44 (1.87-3.20)	<0.001
Hypertension	3.48 (3.06-3.96)	<0.001	3.53 (3.05-4.10)	<0.001	3.44 (2.64-4.50)	<0.001

A multivariable model was utilized. Covariates of interest.
Abbreviations as in Table 1.

TABLE 7 Risk Factors Associated With Premature Atherosclerotic Cardiovascular Disease (vs No ASCVD)

	All South Asian Individuals		Men		Women	
	Odds Ratio (95% CI)	*P* Value	Odds Ratio (95% CI)	*P* Value	Odds Ratio (95% CI)	*P* Value
Age	1.00 (0.99-1.01)	0.893	1.00 (0.99-1.00)	0.289	1.01 (1.00-1.02)	0.096
BMI	1.00 (NA-1.00)	0.931	0.996 (0.978-1.01)	0.605	1.00 (NA-1.00)	0.938
Current smoking	0.93 (0.64-1.31)	0.691	0.87 (0.59-1.24)	0.457	2.43 (0.57-7.09)	0.154
Diabetes mellitus	1.33 (1.13-1.56)	0.001	1.22 (1.00-1.47)	0.045	1.72 (1.26-2.34)	0.001
Sex (M vs F)	1.681 (1.42-1.99)	<0.001	NA	NA	NA	NA
Hyperlipidemia	6.194 (4.88-7.95)	<0.001	8.067 (5.85-11.43)	<0.001	3.791 (2.61-5.60)	<0.001
Hypertension	5.233 (4.39-6.25)	<0.001	5.213 (4.26-6.40)	<0.001	5.457 (3.79-7.92)	<0.001

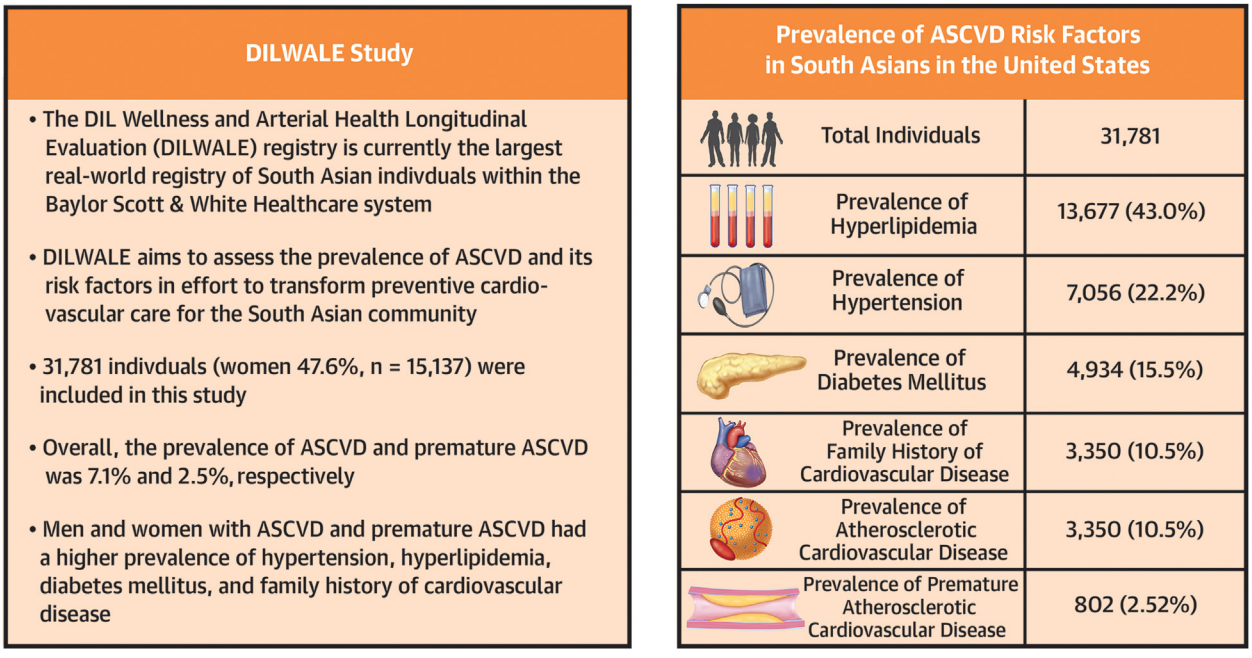
Abbreviations as in Table 1.

groups as previously reported in the MESA (Multi-ethnic Study of Atherosclerosis).[21]

The median age of onset of ASCVD among women occurred later in life than men. These findings are consistent with existing data on the development of coronary artery calcium later in life among women in MESA and MASALA.[22] A notable underuse of statin and ezetimibe among SA women compared to men was noted. While undertreatment is not unique to SA women and has been demonstrated in other cohorts,[23-25] these findings highlight an opportunity to mitigate disparities in preventive care. Importantly, the decision to initiate statin therapy hinges on risk quantification use available risk calculators, namely the pooled cohort equation or QRESEARCH cardiovascular risk algorithm; risk estimation in SA adults using the these is often inaccurate,[4,26,27] which may lead to underprescribing or overprescribing of statin therapy and may explain withholding statin therapy in SA women. This lends credence to the use of coronary artery calcium to refine risk, particularly in the presence of multiple traditional risk factors.[14,27]

The median age of ASCVD in the United States across all racial and ethnic groups is around 66 years

CENTRAL ILLUSTRATION DILWALE Study Quick Facts



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ASCVD = atherosclerotic cardiovascular disease.

in men and 72 years in women.[28] Prior studies suggest that the clinical presentation of ASCVD among SA occurs at a mean of 53 years.[2,3,29] In DILWALE, the median age at the time of first ASCVD diagnosis overall was 64 years, a difference from previously published findings. This may be explained by differences in the approach to preventive management including awareness of the burden of ASCVD in SA communities, earlier identification of risk factors, and availability of nonpharmacologic and pharmacologic interventions.[30] These findings merit further investigation. It is also important to note that ASCVD burden and presence of risk factors may differ among SAs residing in the United States as compared to those residing in their native country. The impact of Western migration on ASCVD and its risk factors merits further investigation.

STRENGTHS AND LIMITATIONS. Strengths of this study include the use of a large cohort of SA individuals in a real-world setting using single electronic health record system across a large health system. Limitations include that all patients were from Texas and this may limit the generalizability to all SA residing within the United States. The use of ICD-10 codes and medications may not fully capture risk profile or adherence to therapy. The term SA characterizes a diverse group of individuals within whom ASCVD risk is heterogeneous. Prior assessment of SA subpopulations has demonstrated that the highest CVD risk is noted among individuals of Bangladeshi origin, followed by Pakistani, and then Indians.[4,31]

CONCLUSIONS

The current study details a high prevalence of traditional ASCVD risk factors and ASCVD and premature ASCVD events in SA adult. Our findings highlight the importance of comprehensive evaluation and management of traditional ASCVD risk factors, all of which are key drivers of ASCVD. The high prevalence of ASCVD and its risk factors among SA individuals argues for culturally competent, early, and aggressive screening and management of modifiable ASCVD risk factors.

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Dr Nambi has stock in Insera Therapeutics and Abbott labs. Dr Butler has served as a consultant to Abbott, American Regent, Amgen, Applied Therapeutic, AskBio, Astellas, AstraZeneca, Bayer, Boehringer Ingelheim, Boston Scientific, Bristol Myers Squibb, Cardiac Dimension, Cardiocell, Cardior, CSL Bearing, CVRx, Cytokinetics, Daxor, Edwards, Element Science, Faraday, Foundry, G3P, Innolife, Impulse Dynamics, Imbria, Inventiva, Ionis, Lexicon, Lilly, LivaNova, Janssen, Medtronics, Merck, Occlutech, Owkin, Novartis, Novo Nordisk, Pfizer, Pharmacosmos, Pharmain, Prolaio, Regeneron, Renibus, Roche, Salamandra, Sanofi, SC Pharma, Secretome, Sequana, SQ Innovation, Tenex, Tricog, Ultromics, Vifor, and Zoll. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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PERSPECTIVES

COMPETENCY IN MEDICAL KNOWLEDGE: ASCVD and premature ASCVD are prevalent among SA adults residing in the United States. Efforts toward comprehensive risk factor treatment optimization are needed to slow the risk of ASCVD in this higher risk population. The high prevalence of ASCVD and its risk factors among SA individuals argues for culturally competent, early, and aggressive screening and management of modifiable ASCVD risk factors.

TRANSLATIONAL OUTLOOK: Findings from this study shed light on the real-world prevalence of atherosclerotic cardiovascular disease (ASCVD) and its risk factors among men and women of South Asian ethnicity. Better understanding of how these afflict South Asian individuals will help empower clinicians to appropriately care for this high-risk population and implement therapeutic interventions when indicated.

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APPENDIX For supplemental material and tables, please see the online version of this paper.