

REVIEW

Elevated Risk for Cardiovascular Disease in Diasporic South Asians

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Background & Objectives: Diasporic South Asians, individuals of South Asian descent who live outside their country of origin or heritage, are at a higher risk of developing cardiovascular diseases than the general population in many countries, including the United States. South Asians are also at elevated risk for specific cardiovascular risk factors, including Type 2 diabetes, obesity, metabolic syndrome, hypertension, dyslipidemia, and central distribution of fat (including visceral fat). The MAS-ALA Study, a longitudinal cohort study of South Asians in the United States, found significantly elevated ectopic adiposity, increased insulin resistance, increased inflammatory markers, and decreased insulin sensitivity. To prevent cardiovascular disease, physicians and other medical providers must focus on mitigating known risks, including hypertension, diabetes, tobacco use, low physical activity levels, central obesity, coronary artery calcium (CAC), poor diet, and psychosocial factors. Healthcare workers must proactively address these risks for South Asians, by ensuring blood pressure, cholesterol, and fasting glucose levels are checked even if their body mass index (BMI) appears normal or they follow a vegetarian diet.

Methods & Recommendations: This narrative overview aims to highlight diasporic South Asians as an underappreciated high-risk group for cardiovascular conditions and disease and to synthesize recently published literature in this area to provide further education to providers and public health workers who are working with South Asian patients. It is also essential to undertake culturally tailored outreach in specific South Asian communities to create educational materials regarding healthy behavior and lifestyle changes, including in languages needed by the most recent immigrants. Future research must include race, ethnicity, and native country of origin to better characterize the risk of stroke and heart attack and the impact of interventions among diasporic South Asian subgroups.

Key Words: cardiovascular risk factors ■ disparities ■ hypertension ■ diabetes ■ coronary artery calcium ■ diet

The term South Asian denotes people whose countries of origin include Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. This term also denotes persons from the South Asian diaspora whose families have settled in other parts of the world, such as the United Kingdom, Fiji, Guyana, Kenya, Trinidad/Tobago, and Tanzania, often generations ago. While native South Asians (who reside in the countries of origin aforementioned) may share genetic and cultural risk factors with diasporic South Asians (individuals of South Asian descent living outside of their native region), they may differ in socioeconomic status, education levels, healthcare behaviors, religious beliefs and attitudes, access to health insurance and language proficiency.¹ These factors can affect the risks for, treatment of, and outcomes of cardiovascular disease (CVD).

South Asians in the United States are four times more likely to develop cardiovascular conditions and diseases than the rest of the population.² South Asians in America have an increased risk of CVD in comparison to non-Hispanic Whites,³ are at high risk of coronary artery disease (CAD) and cardiovascular mortality compared to other ethnic groups, and exhibit higher rates of premature CVD.⁴ South Asians in Canada also experience the highest rates of CAD in that country.⁵ The Indo-Caribbean diaspora also includes individuals with ancestral roots from South Asia and have a similarly high prevalence of CVD.⁶ There is limited population-specific data for stroke in the United States, but South Asians in the United Kingdom have excess stroke mortality compared to European whites.⁷ South Asians also experience a high prevalence of specific CVD risk factors, such as Type

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POPULAR SCIENTIFIC SUMMARY

- South Asians who live in countries outside of the South Asian subcontinent are often at higher risk of developing heart diseases compared to other racial and ethnic groups. This may be due to elevated risks of other cardiometabolic conditions, including high levels of central body fat (despite normal weight), diabetes, and high blood pressure.
- South Asians may have lower levels of physical activity and face dietary challenges that can also impact their risk of heart diseases, but these risks are not often addressed by healthcare providers.
- To address these disparities, we need to educate physicians, healthcare providers, and healthcare systems to proactively address the unique cardiovascular risk factors in South Asian individuals.

2 diabetes, obesity, metabolic syndrome, hypertension, central distribution of weight and fat and abnormal blood cholesterol and glucose levels.^{3,8} This risk profile can also be attributed to upstream factors such as urbanization, globalization and other genetic, environmental and behavioral lifestyle factors.^{2,3}

South Asian Americans are one of the fastest-growing immigrant groups (and Asian Americans, in general, have experienced significant population growth, increasing 81% between 2000 and 2019 alone) and will make up the largest immigrant population in the United States by 2065.⁹⁻¹¹ Most physicians in the United States will care for a South Asian patient, driving the immediate and urgent need to understand the risk profiles of South Asian communities and how the diverse range of ethnic, religious, and socioeconomic statuses of these groups intertwine with their cardiovascular health outcomes.

METHODS

This article is written as a narrative overview of cardiovascular risks in the South Asian diaspora. Narrative overviews synthesize existing literature on a specific topic to summarize recent findings. We synthesized information from California's Right Care Initiative position paper on South Asians and heart disease as well as an American Heart Association scientific statement on the topic.⁹ Both products focused primarily on CVD risk factors for South Asian Americans. Through that, we identified a gap in information on South Asians from across the diaspora and included primary research studies that address cardiovascular risks specific to this subpopulation. With individuals from the South Asian diaspora contributing to a significant portion of the population, it is critical to understand subtle differences in risk factors for heart disease and stroke and causes of mortality among this globally underrepresented community.

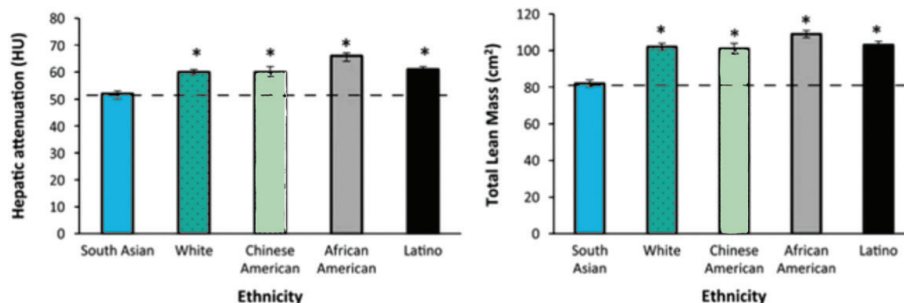
To examine existing literature regarding the intersection of diasporic South Asians and CVD, the authors searched PubMed/MEDLINE using the terms 'South Asian', 'MASALA', 'cardiovascular disease', and 'cardiovascular risk' in various combinations. 'MASALA' represents the Mediators of Atherosclerosis in South Asians Living in America (MASALA) Study, the first longitudinal cohort study of South Asian Americans that investigate behavioral, cultural, and clinical risk factors for heart disease.¹² From this preliminary search, only English-language studies were reviewed. Studies that focused primarily on communities from (or only included participants living in) South Asian countries were excluded, as the intention of this overview is to focus specifically on literature unique to diasporic South Asians.

The information and next steps included below reflect the synthesis of findings from primary research and related reviews found in the search and the recognition that diasporic South Asians have a multitude of risks for CVD that are often not discussed in healthcare settings nor in society as a whole.

MEDIATORS OF ATHEROSCLEROSIS IN SOUTH ASIANS LIVING IN AMERICA STUDY

The MASALA study is the first longitudinal cohort study of South Asians in the United States and seeks to understand unique factors leading to CAD in South Asian Americans.¹² Since 2010, investigators at the University of California, San Francisco (UCSF) and Northwestern University have recruited 1,164 diasporic South Asians from the greater San Francisco Bay Area and Chicago. The MASALA study demonstrated high rates of diabetes, lipid disorders, and low physical activity among South Asians. These data can be used to further identify risk factors in this population and help guide future prevention efforts for heart disease in South Asians in the United States.^{12,13}

Recently, the MASALA study found that South Asians in the cohort have higher liver, visceral, and intermuscular fat levels and significantly less total lean abdominal and back muscle mass than four other ethnic groups from the Multi-Ethnic Study of Atherosclerosis (MESA).¹⁴ This study also found that South Asians had significantly lower (and thus worse) liver fat attenuation compared to these other groups (Fig. 1).¹⁴ Differences in these levels are hypothesized to be caused by variations in lifestyle, genetics, physical activity and diet, insulin resistance, and adiposity distribution.^{14,15} Specifically, higher levels of ectopic adiposity are associated with insulin resistance, increased inflammatory markers, and decreased insulin sensitivity, and these differences then increase the risk of metabolic disorders and CVD.¹⁴



Differences in hepatic attenuation by ethnicity Differences in total lean mass by ethnicity

Figure 1. Differences in body composition by ethnicity (Shah et al.¹⁵).

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LEADING CAUSES OF MORTALITY IN DIASPORIC SOUTH ASIAN INDIANS

Research evaluating the leading causes of mortality in diasporic Asian Indians living in California found CVDs to be the leading cause of death for both men and women. Almost half of all deaths for diasporic Asian Indian men in this study were due to CVD. In this same study, the number of deaths due to diabetes, a significant risk factor for heart disease, increased with age for both Asian Indian men and women.⁸

A 2014 study examined national mortality data comparing Asian sub-groups to non-Hispanic Whites using the United States death records from 2003 to 2010. Non-Hispanic White men and women had the highest overall age-adjusted mortality rates, but Asian Indian men and women had a more significant proportionate mortality burden from ischemic heart disease using proportional mortality ratios (PMRs) for relative risk.¹⁶ This means that Asian Indians during those years had a higher proportion of deaths caused by ischemic heart disease compared to other ethnic groups in the study.

More recently, another study examined outcomes for mortality from ischemic heart disease and cerebrovascular disease among the six largest Asian-American subgroups compared with non-Hispanic Whites.¹⁷ This 2019 study demonstrated that Asian Indians had more years of productive life lost (YPLL) to ischemic heart disease than did non-Hispanic Whites, and that disparity was noted for both men and women.¹⁷

With the existing data, it is evident that diasporic South Asians are at high risk for CVD in the United States and other countries. There is a need to mitigate known risks, such as hypertension, diabetes, tobacco use, low physical activity levels, central obesity, coronary artery calcium (CAC), poor diet, and other psychosocial factors.

MODIFIABLE RISK FACTORS FOR HEART DISEASE AND STROKE

1. Hypertension: One of the most common CVD risk factors among diasporic South Asians in the United States

(South Asian Americans) is hypertension, with a prevalence of 43% in men and 35% in women in the MASALA cohort.⁴ Multiple studies show a high prevalence of hypertension in South Asian Americans,^{2,9} and studies from the United Kingdom demonstrated increased rates of hypertension in Gujarati Indians living in the United Kingdom compared to a nonmigrant group from India.¹⁸ Even though many South Asians may have hypertension, a large portion of this population are often unaware of the condition and options to treat or manage hypertension.¹⁹

2. Diabetes: One study found the prevalence of Type 2 diabetes to be 24% among South Asians in India, with incidence continuing to rise.²⁰ South Asians in the MASALA cohort had age-adjusted rates of Type 2 diabetes of 23%, which is much higher than for other United States groups, and high levels of insulin resistance, which is a risk factor for Type 2 diabetes.²¹ Another study also found an 18.3% prevalence of diabetes mellitus in Asian Indians in the Atlanta metro area, with this percentage increasing with age.²² In general, South Asians are at a higher risk of both Type 2 diabetes and CVD compared with other populations.²¹⁻²⁴ South Asians also develop these diseases at a significantly younger age and tend to have more severe and extensive manifestations of these diseases.^{20,25}

Current data also suggest that about one in four people with Type 2 diabetes are unaware of their condition, which means that a large proportion of South Asians are likely living with Type 2 diabetes (and thus have greater cardiovascular risk), yet are completely unaware and thus are not managing their condition.²⁶ Risk factors for Type 2 diabetes include Asian ethnicity, and so it is imperative that South Asian patients are screened as early as possible, especially if they are over the age of 45 years, have a first-degree relative with Type 2 diabetes, have overweight (especially abdominal obesity), and have any features of metabolic syndrome.²⁶

3. Tobacco use: A 2009 study found that South Asians living in California had an overall rate of daily smoking of

9%, similar to the 10% rate observed in the general population in California.²⁷ They also found that this rate was higher among South Asian men (19%) compared to all men in California (11.5%).²⁷ South Asian men also tend to have higher rates of smoking than women although rates among women increase with acculturation to American culture.²⁸ While the reported frequency of smoked tobacco among South Asians may be comparable to the general population, it is essential to note that tobacco within this community is consumed in many different cultural smokeless forms as well. In fact, South Asians in England have the highest rates of smokeless tobacco use compared to other subpopulations.²⁸ Tobacco in all forms is a key modifiable risk factor for CVD. Thus, it is crucial to understand the distinct ways in which diasporic South Asians view tobacco products in order to implement better intervention strategies for users and prevention strategies for nonusers.

Some examples of cultural smokeless tobacco products include paan, beedis, and ghutka, which can increase heart attack and stroke risk.^{28,29} Usage of these tobacco products has often been embraced by diasporic South Asians to maintain cultural traditions, engage in celebration, and socialize with others of a similar ethnic background.²⁸ Children of South Asian immigrants have also been observed to adopt similar patterns of cultural smokeless tobacco usage to resemble a 'native' behavior displayed by their parents in order to symbolize a connection to cultural roots.²⁸

Beyond smokeless products, another popular form of tobacco use within the South Asian community includes hookah. Compared to South Asian elders, hookah was more consistently recognized as culturally popular among younger generations, as its popularity has been influenced by both college and ethnic settings.³⁰ Second-generation diasporic South Asians also report more frequent use of hookahs and alternative tobacco use methods compared with earlier generations, which can put them at greater risk of future CVD.²⁸ In contrast, elder South Asian generations more commonly preferred paan and other smokeless tobacco products.³⁰ Understanding the difference in tobacco product familiarity between age groups allows providers to better educate South Asian patients regarding the risks associated with all tobacco use, not just traditional cigarette smoking.

As the popularized form of tobacco usage is often smoking, and certain smokeless tobacco products are viewed as related to South Asian culture and tradition, items such as hookahs and paan may not be overtly considered tobacco products within the South Asian community, and thus many people underestimate the associated health risks.²⁸ The same 2009 study that found an overall 9% rate of daily smoking in South Asians living in California also observed that 28% of South Asians in their sample reported current use of at least one cultural smokeless tobacco product.²⁷ This indicates that daily

smoking rates do not accurately represent tobacco usage for patients or subpopulations of South Asians.

Furthermore, most clinical tobacco use interventions focus on cigarette smoking rather than other forms of tobacco usage. Researchers have noted a need to increase awareness among healthcare providers about the common usage of hookah, paan, beedis, and ghutka and their associated risks.^{28,31} This awareness will allow providers to provide tailored information, early screening, and treatment and recommend appropriate behavioral modifications for diasporic South Asian patients.²⁸

Another recommendation is to consider paan, beedis, and ghutka as smokeless tobacco products when screening patients or gathering population data.³⁰ Researchers have categorized participants using smokeless tobacco products every day or some days as current users, and those who have not used any smokeless tobacco products as never users.³² Such categorizations and screening will allow providers and researchers to better understand product usage to inform future public health interventions in South Asian communities.³⁰

4. Low levels of physical activity: South Asians in the United States tend to have lower physical activity levels than other groups. In general, diasporic South Asians exhibit a more sedentary lifestyle on immigration to Western countries.^{3,21,33} Insufficient physical activity is a significant risk factor for abnormal lipid and glucose profiles, high blood pressure, and CVD.³ Studies have shown that participating in 2.5 h of exercise weekly improves endothelial function, increases high-density lipoprotein (HDL) levels, decreases ambulatory blood pressure, and reduces the risk of CVD.³ Notably, low physical activity increases cardiovascular risk as much as high blood cholesterol, high blood pressure, or smoking cigarettes.

A reasonable walking goal is 7,000–10,000 steps a day.³⁴ The Centers for Disease Control and Prevention (CDC) recommend about 150 min of moderate physical activity per week (30 min on 5 days of the week). However, in one cohort study, only 52% of South Asian participants met these recommended guidelines, and the average number of daily steps was 6,904, which is in the 'low active' category.^{9,35} One recommendation to increase physical activity is to create and disseminate more educational information on the preventive benefits of moderate- and high-intensity physical activity for South Asian Americans at the community and neighborhood levels.

It is essential to recognize significant barriers to improving physical activity levels among South Asian communities, including certain cultural beliefs, practices, and accessibility issues. Individual participation in regular physical activity can sometimes be seen as opposing South Asian cultural norms of putting family before self. There may also be lower physical activity levels among

lower socioeconomic groups due to accessibility issues, including limited time, resources, and inadequate access to safe and walkable neighborhoods.³

South Asian women may also participate in less leisure-time physical activity due to religious modesty, fear of going out alone, and even potential cultural stigma from their community.³⁶ Asian Indian women in the United States have also reported less physical activity compared to their Caucasian American women counterparts.³⁷ There is a need for culturally acceptable programs tailored for South Asian women. For example, Bollywood dance was found to be as effective as other forms of moderate-vigorous physical activity and that some dance styles can significantly reduce body mass index (BMI) and total fat mass in South Asian women.^{36,38}

Low levels of physical activity are a risk factor for CVD, and given diasporic South Asians have lower levels than the general population, interventions such as the multilevel promotion of daily physical activity must be incorporated.³⁹ A proposed approach to promote daily physical activity includes empowering South Asians as advocates of their own, familial, and community cardiovascular health via education of physical activity as a factor in preventing CVD.³⁹ Incorporating regular physical activity such as walking or cycling to work may also be valuable, as sedentary jobs are common among many South Asians.³⁹

Sedentary lifestyles and prolonged sitting are also common in many older adults and are associated with insulin resistance and poor cardiometabolic health.⁴⁰ A recommendation for those with sedentary lifestyles is to break periods of sitting with short (approximately 5 min) walks. Implementing short bouts of light walking has been shown to clinically improve markers of metabolic health in older adults, and South Asians specifically have demonstrated more significant reductions in postprandial insulin.⁴⁰

Studies have shown that South Asians have higher levels of postprandial triglycerides, glucose, and insulin responses to meals in comparison to white Europeans.⁴¹ There is also evidence that South Asians may exhibit more significant exercise-induced reductions in postprandial triglycerides.⁴¹ Some studies have noted that running for 60 min shows a more substantial decrease in postprandial triglyceride response to high-fat meals in South Asians (22.6% reduction) than white Europeans (9.9% reduction).⁴¹ In contrast, these same researchers found no difference in the magnitude of reduction between South Asians and white Europeans after 60 min of brisk walking.⁴¹ This may indicate that South Asians require a higher intensity of exercise to maximize reductions in postprandial triglycerides. As high triglyceride levels are associated with obesity and metabolic syndrome, which increase both the risk of heart disease and stroke, an improved understanding of postprandial health benefits of physical activity may assist

in optimizing lifestyle-based recommendations for diasporic South Asians.⁴¹

Yoga has also been shown to effectively manage conditions in patients with heart disease and hypertension, as it reduces anxiety and promotes well-being.^{9,42} Some studies involving postural techniques of yoga, known as asanas, have also demonstrated significant reductions in blood pressure.⁴² The use of yoga as a complementary disease-managing practice is appropriate and is worth considering for physicians to recommend.

5. Obesity: Obesity is a crucial precursor of Type 2 diabetes and a significant risk factor for CVD. South Asians in several studies have been noted to be especially prone to developing central obesity, with fat primarily in the liver and around the abdominal visceral organs, which promotes insulin resistance and inflammation, and is metabolically much more harmful than other fat depots, contributing to high cardiovascular risk. This phenotype, 'metabolically obese-normal weight', can be described as a higher propensity for liver and visceral fat deposition and is widely prevalent among South Asians.²⁵ So, while South Asians at normal weights may be metabolically obese, and thus at greater risk for CVD, they are not adequately assessed if standard BMI cut-offs are used by physicians.

With obesity on the rise, and fat stores still prevalent in normal-weight South Asians, it is essential to use Asian-specific BMI cut-offs to properly assess heart disease risk for South Asians. With these specific cut-offs, a BMI >23 kg/m² is considered overweight, and >27.5 kg/m² is considered obese.⁴³ When these standards were applied to the MASALA cohort, 33% of South Asian Americans exceeded these lowered BMI cut-offs for obesity, putting them at higher risk for CVD.⁴⁴

6. CAC: Levels of CAC are a strong predictor of CAD and cardiovascular events. The MASALA and MESA studies showed that CAC levels in South Asian men are similar to those of white men and are overall higher compared to African Americans, Latinos, and Chinese Americans.⁴⁵ This study also found that South Asian women tend to have similar CAC levels compared to other women, but those levels increase significantly in older age (>70 years).⁴⁵ This high burden of subclinical coronary atherosclerosis, as indicated by higher CAC scores in South Asians starting at earlier ages (Fig. 2), partly explains the higher rates of CVD in South Asians. A UK study also demonstrated higher prevalence and severity of arterial calcification in Asian Indians compared to whites with angina, even with the matching of age and risk factors for CVD.⁴⁶

CAC testing in asymptomatic populations has also been evaluated by several independent groups and found to be cost-effective compared to other preventive methods such as implementing statin therapy.⁴⁷

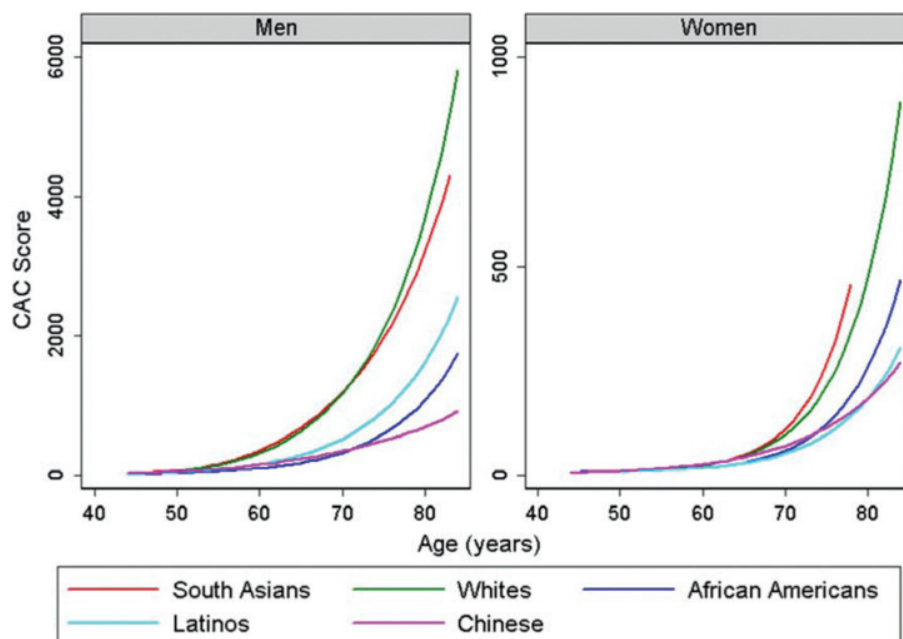


Figure 2. Mean coronary artery calcium score by age for five ethnic groups by sex. Data from the MASALA and MESA studies Kanaya et al.²¹

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7. Poor diet: South Asians who migrate to Western countries report increased consumption of fats and carbohydrates and decreased consumption of fiber.^{48,49} Several studies have also noted alarmingly low fresh fruit and vegetable consumption among South Asian migrants in the United States. A recent review of modifiable lifestyle and cardiovascular risk factors in Indo-Fijian subgroups also found a low prevalence of recommended fruit intake, which can contribute to greater risk.⁵⁰ Emphasizing increased consumption of fresh fruits and vegetables and lowering sodium in the diet can help prevent dietary patterns that may increase hypertension in South Asians.⁵¹ Specifically, physicians can emphasize the inclusion of certain vegetables such as tomatoes, soybeans, potatoes, asparagus, sesame, onions, broccoli, and other cruciferous vegetables in the diet, as numerous studies have shown these vegetables' inverse association with CVD incidence.⁵²

Cultural beliefs, practices, and celebrations are all closely tied to specific culinary traditions in South Asian communities. They frequently include the consumption of fried sweets and foods, paired with a lacto-vegetarian diet in Hindu-practicing populations.⁵³ High consumption of fried snacks and sweets, along with high-fat dairy patterns, is associated with lower HDL levels and higher insulin resistance, which indicate an increased cardiometabolic risk.⁵¹ While South Asians may rely on vegetarianism as an indicator of a healthy diet, it is crucial that physicians educate South Asian patients on how frequent consumption of fried and high-fat vegetarian foods can increase CVD risk.

A few health-oriented organizations have developed healthier versions of existing cultural food recipes in the form of cookbooks and online blogs. Still, researchers have noted that many South Asian community members do not actively seek out this material. Thus these resources currently do not broadly impact many South Asians, especially those who have not contemplated lifestyle or dietary changes.⁵⁴

Implementing a calorie-restricted diet can also prove useful in improving insulin sensitivity and decreasing risk factors for CVD.⁵⁵ A study focusing on overweight, insulin resistant, and healthy Asian Indian women found that a calorie-restricted diet, notably lower in carbohydrates (containing only 40% carbohydrates for 3 months), led to weight loss, decreased insulin resistance, and significantly reduced their risk of Type 2 diabetes and CVD.⁵⁵

Another area worth considering is the use of alternative medicine and supplements popular among South Asians, for instance, Ayurvedic medicine and herbs. Many South Asians are familiar with this practice that originates from the Vedic civilization of India approximately 5,000 years ago.⁴² Typical Ayurvedic treatment includes specific herb usage, yoga, and meditation.⁹ Many existing studies of Ayurvedic herbal treatments have not used rigorous methodology nor included adequate sample sizes. However, a recent metabolomic profiling of *Crataegus oxyacantha* indicated the presence of certain phytoconstituents with antioxidant potential.⁴¹ These phytoconstituents may have a role in remedying certain

diseases such as myocardial infarction, coronary heart diseases, hypertension, and diabetes-related complications.⁴¹ The presence of ursolic acid in *C. oxyacantha* also has angiotensin-converting, enzyme-inhibiting, and cardioprotective potential.⁴¹ Other herbs that have alleviated cardiotoxicity by helping maintain normal levels of biochemical parameters include *Terminalia arjuna*, *Rauvolfia serpentina*, and *Elettaria cardamom*.⁴¹ Evidence-based studies have concluded that these herbs can safely be used to assist in managing CVDs.⁴¹

8. Psychosocial factors: In 2014, a systematic review by the American Heart Association concluded that depression is a risk factor for adverse consequences in patients with acute coronary syndrome and coronary heart disease.⁵⁶ While this review did not explicitly focus on South Asians, it did identify that depression in all patients can impact cardiac outcomes by influencing high-risk behaviors for CVD, such as increased smoking, decreased physical activity, and decreased adherence to prevention measures.⁵⁶ Longitudinal studies have also shown that depression is associated with an accelerated progression of subclinical atherosclerosis in participants with coronary heart disease risk factors.⁵⁷⁻⁵⁹ As depression is associated with an elevated risk for adverse cardiovascular outcomes, physicians should consider the role of depression screening and treatment in minimizing the risks for CVD in patients.⁶⁰

The MASALA study found that the impact of psychosocial factors on subclinical atherosclerosis varies between men and women.⁵⁷ Depression and anxiety in South Asian men and stress in South Asian women were associated with thicker arterial walls (elevated carotid intima-media thickness), which is a marker for subclinical CVD.⁵⁷ Specifically, life stress (currently and over the past 6 months) was positively correlated with carotid intima-media thickness in South Asian women.⁵⁷ The MASALA study found that South Asian women with chronic stress reported less exercise, higher BMI, and little social support.⁵⁷ The correlation between stress and elevated carotid intima-media thickness may be due to the role of stress in developing unhealthy behaviors such as smoking, inactive lifestyle, and a higher caloric intake, which might lead to thicker arterial walls.^{61,62} More studies are needed to understand the pathways in which stress impacts arterial walls and atherosclerosis.

Another UK study focusing on the prevalence of psychosocial factors correlated with cardiovascular risk found that diasporic South Asians had a higher risk profile of psychosocial factors (such as more racial harassment, more crowded homes, less neighborhood social cohesion, and generally were more depressed) compared to white Europeans.⁶³ When South Asian women experienced more neighborhood social cohesion, the MASALA study found a decreased incidence of hypertension.⁹

The MASALA study also found that a higher degree of preference for American culture over native South Asian culture (regarding the South Asian diasporic assimilation to or integration into a place of residence) was associated with a healthier cardiometabolic profile among South Asian women in the United States. In contrast, preference for either culture was not significant in the cardiometabolic profile of South Asian men.⁶⁴ Some of the assimilation and integration strategies that helped these profiles included less caloric intake, more exercise, and less depressive symptoms.⁶⁴ The differences in psychosocial factors impacting cardiovascular risk according to sex are not yet thoroughly explained and warrant more investigation.⁶⁵

Overall, these psychosocial factors are believed to contribute to cardiovascular risk and thus are important to acknowledge in clinical settings when discussing vulnerability to certain cardiometabolic conditions or diseases. At the same time, future prospective studies are needed to completely understand how these factors directly affect cardiovascular risk via increased carotid intima-media thickness and other measures.

NEXT STEPS

1. Educate physicians, healthcare providers, and health systems to proactively address the unique risks of South Asian individuals for heart disease and stroke, lipid disorders, hypertension, and diabetes, through screening, education, and counseling of patients.

2. South Asian patients should have their blood pressure, cholesterol, and fasting glucose levels checked even if their BMI is normal (cardiometabolic risk begins at >23 kg/m²). Consider ordering coronary CT scans to assess for CAC scores at younger ages.¹⁷

3. Create South Asian-specific cardiovascular risk assessment tools that incorporate a higher prevalence of hypertension, diabetes, and arterial calcification, culturally specific tobacco habits, unique obesity phenotypes, and specific psychosocial factors varying by age and sex. Certain existing risk models underestimate cardiovascular risk in South Asian subpopulations.⁶⁶

Researchers have developed risk assessment tools for culturally specific tobacco habits. They include categorizing those who report chewing paan and ghutka every day or some days as current tobacco users.³² The Cardiovascular Health Among Asian Indians (CHAI) project also identified that additional South Asian language options, such as in screenings and assessments, bring out more variation in communities and are critical to consider when creating tools for South Asians.⁶⁷

Overall, although some population-specific cardiovascular risk assessment tools exist, such as for South Asian diet and tobacco use, few instruments are rooted in or validated in South Asian Americans, one of the largest diasporic South Asian groups.⁹ Existing databases such as the NIH HeartShare program, disease registries, existing cohort studies, electronic health record data, and administrative data sets can all be used to better understand the epidemiology of CVDs in diasporic populations and assist in creating better tools where needed.⁶⁵ Better tools may allow providers to better assess South Asian patients' modifiable risks and design individually tailored prevention strategies.

4. Control cardiometabolic risk factors in those who have already developed them using culturally tailored interventions; poor control of risk factors results in greater cardiovascular mortality.

5. Incorporate race, ethnicity, and country of origin in electronic health records and research studies of stroke, lipids, and genetic markers for lipid abnormalities. Also, given their unique predispositions and intrinsic risk factors, it is critical to disaggregate South Asians from the umbrella term Asians when conducting health disparities research examining differences based on ethnicity and race.

Currently, nationally representative and disaggregated (in accordance with South Asian subgroups) data are minimal.⁶⁸ There need to be efforts to improve data collection with respect to stratification by ethnicity, inclusive of Indo-Caribbeans, to substantially improve proactive management of cardiovascular conditions and outcomes.⁶ Other smaller diasporic groups have minimal literature and data to guide our complete understanding of cardiovascular risk in diasporic South Asians. Without these data, researchers and advocates are restricted in their understanding of cardiometabolic prevention needs in South Asian communities, and it is difficult to curate and implement culturally tailored and evidence-based interventions.

6. Further identify cultural beliefs and practices, such as the use of chewed tobacco products or use of Ayurvedic medicine or herbs, among the diasporic South Asian communities. They may play a role in cardiometabolic risk factors.⁵⁴ By targeting these beliefs and practices, providers can supplement current strategies for the prevention of both CVD and diabetes in diasporic South Asians.

7. Adequately fund longitudinal studies and clinical trials among these high-risk groups who have often been harder to recruit into research studies.⁶⁹ Groups that participate in studies such as the MASALA study may not represent all diasporic South Asian communities. It is

important to note that South Asians living in the United States often have unique social and demographic profiles specific to their geographic region, and results from the MASALA study may be most indicative of patterns in South Asians living in Northern California and Chicago, compared to the entire United States or may not apply to other diasporic countries.

8. Undertake culturally tailored outreach in South Asian communities, including creating culturally relevant educational materials in common South Asian languages, such as Hindi, Punjabi, Bangla, Urdu, Gujarati, Tamil, Telugu, etc. Develop interventions and evaluate them for effectiveness.

Interventions can include incorporating more fresh fruits, vegetables, nuts, legumes, whole grains, and low-fat dairy products into the diet, and promotion of the regular physical activity. In regard to diet, we need culturally appropriate ways to modify favorite foods, rather than eliminating beloved food items from the South Asian diet.⁵⁴ It is important to take cultural beliefs and practices into account before recommending behavior and lifestyle changes, as dense caloric foods (oftentimes used for rituals, ceremonies, and celebrations) are very unlikely to be completely eliminated by many South Asians.⁵⁴ Instead, providers should discuss alternative preparations of certain foods or explain the benefit of reducing the frequency or quantity of such foods consumed.

Interventions such as the one aforementioned should be implemented at the preconception, in utero, infancy, childhood, adolescent, and adult levels to ensure all South Asians, regardless of age, are countering known risk factors and making appropriate lifestyle changes as needed.⁷⁰

9. Further research into the use of traditional medicine approaches is needed. While approaches originating from alternative medicine disciplines are in practice, these treatments have not been convincingly proven effective due to some methodologic issues and inadequate sample size in existing studies.⁹ Future randomized controlled trials investigating the implementation of traditional herbal treatments in preventing and treating CVD are needed.

It is also important to note that much of the research on cardiovascular risk factors in South Asian Americans focuses specifically on persons of Asian Indian descent; those originating from other South Asian countries (Pakistan, Bangladesh, Sri Lanka, etc.) have been under-sampled in research on South Asian cardiovascular risks. There may be specific nuances in risk factors for each ethnic group not yet understood, and it is important to eventually generate more cardiometabolic data for each of these subpopulations for a more representative picture of risk factors.

ARTICLE INFORMATION

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