Upon hearing the words “Atherosclerosis and Indians,” the following key points and definitions come to mind:

1. South Asia comprises Bangladesh, India, Nepal, Pakistan and Sri Lanka. Indians comprise 85% of this group in the U.S.\textsuperscript{1} Often, these groups are investigated together in large studies.

2. The Coronary Artery Disease in Asians Indians (CADI) research project: Groundbreaking research begun in the 1990s is a must read for anyone treating Indians. CADI has provided understanding of the development of premature, malignant cardiovascular disease at younger ages than Caucasians.\textsuperscript{2}

3. The Indian Paradox: Described as both 1) a higher prevalence of coronary artery disease (CAD) despite lower cholesterol, and 2) Indian vegetarians and non-vegetarians having the same lipoprotein levels and CAD rates in contrast to Western vegetarians, who have favorable lipids and lower disease rates.\textsuperscript{3,4}

4. Metabolic Syndrome: 32.7% prevalence in U.S. Indians\textsuperscript{5} who also suffer a higher prevalence of hypertension, diabetes mellitus, obesity and hyperlipidemia at a younger age compared to non-Indians.

5. The Need for better risk stratification: “If you are a male from the Indian subcontinent, over age 30 and have a parent with coronary disease, then you should take a statin.” – Dr. Robert A. Vogel in 2005 at the American College of Physicians, Delaware Chapter seventh annual Lower Shore Symposium). Research has shown that the Framingham risk assessment and traditional lipid panel do not account for the disease prevalence and aid in risk reduction. India’s population is more than 1.2 billion. More than 2.8 million Indians live in the U.S., 70% more than in 2000. Despite having increased risk (40%-400%) of developing and dying of coronary disease than the general population, this group is generally poorly understood by clinicians.
Interestingly, Indians have higher coronary artery calcium scores at younger ages and lower hypertension prevalence compared to other ethnicities. CAD onset is from 5 to 10 years earlier compared to other ethnicities, averaging around age 53 for a first myocardial infarction. South Asians present later during acute myocardial infarction and are more likely to have an anterior infarct. Significant left main, multi-vessel and distal disease, despite presenting younger than their Caucasian counterparts, is noted. 

The risk for CAD in the South Asian community can be accounted for by nine modifiable risk factors: ApolipoproteinB/ApolipoproteinA-I (ApoB/ApoA-I) ratio, smoking, hypertension, diabetes, waist-hip ratio, psychosocial factors, moderate/high intensity exercise, alcohol consumption and consumption of fruits and vegetables. They account for 85.8% of attributable risk, similar to other populations. Tobacco use is generally lower, though this is rapidly increasing with economic expansion.

Metabolic syndrome prevalence in U.S. Asian Indians is high, more than 32%. Most tend to accumulate obesity in the abdominal region compared to the uniform obesity found in the West. Compared with Europeans, South Asians have increased abdominal visceral fat and greater insulin resistance at similar levels of BMI, which suggests that reliance on BMI alone may underestimate true risk in South Asians. Waist circumference may be a better tool to assess the harmful effects of obesity. Diabetic prevalence also is high, around 6% or 7% for those considered to have a normal weight; it’s a rate that increases to between 19% and 33% for the obese.

Along with central obesity, South Asians have lipid profile characteristics, elevated levels of triglycerides, low HDL Cholesterol and perhaps only mildly elevated LDL Cholesterol. LDL particle size tends to be smaller, They have lower HDL Cholesterol levels and tend to be concentrated with more small, HDL particles and lower levels of HDL2b, which can be associated with reverse cholesterol transport.

Physical activity is less common in South Asians. Daily, moderate-intensity exercise is associated with a more than 50% risk reduction for coronary heart disease (CHD). It improves insulin sensitivity, HDL cholesterol, hypertension, endothelial function, diabetes and central obesity. Walking 12 miles a week can significantly reduce LDL-particle number, despite LDL-C and total cholesterol remaining unchanged.

Cultural biases and goals often hinder physical activity in the Indian community. Immigrants have skilled but sedentary jobs. Children are encouraged to seek academic excellence, leaving little time for physical activity. One immigrant-physician mentioned that participation in sports was considered a “low-class” activity in India. That same bias permeates to children. They are involved in sedentary activities such as extra tutoring and music along with the ubiquitous electronics. Sports are not encouraged for fear that they may interfere with academics. An hour after physical inactivity, lipoprotein lipase is suppressed in skeletal muscle, which can contribute to hypertriglyceridemia.

Clinicians need to be better versed in the diverse diet of the subcontinent. As Indian physicians, even we, the authors, admit we are not experts. Our South Indian diet differs from that of other regions and from mainstream Indian restaurants. Anecdotal patient reports suggest that many U.S.-

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**TABLE 1. Useful Clinical Resources for the Care of South Asian Patients**

<table>
<thead>
<tr>
<th>Resource Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary Artery Disease in Asian Indians (CADI) Research Foundation</td>
<td>A non-profit organization dedicated to reducing the ravages of heart disease around the globe, with special focus on Asian Indians. A great repository of facts and links to articles.</td>
</tr>
<tr>
<td>2010 ACCF/AHA Guideline for Assessment of Cardiovascular Risk in Asymptomatic Adults</td>
<td>The American College of Cardiology Foundation and American Heart Association Task Force Guidelines</td>
</tr>
</tbody>
</table>

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**LipidSpin**
based dietitians are not well versed in South Asian diets. We’ve generally relied on dietitians of Indian origin, but find a shortage of availability. The AAPI (American Association of Physicians of Indian Origin) has spent a considerable effort in producing “Indian Foods: AAPI’s Guide to Nutrition, Health and Diabetes, 2nd Ed.,” a worthwhile resource for those treating patients from the Subcontinent (http://aapiusa.org/resources/nutrition.aspx).

Non-Indian vegetarians outside India enjoy better health compared to meat-eaters. Decreased dyslipidemia, obesity, hypertension, diabetes, CAD and cancer result in an increased life-expectancy of 3 to 6 years. Indian vegetarians do not appreciate the same benefits. They have similar rates of dyslipidemia and CAD as non-vegetarians, likely because of a “contaminated vegetarianism”. Despite nearly half of Indians being vegetarians, low amount of fruits and vegetables are consumed. Increased fruit and vegetable servings decrease CHD risk, which has been validated in India. An Indian vegetarian diet constitutes grains, breads and legumes but vegetables often are subjected to prolonged cooking, removing much of their protective benefits. Deep-frying vegetables in high-saturated-fat palm and coconut oils is a common practice. Also, many sweets and curries contain saturated fats, trans-fats and refined sugars. Liberal amounts of butter, ghee/clarified butter, cheese, ice cream and yogurt increase LDL Cholesterol levels 3 times as much as they raise HDL Cholesterol levels.

Many physicians do not understand the risk associated with the combination of low HDL-C and elevated TG’s, often coupled with insulin resistance. We feel this information needs to be shared with physicians in a manner similar to the familial hypercholesterolemia (FH) campaign. These patients’ cardiovascular disease risk is often underappreciated; they also often don’t make it to lipidologists until it’s too late. CAD onset in Indians doesn’t occur as early as in FH patients but does occur earlier than Caucasians. A higher prevalence of disease starts at a younger age than in Caucasians and the fact that severe insulin resistance can be seen in the absence of visceral fat in lean, young South Asian patients argues for earlier screening. Metabolic Syndrome factors must be documented in each Indian patient as a standard.

“If you are a male from the Indian subcontinent, over age 30 and have a parent with coronary disease, then you should take a statin.”

Reducing adiposity should affect dyslipidemia and insulin resistance in a beneficial way, leading to decreased vascular events. We applaud AAPI for targeting childhood obesity with its “Be Fit Be Cool” national program and its recent partnership with the American Heart Association (AHA) in promoting awareness. Continued efforts are needed to increase awareness and primary prevention for this at-risk group. A higher incidence of CAD in expatriate South Asians compared to the native cohorts has been observed. Collaborative efforts between the National Lipid Association (NLA), national organizations and the community are necessary. More population-specific research studies are needed. Identification of Asian subgroups on such items as death certificates and hospital demographics can aid studies.

Randomized, controlled prospective data on this population is not available but we need to do a better job of identifying these at-risk patients earlier. The traditional Framingham Risk Score appears to be inadequate and alternate risk score calculators [QRISK score (http://www.qrisk.org) or Reynolds Risk Score (http://www.reynoldsriskscore.org)] may be superior (Shah, 2010). The Society for Heart Attack and Eradication (SHAPE) guidelines are an option; they advocate assessment of biomarkers in all intermediate risk patients, a position not yet endorsed by NLA. ACC/AHA Guideline for Assessment of Cardiovascular Risk in Asymptomatic Adults (2010) lists a few diagnostic tests as Class IIa recommendations. As an organization, we collectively need not only to educate the Indian/South Asian population but also our colleagues to recognize this group as a unique population that has early events that often are not identified using traditional risk assessment tools or diagnostic tests.

“It is health that is the real wealth and not pieces of gold and silver.”
– Mahatma Gandhi

Disclosure statement: Dr. Hosmane and Dr. Reddy have no disclosures to report.
References are listed on page 30.