Reducing the Burden of Coronary Artery Disease in India: Challenges and Opportunities

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ABSTRACT

Asian Indians—living both in India and abroad—have one of the highest rates of coronary artery disease (CAD) in the world, three times higher than the rates among Caucasians in the United States. The CAD among Indians is usually more aggressive at the time of presentation compared with whites or East Asians. The overall impact is much greater because the CAD in Asian Indians affects the "younger" working population. This kind of disproportionate epidemic among the young Indians is causing tremendous number of work days lost at a time when India is experiencing a dizzying economic boom and needs a healthy populace to sustain this boom. While the mortality and morbidity from CAD has been falling in the western world, it has been climbing to epidemic proportions among the Indian population. Various factors that are thought to contribute to this rising epidemic include urbanization of rural areas, large-scale migration of rural population to urban areas, increase in sedentary lifestyle, abdominal obesity, metabolic syndrome, diabetes, inadequate consumption of fruits and vegetables, increased use of fried, processed and fast foods, tobacco abuse, poor awareness and control of CAD risk factors, unique dyslipidemia (high triglycerides, low HDL-cholesterol levels), and possible genetic predisposition due to lipoprotein (a) [Lp(a)] excess. The effect of established, as well as novel, risk factors is multiplicative, not just additive (total effect > sum of parts). The management would require aggressive individual, societal, and governmental (policy and regulatory) interventions. Indians will require specific lower cut-offs and stricter goals for treatment of various risk factors than is currently recommended for western populations. To this end, the First Indo-US Healthcare Summit was held in New Delhi, India on December 14 and 15, 2007. The participants included representatives from several professional entities including the American Association of Physicians of Indian origin (AAPI), Indian Medical Association (IMA), Medical Council of India (MCI), and Government of India (GOI) with their main objective to address specific issues and provide precise recommendations to implement the prevention of CAD among Indians. The summary of the deliberations by the committee on "CAD among Asian Indians" and the recommendations are presented in this document.

OBJECTIVES

- Discussion of demographics of CAD in Indians—both in India and abroad, current treatment strategies, primordial, primary, and secondary prevention.
- Development of specific recommendations for screening, evaluation and management for the prevention of CAD disease epidemic among Asian Indians.
- Recommendations for improving quality of care through professional, public and private initiatives.

KEYWORDS

Coronary artery disease, guidelines, Health Summit, primary prevention

INTRODUCTION

Asian Indians around the globe have the highest rates of premature coronary artery disease (CAD), with clinical manifestations occurring about 10 years earlier than in other populations.[1,2] Numerous studies over the past 50 years, involving several generations, have consistently shown that the incidence and mortality rates for CAD are 50−300% higher among overseas Indians compared with compatriots

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of other ethnicities in several countries.[3] The risk factor adjusted CAD rates are two times higher among overseas Indians than whites.[2] Asian Indians develop clinical manifestations such as myocardial infarction (MI) at a young age and often follows a malignant course. Approximately 50% of the first MI among Indian men occurs before the age of 55 years and 25% occurs before 40 years of age.[2] Among Asian Indians younger than 30 years of age, the CAD mortality has been described to be 3-fold higher than whites in the United Kingdom and 10-fold higher than Chinese in Singapore.[1] The same pattern of CAD is observed among all South Asians—whether living abroad or within Indian subcontinent—which include persons of Indian, Pakistani, Bangladeshi, and Sri Lankan origin.[4] Although more than half of the Asian Indians are lifelong vegetarians, CAD rates are similar among both vegetarians and non-vegetarians. This is in sharp contrast to Western vegetarians who tend to have very low rates of CAD. The consistently higher rates of CAD among Asian Indians in several countries, compared to people of other ethnic origin, who shares the same environment, may indicate a possible genetic susceptibility.[2]

BURDEN OF CAD IN INDIA

The CAD rates are decreasing among overseas Indians, whereas, these rates are increasing in the Indian subcontinent. From 1970−2000, CAD prevalence in India has increased by 300%.[3] Currently, 10−12% of urban Indians have CAD compared to 3% of the US population. It has been predicted that cardiovascular diseases (CVD), which includes stroke and CAD, will increase rapidly in India. In the next 15 years, India is projected to have more than half of the cases of CVD in the world.[4] India had 28 million people afflicted with CAD in 2000, and this number is projected to increase to 62 million by 2015–an increase of 114% in just 15 years. Of these, 23 million will be younger than 40 years of age, and only 11 million will be older than 60 years of age (Table 1).[5] For comparison, the US, with a population of 300 million had only 44,000 people with MI <45 years of age (in 2005).[5]

Table 1. The projected burden of coronary artery disease (CAD) and death from CAD in India from 2005–2015 in millions[6]

	2005	2010	2015
Number of Asian Indians with CAD	34.8	46.9	61.8
Number of Asian Indians <50 years of age with CAD	20.7	28.4	37.3
Number of CAD deaths	1.7	2.3	2.9
Number of CAD death among <50 years of age	0.9	1.1	1.5

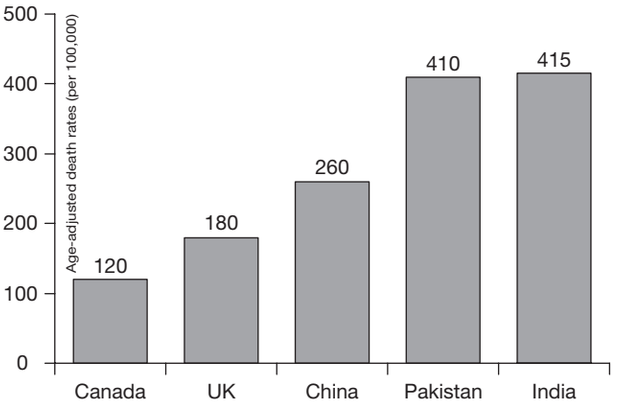

Figure 1. Age-adjusted cardiovascular disease death rates in Canada, UK, China, and Indian subcontinent in 2005. Data from WHO Report[5].

An estimated 1.3 million Indians died from CAD in 2000. The projected death from CAD by 2015 is 2.95 million, of which 14% will be <30 years, 31% will be <40 years, and 50% will be <50 years of age (Table 1).[6] For comparison, CAD deaths in the US were only 653,000 in 2002 and 451,326 in 2004.[7] Among Americans, only 7% of CAD death occur in people <50 years of age, and 17% in those <65 years old. Overall 22% of the CAD deaths in the west occurs in people <70 years of age.[7] No society pays equal value to those dying at age 50 and age 70. The high rates of malignant CAD at young age among Asian Indians may, again, suggest a genetic predisposition to CAD. At the present time, CVD accounts for >25% of all death in India.[4] The age-adjusted death rate from CVD in India is 2−3 times higher than that of Canada and UK (Figure 1).[5] In addition, the "years of life lost" due to early CVD deaths in India is projected to increase from 9.2 million in year 2000 to 17.9 million in 2030.[8] The corresponding figures for the US are 1.6 million and 2 million, respectively.[8]

The CAD rates in rural areas of India are only half that found in urban India. This 2-fold urban—rural gradient and the 3-fold increase in the prevalence of CAD over the past 30 years, among people who share the same genetic pool, suggest a powerful impact of environmental/lifestyle factors (nurture) superimposed over the possible genetic susceptibility (nature).

RISK FACTORS FOR CAD

Numerous studies indicate that tobacco use, obesity—particularly abdominal obesity, high blood pressure, dyslipidemia, diabetes, low consumption of fruits and vegetables, and sedentary lifestyles are important determinants of CAD in India.[9] The Asian Indian dyslipidemia is characterized by high serum levels of apolipoprotein-B (apo-B), triglycerides, lipoprotein(a) [Lp(a)], and non-HDL cholesterol;

Borderline elevation in LDL cholesterol; and low levels of apolipoprotein-A1 (apo-A1) and HDL cholesterol.[10] Asian Indians have high ratios of total cholesterol to HDL, triglycerides to HDL, and apo-B to apo-A1. These lipid abnormalities and ratios are highly correlated with severity and prematurity of CAD as well as acute MI at a very young age.[10] The incidence and prevalence these risk factors have increased substantially over the past 50 years and continue to climb. Control of these risk factors is essential to arrest and reverse the CAD epidemic in the Indian subcontinent.[4,11]

Asian Indians not only have low levels of protective HDL cholesterol, but they also have a preponderance of small dense dysfunctional HDL-cholesterol particles. The latter are associated with less efficient reverse cholesterol transport and less protection against CAD.[9] The level of HDL-2b, the most protective component of HDL cholesterol, is low in over 90% of Asian Indians.[12] However, physical activity has been shown to cause significant elevations in the protective, large HDL cholesterol in this population.[13] South Asians have also been reported to have "dysfunctional HDL", even when HDL levels are normal.[14]

The high intake of carbohydrates (high glycemic load) coupled with higher prevalence of insulin resistance among Asian Indians generally results in higher serum levels of triglycerides that artificially lower LDL cholesterol, giving a false sense of security.[15] The true risk of CAD in people with high triglycerides is represented by the non-HDL cholesterol levels (total cholesterol minus HDL cholesterol) which can be calculated even in non-fasting state.[10] The non-HDL cholesterol target is set at 30 mg higher than LDL cholesterol target. As a unique population, Asian Indians also have high levels of homocysteine, which is believed to be due to poor nutritional habits such as prolonged cooking of foods, and low intake of fruits, vegetables, and n-3 fatty acids.[15]

Asian Indians develop diabetes at a younger age and at a lower body mass index (BMI) and waist circumference than whites.[16] Diabetes confers a very high risk of CAD among Asian Indians, compared to little risk among blacks and other Asians.[17,18] The prevalence of diabetes varies from 3−6% in rural India and 12−17% in urban India. The prevalence of diabetes among immigrant South Asians is >20% and is generally 3−6 times higher than the whites after standardizing for age. By the year 2030, an estimated 79 million Indians will have diabetes, 80% of whom will die from CAD. Given that Indians account for one-sixth of the world's population, the rise in CAD and diabetes rates would have profound national and global implications in this day and age of global economy.

Metabolic syndrome is a cluster of CAD and diabetes risk factors including elevated waist circumference, high blood pressure, elevated triglycerides, low levels of HDL cholesterol and high fasting glucose levels.[19] Metabolic syndrome is defined by the presence of three or more of the factors, and increases a person's short-term risk of developing diabetes and CAD by 3- to 5-fold. People with metabolic syndrome have a 30−40% probability of developing diabetes and/or CAD within 20 years, depending on the number of components of metabolic syndrome present.[20] The prevalence of metabolic syndrome is as high as 35% among Asian Indians[16], a rate nearly similar to the US population. Because South Asians develop metabolic abnormalities at a lower BMI and shorter waist circumference than other groups, conventional criteria underestimate the prevalence of metabolic syndrome by 25−50%. The tendency to insulin resistance observed in South Asian adults is apparent in children, in whom it may reflect an increased sensitivity to adiposity. Interventions to prevent non-insulin dependent diabetes in South Asian adults may need to begin during the childhood years.[21]

Prospective studies have shown that the incidence of, and mortality from, CAD is 2-fold higher among Asian Indians even when adjusted for standard risk factors including diabetes.[22] Forouhi and colleges[23] prospectively examined whether the measured risk factors could explain the higher CAD mortality in Asian Indians compared with Europeans in the UK. Between 1988 and 1990, conventional CAD risk factors and those associated with insulin resistance were measured in 1,787 European men and 1,420 South Asian men aged 40−69 years. By February 2006, there were 202 CAD deaths (94 European and 108 South Asian). Despite universal access to healthcare, South Asian men had double the CAD mortality (hazard ratio [HR] 2.14 [1.56−2.94]; $p < 0.001$) of European men in Cox regression analysis adjusted for age, smoking, cholesterol, metabolic syndrome, and diabetes. The HR increased to 2.20 when adjusted for socioeconomic status (Figure 2).[23] Another prospective study in Trinidad had reported similar results.[22]

Genetically determined elevations in Lp(a) play an important role in acceleration of atherosclerotic process that leads to premature MI and stroke.[24–26] Among patients with Lp(a) excess, the CAD risk is increased by 3-fold even in the absence of any other risk factors, and by 8-fold in the presence of low HDL cholesterol levels. Furthermore, this risk rises by 12-fold in association with high LDL cholesterol levels, by 16-fold in presence of concomitant diabetes, and by 25-fold when coupled with high TC/HDL ratio.[24] Approximately 30−40% Asian Indians have Lp(a) levels >20 mg/dL, which is generally considered as the threshold for high risk for CAD. High levels of Lp(a) correlate with the prematurity, severity, extent, and progression of coronary atherosclerosis as well as the occurrence and recurrence of MI among Asian Indians.[23,25] In a study by Enas *et al*., a combination of high Lp(a) and low HDL cholesterol, which confers a very high risk of CAD, was found to be present in 42% of Asian Indians.[10] The adverse effects from elevated Lp(a) levels are magnified in Asian Indians because of the

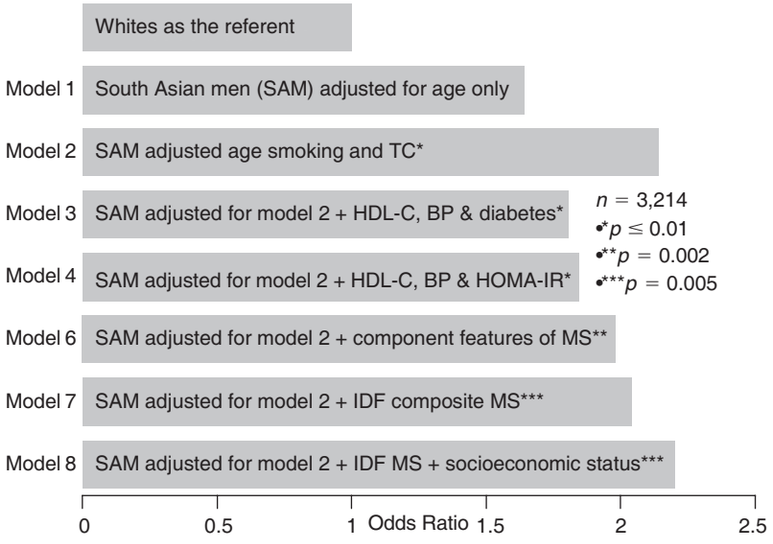

Figure 2. Odds ratio for CAD death in White and South Asian men in UK. Data from Enas *et al.*[10] (Reproduced with permission). BP: blood pressure, IDF: International Diabetic Federation, IR: insulin resistance, MS, metabolic syndrome.

presence of concomitant abnormalities of lipoproteins, as noted above, as well as the high prevalence of metabolic syndrome and diabetes.[27]

Many Asian Indians are in double jeopardy from nature and nurture—nature, among other things, being the genetically determined Lp(a) excess, and nurture, being an ever-increasing unhealthy lifestyle associated with rising affluence, urbanization, and mechanization.[10] The adverse effects of the modifiable risk factors related to lifestyle, such as smoking, hypertension, atherogenic diet, physical inactivity, abdominal obesity, and diabetes, are markedly magnified in those with Lp(a) excess.[28] This synergy between nature and nurture best explains the high rate of CAD among Asian Indians, who often have otherwise lower prevalence of traditional risk factors.[2,27] The potential explanations for the ongoing epidemic of CAD in India include[1]:

1. Urbanization of rural areas
2. Large-scale migration of rural population to urban areas
3. Dyslipidemia, particularly high non-HDL cholesterol, and apo B/apo A ratio and total cholesterol to HDL ratio
4. Low HDL cholesterol and small dense dysfunctional HDL
5. Increase in sedentary lifestyle
6. Increase in obesity, particularly abdominal obesity
7. Increase in metabolic syndrome and diabetes
8. Inadequate consumption of fruits and vegetables
9. Increased use atherogenic diet including fried foods, processed foods, fast foods, that are high in calories, saturated fat, and trans fat
10. Increased consumption of foods high in glycemic index (high glycemic load)
11. Tobacco abuse
12. Poor awareness and control of CVD risk factors such high blood pressure, dyslipidemia, and diabetes
13. Genetic predisposition due to Lp(a) excess

PREVENTION OF CAD

Since 1970, CAD death rates have decreased by 50–65% in US and several other countries, while the morbidity and mortality from CAD are exhibiting a meteoric rise in India.[7,29] Prevention of CAD can play a dynamic and important role in combating the leading cause of disability and death in India today.[30] In fact, CAD has now become the most predictable, most treatable, and the most preventable of all chronic diseases.[31] Type 2 diabetes and CAD seem to share risk factors, including obesity and dyslipidemia, and might even share etiology, which has important implications for screening and prevention strategies for both diseases. Recent data show that most CAD and diabetes are related to the presence of non-optimal levels of BMI, BP, and cholesterol. Several studies indicate that the risk for type 2 diabetes and CAD is detectable early, in the childhood years, although these disorders may not clinically manifest until adulthood. Prevention of atherosclerosis, thus, should begin early in life.

PRIMORDIAL PREVENTION

Prevention is usually classified as primordial, primary, and secondary prevention. Primordial prevention aims to prevent the development of risk factors, such as high

cholesterol, high blood pressure, obesity, and tobacco use through healthy lifestyle changes. Current treatments, including drug treatment and lifestyle modification, to control high BP and high TC level, while effective, do not lower the CAD morbidity and mortality risk to levels observed in low risk individuals. This fact underscores the crucial role of primordial prevention.

Application of primordial prevention for the total population is called population-based or public health strategy of prevention. Such strategy aims to lower the risk factors through modification of lifestyle in the entire population or the country. The proportion of high-risk cases in a population is directly dependent on the average level and distribution of risk factors in that population. For example, the mean blood pressure of the population accurately predicts the number of hypertensive individuals and the mean BMI predicts the number of overweight and obese individuals in a population.

Since the risk associated with most of the risk factors is a continuum, the strategy that enables greater number of people to make even a smaller extent of change results in large benefit to the society, as opposed to the strategy of causing large changes in only a small number of high-risk patients. Although the benefit to an individual may be small, the overall benefit to the society becomes large in the process of public health prevention. This irony in preventive medicine is termed "Prevention Paradox."[32]

POPULATION-BASED STRATEGY

The population-based strategy can create a new generation in which low risk is the rule and high risk the exception. Most importantly, this ensures that children adopt healthy eating habits, slowing the rise in their cholesterol level with age, thereby creating a new generation with lower risk factor levels. The experiences in the US and Finland have clearly demonstrated that lowering the mean population serum cholesterol level has far greater impact than treatment of all those with high levels of cholesterol.[29] In the US, UK, and many other countries, the decrease in cholesterol level was mostly due to dietary changes and not statin therapy (the latter given only to those with high or very high cholesterol levels). Identification of, and intervention on, high-risk individuals ("high-risk strategy") is helpful and cost effective, but population-based strategy is overwhelmingly more effective in reducing the disease burden in the population as a whole.

The health behavior of the entire population is a major determinant of success of the primary prevention of the individual patient. For example, it will be very difficult for a patient to engage in healthy behaviors (such as a smoker to quit smoking and stay as such) if other members of the family and the community indulge in unhealthy behaviors (such as smoking). Lifestyle interventions of proven benefit include prudent diet, regular exercise, tobacco abstinence, and maintenance of ideal body weight and waist circumference.

The population-based strategy requires promoting a healthier lifestyle in the population as a whole by encouraging people to seek alternatives to current lifestyle, and making those alternative options available.[33] Implementation of many evidence-based interventions that exist requires a sustained policy framework and strengthened institutional support. Compliance with preventive measures is achievable only if the message is given repeatedly, consistently and unambiguously, irrespective of the economic impact.[33] It rests mainly on public education, media, legislation, and government policy. This will require further concentrated effort, guided by an Indian Health Strategy, and will involve effective partnerships among government, non-governmental organizations, and the civil society. It requires greater investment and planning for the implementation of lifestyle intervention. It is very dependent on the governments' commitment and determination.[34]

Primary Prevention

Primary prevention, also called high-risk prevention, aims at identifying individuals with markedly elevated risk factors (high blood pressure, high cholesterol, or smoking) who have not yet suffered a coronary event, and targeting them for interventions. Individuals so identified to be at high risk are targeted for maximum lifestyle changes (if they are not following the recommendations made in the section on primordial prevention). Primary prevention has been consistently shown to outweigh secondary prevention. Although the number of lives saved is 3- to 4-fold greater with primary prevention than secondary prevention, the governments and healthcare personnel in most countries give more attention to the latter. India needs a balanced combination of public health and high-risk individualized strategies for the effective control of the CAD epidemic.

Secondary Prevention

Secondary prevention has the most rapid initial impact on CAD outcome and is aimed at reducing the morbidity and mortality among those diagnosed with CAD. People who have had an MI or stroke or other forms of CAD, have a 5% per year mortality for the rest of their lives, in the absence of effective treatment. This risk is 10–20 times higher as compared with those without manifest CAD or presence of multiple risk factors. For this reason, aggressive secondary prevention needs to be undertaken in these high-risk individuals. In addition to implementation of the proven therapeutic measures, a major systematic approach involving the medical and pharmaceutical establishments, as well as effective media campaigns to educate the patients and the public should be mounted to achieve reduction in the rates of recurrent MI and other cardiovascular (CV) events in patients with

known CAD or CAD-risk equivalents. Such a plan of secondary prevention, however, produces rapid but only short-term results because it reduces the rates of recurrent CV events in only those who have already experienced one. It does nothing to prevent the larger burden of first events (primary prevention), and It ignores the long-term cost-effective goal of preventing future high risk of CAD among the youth (primordial prevention). This strategy will do little to reduce the long-term burden of CAD, because, a heart attack or sudden death is the first manifestation of CAD in half of all women and two-thirds of all men. This underscores the need for greater emphasis on primary and primordial prevention.

The CAD mortality has declined by 40% between 1980 and 2000 in the US. Control of the risk factors or primary prevention contributed to 44% of this decline. Treatment including secondary prevention contributed to another 47% of the decline.[35] Currently, CAD mortality rates are decreasing by >4% per year in the US but increasing by >4% per year in India.[5] Although major conventional risk factors, including diabetes, do not fully explain the excess burden of CAD in Asian Indians, these risk factors are doubly important and remain the foundation of preventive and therapeutic strategies for CAD in the Indian population.[10] Recent studies indicate that systolic blood pressure above 115 mmHg accounts for two-thirds of strokes and almost half of CAD cases, and cholesterol concentrations exceeding 147 mg/dL(3.8 mmol/L) for 18% and 55%, respectively.[36] The optimal low-density lipoprotein is 50−70 mg/dL: lower is better and physiologically normal.[37]

THE INDO-US HEALTHCARE SUMMIT RECOMMENDATIONS

The Indo-US Healthcare Summit concluded with 2 broad sets of recommendations:

1. Specific recommendations directed at CAD, and
2. General recommendations applicable to chronic disease prevention in general.

Specific Recommendations

Modified Risk Calculation for Asian Indians (the Risk is "Doubled")

In order to determine the CAD risk more adequately among the Asian Indians, one must multiply the 10-year risk of CAD by a factor of 2, when using American risk prediction algorithm such the Framingham Risk Score or European risk prediction algorithm such as the Systematic Coronary Risk Evaluation (SCORE).[38] This recommendation is based on the results of prospective studies that have shown ≥2 fold risk of dying from CAD from any combination of traditional risk factors, diabetes, and metabolic syndrome among Indians compared with whites[23] It is also in agreement with those of several international agencies including World Health Organization (WHO), International Diabetic Federation, British Heart Foundation, South Asian Heart Foundation, European Society of Cardiology (ESC), American Heart Association (AHA), American Association of Physicians of Indian origin (AAPI), and Australian and New Zealand Guideline committees.[39,40] These agencies have proposed modifications of the CAD risk estimation to compensate for the underestimation of risk among Asian Indians.[41−48]

Stricter Treatment Goals and Modified Thresholds for Intervention

In general, to reduce the "disproportionately high" risk of CAD in Asian Indians, the treatment has to be more aggressive and should begin at a lower threshold than is recommended for western populations.[49] One must, therefore, lower the threshold of intervention and treatment goals by 10% for risk factors in general, 20% for total cholesterol, and 30 mg/dL for LDL levels.[50] The specific cut-points for selected risk factors specific to the Indian population are shown in Table 2.

Screening for Risk Factors

Universal Screening

Universal screening of all Indians by age 18 across the board or at the earliest opportunity thereafter is strongly for thee purpose of early detection of high-risk individuals. The screening should document the following:

- Name, age, gender, and general health history
- Family history of premature CAD, CVD, or diabetes

Table 2. Recommended thresholds of intervention and treatment goals for Indians

Parameters	Desirable levels for Asian Indians
Waist circumference	<80 cm for women; <90 cm for men
Body mass index	<23 men and women
Blood pressure	<130/85 mmHg <120/80 mmHg for those with diabetes and heart failure
Total cholesterol (TC) (mg/dL)	<160 mg/dL (high-risk Indians)
LDL cholesterol (mg/dL)	<100 mg/dL (high-risk Indians)* <70 for people with CAD or diabetes**
Non-HDL cholesterol	<130 mg/dL (high-risk Indians)* <100 for people with CAD or diabetes**
Triglycerides	<150 mg/dL
HDL	>40 mg/dL (men); >50 mg/dL (women)
Hemoglobin A_{1c}	<6.5%
Lipoprotein(a)	<20 mg/dL

*,**See discussion below for high-risk Indians and very high-risk Indians.

- History of tobacco use (cigarettes, beedies, and smokeless tobacco)
- Dietary history with focus on intakes of saturated fat, trans-fat, salt, fruits, and vegetables
- Personal history of CAD or CVD
- Blood pressure
- Body weight and height, BMI, and waist circumference
- Blood sugar and diabetes status and the Indian diabetic score[51]
- Fasting lipid profile (total cholesterol, triglyceride, HDL, calculated non-HDL cholesterol, and LDL cholesterol levels)
- Evaluation for metabolic syndrome using SAM-NCEP criteria[16]
- Extent of physical activity (sedentary, physically active, athletics, etc.)

Specific Cut-points (Thresholds) for Asian Indians

Individuals found to have abnormal level of risk factors should receive lifestyle modification. Those with markedly abnormal levels need to be referred to a physician for further evaluation and management.

The following are the recommended cut-points (thresholds) for various risk factors for the Asian Indians:

- Age
  - >25 in males or
  - >35 in female Asian Indians
- Family history of premature CVD or diabetes
- Tobacco use including beedi and smokeless tobacco
- HDL Levels
  - <40 mg/dl in male and
  - <50 in female
- Total cholesterol levels
  - >160 mg/dl or
  - non-HDL-C > 130 mg/dl or
  - LDL-C > 100 mg/dl
- Hypertension >130/85 mmHg
- Elevated BMI (>23) or
- waist circumference
  - >80 cm for women and
  - >90 cm for men
- Triglycerides >150 mg/dl
- Sedentary lifestyle (<150 minutes of physical activity/week)

Early identification of Asian Indians at High Risk for CAD

Those who have ≥2 risk factors or metabolic syndrome are considered high-risk individuals. Since elevated levels of Lp(a) and homocysteine are particularly common among Asian Indians with premature CAD, high levels of these emerging risk factors can also be counted in determining the high risk status.[16] It is important to recognize that the conventional National Cholesterol Education Program (NCEP) criteria may under-estimate the prevalence of metabolic syndrome by up to 50%. The South Asian Modified NCEP criteria for metabolic syndrome substitutes the waist circumference cut-points shown above (>90 cm for men and >80 cm for women) in the NCEP criteria and is more appropriate for Asian Indians.[16] Persons who have evidence of significant subclinical atherosclerosis as evidenced by carotid atherosclerosis, or significant coronary artery calcification score (>300) are also categorized as high risk. High-risk individuals require more aggressive treatment to achieve the lower treatment target for dyslipidemia and hypertension described above.

Those who have diabetes, CAD, or CVD are considered very high risk. A schema for categorization of Indians into high risk, at risk and optimal risk is drawn up patterned after American College of Cardiology/American Heart Association (ACC/AHA) guidelines for CAD prevention in women.[52] The table is modified for Indian population and is presented below (Table 3).[52]

Promotion of Primary Prevention in High-Risk Persons

Aggressive primary prevention is critical to preventing the development of CVD in those who are in high-risk category with the following four key objectives:

- Control of dyslipidemia (see goals above)
- Control of blood pressure (see goals above)

Table 3. Classification of risk level in Asian Indians

Risk status	Criteria
High risk	• Established coronary heart disease • Cerebrovascular disease • Peripheral arterial disease • Abdominal aortic aneurysm • End-stage or chronic renal disease • Diabetes mellitus • Metabolic syndrome • 10-year Framingham global risk ≥10%
At risk	• One major risk factors for CVD, including: ◦ Cigarette smoking ◦ Poor diet ◦ Physical inactivity ◦ Obesity, especially central adiposity ◦ Family history of premature CVD (<55 years of age in male relative and <65 years of age in female relative) ◦ Hypertension ◦ Dyslipidemia • Evidence of subclinical vascular disease (e.g. coronary calcification) • Poor exercise capacity on treadmill test and/or • Abnormal heart rate recovery after stopping exercise
Optimal risk	• A healthy lifestyle, with no risk factors (Framingham global risk <5%)

- Control of blood sugar, diabetes, and metabolic syndrome through intense lifestyle modification and medications if necessary
- Complete smoking cessation (cigarette smoking, beedies, and chewing tobacco)

Overall, there are three main categories of preventive interventions (Table 4). They can be categorized into lifestyle interventions, major risk factor interventions, and preventive drug interventions.

Pharmacologic preventive interventions include aspirin, statins, and angiotensin-converting enzyme inhibitors/or angiotensin receptor blockers. Statin medications are safe and highly effective with a 25−60% reduction in LDL and non-HDL cholesterol achievable at maximum doses (atorvastatin 80 mg or rosuvastatin 40 mg/day). Non-HDL cholesterol reflects cholesterol concentration in all the atherogenic lipoprotein particles and is a better predictor of CAD than LDL cholesterol, especially when the triglycerides levels are also elevated.[53,54] Many statins have been approved for use in children as young as 10 years of age.[55,56] Lowering of LDL cholesterol with statins reduces the risk of CAD by 30−35%. It is often not appreciated that the residual risk after LDL lowering therapy is as high as 65−70%, possibly due to the concomitant presence of low HDL cholesterol and other lipid and non-lipid abnormalities.[10] Statin–niacin combination therapy has been shown to reduce the risk of CAD by 60−90%, and may be particularly beneficial among Asian Indians who have multiple lipid abnormalities.[10]

Table 4. Categories of preventive interventions as cornerstone of risk reduction

Type of Intervention	Examples
Lifestyle interventions	• Cigarette smoking, beedies, chewing tobacco • Physical activity • Cardiac rehabilitation • Dietary changes • Weight maintenance/reduction • Use of omega-3 fatty acids • Care of depression
Major risk factor interventions	• Hypertension • Dyslipidemia ◦ LDL-C and non-HDL-C lowering ◦ Raising HDL-C ◦ Triglycerides lowering ◦ Lipoprotein(a) lowering • Diabetes mellitus
Preventive drug interventions	• Aspirin • β-blockers • Statins • Angiotensin converting enzyme inhibitors/or • Angiotensin receptor blockers • Aldosterone blockade • ? Folic acid for hyperhomocysteinemia • Hormone replacement therapy (no role) • Antioxidant supplements (no role)

Aggressive Implementation of Secondary Prevention

Secondary prevention measures need to be aggressively implemented with optimal use of cardiac rehabilitation and medications such as aspirin, ACE inhibitors, β-blockers, and statins, as recommended by ACC/AHA. A modified table unique to Asian Indians is presented in Table 5.

Recent data indicate that treatment with warfarin was associated with a 2-fold greater risk for intracranial hemorrhage among whites, a 4- to 5-fold risk for blacks and Hispanics and a15-fold risk for South Asians. After adjusting for the established stroke risk factors and warfarin use, South Asians remained 4 times more likely to have intracranial hemorrhage, whereas blacks and Hispanics were about twice as likely.[57] This excess risk of intracranial hemorrhage needs to be factored, when using anticoagulants in Asian Indians. Treatment with β carotene, vitamin A, and vitamin E supplements may increase mortality rather than reducing it, according to a recent comprehensive meta-analysis of all studies.[58] However, fruits and vegetables and other healthy foods containing these ingredients are highly beneficial.

General Recommendations

These recommendations are applicable to all Asian Indians regardless of the presence or absence of CAD and various risk factors. This is particularly true for diabetes, a chronic disease, inextricably intertwined with CAD and shares common risk factors.

Promotion of Primordial, Primary, and Secondary Prevention by the Government, Medical Community, Public, Industry, and the Media

Primordial prevention is aimed at preventing the development of risk factors with the following four key objectives:

- Avoidance of smoking and other tobacco products
- Avoidance of obesity
- Daily regular exercise
- Prudent diet

Adherence to the primordial prevention will help avoid the need for primary prevention which is directed at controlling existing risk factors such as obesity, tobacco use, hypertension, diabetes, and dyslipidemia (any lipid abnormality).

Stop Tobacco use (Including Beedies and Chewing Tobacco)

- Widespread enforcement of existing anti-smoking laws.
- Increase tax for tobacco products to discourage consumption.

Table 5. Thresholds and goals for secondary prevention for patients with coronary and other vascular disease for Asian Indians (modified from AHA/ACC recommendations)[59]

	Lifestyle interventions
1. Smoking (Cigarette, bidis, chewing tobacco, passive smoke) **Goal:** • Complete cessation. • No exposure to second hand smoke	Ask about tobacco use status at every visit. • Advise every tobacco user to quit. • Assess the tobacco user's willingness to quit. • Assist by counseling and developing a plan for quitting. • Arrange follow-up, referral to special programs, or pharmacotherapy (including nicotine replacement and bupropion). • Urge avoidance of exposure to environmental tobacco smoke at work and home.
2. Physical activity **Goal:** • 30–45 minutes, 7 days per week (minimum 5 days/ week) for prevention of weight gain; • 60 minutes or more daily for weight reduction	For all patients, assess risk with a physical activity history and/or an exercise test, to guide prescription. For all patients, encourage 30–60 minutes of moderate-intensity aerobic activity, such as brisk walking, on most, preferably all, days of the week, supplemented by an increase in daily lifestyle activities (e.g, walking breaks at work, gardening, household work). Encourage resistance training 2 days/week. • Advise medically supervised programs for high-risk patients (eg, recent acute coronary syndrome or revascularization, heart failure).
3. Weight management **Goal:** • Body mass index: 18.0–23.0 kg/m^2 • Waist circumference: men ≤90 cm, women ≤80 cm	Assess body mass index and/or waist circumference on each visit and consistently encourage weight maintenance/reduction through an appropriate balance of physical activity, caloric intake, and formal behavioral programs, when indicated, to maintain/achieve a body mass index between 18.0 and 23.0 kg/m^2. If waist circumference (measured horizontally at the iliac crest) is ≤80 cm in women and ≤90 cm in men, initiate lifestyle changes and consider treatment strategies for metabolic syndrome as indicated. • The initial goal of weight loss therapy should be to reduce body weight by approximately 10% from baseline. With success, further weight loss can be attempted if indicated through further assessment.
	Risk factor interventions
4. Hypertension **Goal:** • ≤130/85 mmHg, or • ≤120/80 mmHg if patient has diabetes or chronic kidney disease	**For all patients:** • Initiate or maintain lifestyle modification—weight control; increased physical activity; alcohol moderation; sodium reduction; and emphasis on increased consumption of fresh fruits, vegetables, and low-fat dairy products. **For patients with blood pressure >130/85 mmHg (or >120/80 mmHg for individuals with chronic kidney disease or diabetes):** • As tolerated, add blood pressure medication, treating initially with β-blockers and/or ACE inhibitors, with addition of other drugs such as thiazides as needed to achieve goal blood pressure.
5. Diabetes **Goal:** • HbA_{1c} ≤6.5% • Fasting blood sugar ≤100 mg/dl	Initiate lifestyle and pharmacotherapy to achieve near-normal HbA_{1c}. • Begin vigorous modification of other risk factors (e.g. physical activity, weight management, blood pressure control, and cholesterol management as recommended above). • Coordinate diabetic care with patient's primary care physician or endocrinologist
6. Dyslipidemia **Goal:** • LDL-C ≤100 mg/dl • If triglycerides are ≥200 mg/dl, non-HDL-C should be ≤130 mg/dl	**For all patients:** • Start dietary therapy. Reduce intake of saturated fats (to ≤7% of total calories), *trans*-fatty acids, and cholesterol (to ≤200 mg/day). • Add plant stanols/sterols (2 g/day) and viscous fiber (≥10 g/day) to further lower LDL. • Promote daily physical activity and weight management. • Encourage increased consumption of omega-3 fatty acids in the form of fish or in capsule form (1 g/day) for risk reduction. For treatment of elevated triglycerides, higher doses are usually necessary for risk reduction.

(*Continued*)

Table 5. (**Continued**)

	For lipid management: Assess fasting lipid profile in all patients, and within 24 hours of hospitalization for those with an acute cardiovascular or coronary event. For hospitalized patients, initiate lipid-lowering medication as recommended below before discharge: • LDL-C should be ≤100 mg/dl • Further reduction of LDL-C to ≤70 mg/dl is reasonable. • If baseline LDL-C is ≥100 mg/dl, initiate LDL-lowering drug therapy. • If on-treatment LDL-C is ≥100 mg/dl, intensify LDL-lowering drug therapy (may require LDL-lowering drug combination). • If baseline LDL-C is 70–100 mg/dl, it is reasonable to lower LDL to ≤70 mg/dl. • If triglycerides are 200–499 mg/dl, non-HDL-C should be lowered to ≤130 mg/dl. • Further reduction of non–HDL-C to ≤100 mg/dl is reasonable. • Therapeutic options to reduce non–HDL-C are: More intense LDL-C–lowering therapy, and addition of niacin, or fibrates. • If triglycerides are ≥500 mg/dl, therapeutic options to prevent pancreatitis are fibrate or niacin before LDL-lowering therapy; and treat LDL-C to goal after triglyceride-lowering therapy. Achieve non-HDL-C ≤ 130 mg/dl if possible.
	Preventive-drug interventions
7. Antiplatelet agents and anticoagulants	Start aspirin 75–162 mg/day and continue indefinitely in all patients unless contraindicated. For patients undergoing coronary artery bypass grafting, aspirin should be started within 48 hours after surgery to reduce saphenous vein graft closure. Dosing regimens ranging from 100–325 mg/day appear to be efficacious. Doses higher than 162 mg/day can be continued for up to 1 year. • Start and continue clopidogrel 75 mg/day in combination with aspirin for up to 12 months in patients after acute coronary syndrome or percutaneous coronary intervention (PCI) with stent placement (≥1 month for bare metal stent, ≥12 months for drug-eluting stent). Patients who have undergone PCI with stent placement should initially receive higher-dose aspirin at 325 mg/day for 1 month for bare metal stent, and 6 months for drug-eluting stent. • Manage warfarin to international normalized ratio ≥2.0–3.0 for paroxysmal or chronic atrial fibrillation or flutter, and in post-myocardial infarction patients when clinically indicated (e.g., atrial fibrillation, left ventricular thrombus). • Use of warfarin in conjunction with aspirin and/or clopidogrel is associated with increased risk of bleeding and should be monitored closely.
8. Renin-angiotensin-aldosterone system blockers	**ACE inhibitors:** • Start and continue indefinitely in all patients with left ventricular ejection fraction ≤40% and in those with hypertension, diabetes, or chronic kidney disease, unless contraindicated. • Consider for all other patients. • Among lower-risk patients with normal left ventricular ejection fraction in whom cardiovascular risk factors are well controlled and revascularization has been performed, use of ACE inhibitors may be considered optional. **Angiotensin receptor blockers (ARB):** • Use in patients who are intolerant of ACE inhibitors and have heart failure or have had a myocardial infarction with left ventricular ejection fraction ≤40%. • Consider in other patients who are ACE inhibitor intolerant. • Consider use in combination with ACE inhibitors in severe heart failure. **Aldosterone blockade:** • Use in post-myocardial infarction patients, without significant renal dysfunction or hyperkalemia, who are already receiving therapeutic doses of an ACE inhibitor and or ARB, have a left ventricular ejection fraction ≤40%, and have either diabetes or heart failure.
9. β-blockers	• Start and continue indefinitely in all patients who have had myocardial infarction, acute coronary syndrome, or left ventricular dysfunction with or without heart failure symptoms, unless contraindicated. • Consider chronic therapy for all other patients with coronary or other vascular disease or diabetes unless contraindicated.

- Ban smoking at public and work places and penalize those who break the laws.
- Widespread promotion of anti-tobacco campaign.

Promotion of Regular Physical Activity/Exercise

- The recommended physical activity is 30–45 minutes of moderate-intensity activity such as brisk-walking every day. Those who are overweight or obese, require over 60–120 minutes or more of physical activity.
- Physical education should be given greater emphasis in schools and colleges.
- Exercise facilities and time for exercise should be made available at workplace to encourage physical activity.
- Encourage construction and use of foot-paths and bike-paths in urban areas.
- Yoga can be part of the physical activity especially in those who have high level of stress.

Appropriate Weight Management

- Caloric intake should balance the caloric expenditure to achieve and maintain healthy weight and waist size.
- Disseminate the Asian (Indian) specific BMI cut-point for overweight (BMI >23) and obesity (BMI <25) to both the public and medical community.
- Widely disseminate the gender specific Asian (Indian) waist circumference cut-point (>90 cm for men and >80 cm for women).
- All Asian Indians should be encouraged to achieve and maintain the optimum BMI and waist size.

Adoption of a Healthy Diet

- Reduce the intake of fried foods, refined foods, soft drinks containing calories, and other unhealthy foods; and increase the use of healthy foods.
- Increase the intake of fruits and vegetables (at least 500 g/day), legumes, and whole grain foods (Prudent diet or DASH diet).
- Limit the daily intake of total fat to 25–35% of calories and saturated fat <7% of the calories, by limiting, the use of butter, ghee, full-fat dairy products, and tropical oils (palm oil and coconut oil).
- Increase intake of mono-unsaturated fats up to 20%.
- Reduce intake of trans-fats to the minimum.
- Avoid fried food and other sources of trans-fats.
- Reduced glycemic load by cutting down on the carbohydrates, especially refined carbohydrates. This is particularly important for those with high triglyceride level, metabolic syndrome, prediabetes and diabetes.
- Reduce the intake of salt to <2,300 mg sodium (one teaspoon of salt) per day.
- Moderation in the use of nuts and lean meat.
- Encourage modification of "school lunches" to a healthier type.
- Avoid alcohol by those with family history of alcoholism, or personal history of inability to control the intake, high triglycerides, or high blood pressure.
- Those who drink alcohol should limit the amount to no more than one drink/day for women and two drinks a day for men. One alcoholic drink equals 45 ml of any alcoholic spirit (80% proof) or 12 oz of beer.
- Do not initiate alcohol for primary or secondary prevention of heart disease, since the risk from alcoholism and accidents may outweigh the benefits in most segments of the society.

Development of Governmental Policy to Reduce CAD and Risk Factors

- Develop government policies and programs to arrest and reverse the epidemic of CAD and diabetes with the focus on primordial and primary prevention.
- Promote anti-smoking education to public through organized programs and media and enforce current legislation that is already on the books.
- Mandate food labeling including portion size, calories, total fat, saturated fat, trans-fat, protein, carbohydrates, sodium, sugar, and fiber.
- Develop a food pyramid specific for Indians, using commonly used Indian foods and vegetables.
- Promote healthy nutrition and consider subsidies for producing and distributing healthy foods.
- Promote and facilitate physical activity in all walks of life—schools, work places, and other community settings.
- Make medications available and affordable (by providing subsidies or distribution through various institutions).
- Promote medication coverage under insurance plans to ensure greater adherence to prescribed medications.
- Create culturally sensitive health education materials and translate them into local languages.
- Implement changes in urban design to promote physical activity.

Inclusion of Industry and Private Organizations as Stakeholders

- Include medication coverage under health benefits.
- Promote physical activity at work places.
- Ban smoking at work places.
- Make healthy foods available at work sites.
- Reduce salt content in the processed food.
- Increase opportunities and incentives for physical activity in community and work settings.

Development of Health-Related School Programs

- Include health education with focus on primordial prevention in the school curricula.

- Promote physical activity and other measures outlined in primordial prevention.
- Foster healthy lifestyles and behaviors in schools.
- Improve education in prevention and nutrition in schools.
- Promote daily physical activity, healthy nutrition, and smoke-free campuses.
- Increase opportunities for physical activity in community, school, and work settings (e.g., the provision of incentives to employers who offer appropriate recreational facilities or physical activity opportunities).

Emphasis on Preventive Health Education for Healthcare Providers

- Provide education to public and healthcare professionals to remove myths about various diseases including CAD and diabetes.
- Develop a mechanism for continued medical education (CME) programs for cardiologists, physicians, and general practitioners about advances in CV and other forms of therapy.
- Promote health education to general public including the prevention of CAD through media, health camps, public lectures, newsletters, and journals, etc.
- Educate Indians about the risk of obesity, particularly abdominal obesity and benefits of weight reduction.
- Encourage clinicians to use global risk-assessment tools.
- Make the physicians aware of the guidelines as they are developed and disseminated, particularly pertaining to Asian Indians.
- Persuade the cardiologists and primary care physicians to be medical champions and community leaders in the preventive efforts.
- Establish systems to address the multi-level contexts that influence the development and maintenance of prevention-related health behaviors.
- Develop mechanisms for the systematic integration of social, health, governmental, and policy-level factors with grass-root level approaches.
- Encourage hospitals and healthcare systems to develop and provide preventive cardiology services and systems for the community.
- Create and certify preventive CAD specialists who can train the practitioners and paramedics in strategies of prevention and health promotion.

Promotion of Research in the Field of Prevention and Health Promotion

Research promotion is an important key to progress. Governmental policies should not only facilitate but promote research specific to Asian Indians. Some of the specific recommendations are as follows:

- Support intensive research to determine which strategies are most effective in promoting healthy lifestyles.
- Study the adherence to CAD prevention in various communities, healthcare organizations, and by providers, and patients in a variety of clinical care settings.
- Promote studies that translate efficacy-research into effectiveness-trials and community-based demonstration projects in ethnically, geographically, and economically diverse groups.
- Conduct studies to examine the biases, selection problems, unrealistic expectations, and mechanisms that result in study outcomes failing to translate into real-world outcomes (type I and type II errors).
- Facilitate research into understanding the barriers associated with adherence to guidelines at the community, healthcare provider, and patient levels.
- Conduct studies of various risk-factor interventions, including the manner in which interventions should be prioritized with regard to the psychosocial state of the patient (e.g. stage of change and motivation).
- Gain increased understanding of the extent to which, patient and provider beliefs, cultural diversities, expectations, and preferences, influence provider-patient communication.
- Place special focus on vulnerable groups, including the economically disadvantaged, the elderly, and women.
- Study the efficacy of policy and legal changes in reducing CAD risk factors (e.g., tobacco taxes and mandated school-based physical education programs).
- Increase research regarding the cost-effectiveness of CAD prevention.
- Conduct further research to resolve measurement issues. This applies not only to measurement of medication taking behavior but also to the ability to monitor and verify behavior in other areas such as smoking, diet, and physical activity.
- Develop research proposals that aim to survey the attitudes, beliefs, and behavioral changes of practicing cardiologists and those in training that are used to foster the development of plans for changes in CV training programs.
- Initiate "Preventive Cardiology Awards" to physicians to foster preventive research, training, and clinical care for the current generation.

Involvement of Media

- Provide the media with clear and unambiguous health promotion information that they can disseminate.
- Selection and involvement of "national figures" and "role models" for promotional campaigns.
- Development of "health-related" public sitcoms, and TV programs.

CONCLUSIONS

The Challenge: CAD is the leading cause of death and disability, and it is increasing in prevalence in India, regardless of gender, region, religion, or ethnicity. The risk factors that predispose to CAD have been identified. While the CAD mortality rates have decrease by 65% in the past 30 years in the US and many other countries as a result of the application of the existing knowledge to the entire population, they unfortunately have increased by 300% in India and are further projected to double in the next 10 years. The challenge for India is to contain and reverse this epidemic that is affecting the very young working population that India desperately needs at a time of current unprecedented economic boom.

The Opportunity: The modification or control of CAD risk factors can result in a significant decrease in morbidity and mortality. Effective treatments are available, and preventive interventions have been identified and their benefit well-documented in the literature. Obesity, metabolic syndrome, and diabetes are emerging as major risk factors, and are increasing in prevalence in India. These conditions are highly amenable to clinical intervention through primordial prevention (prevention of risk factors) and primary prevention (treatment of existing risk factors), and offer an enormous opportunity to address this challenge.

The Recommendations: The first Indo-US Healthcare Summit was organized to review this very issue and come up with specific recommendations. The participants addressed infinite detail the magnitude of the overall problem and the opportunities and challenges involved. The strategies thus formulated are described in detail above. Essentially, the group emphasizes institution of proper exercise and diet for all and focused on early school years as the target population for "primordial prevention" through comprehensive screening and intervention for the greatest impact on a population level. In general, it was recommended that the public health approach to CAD prevention should be central to the entire strategy CAD prevention in India. It may require public policy changes, aggressive advertising, and educational campaigns to the public. Central and state level policies should be developed to curtail or ban smoking, encourage food labeling, enforce availability of whole grain products, reduce the intake of trans-fats, and promote education and research-efforts, specific to Asian Indian population. The committee also recommended that physician encounters with patients be broadened to include non-physician personnel and community resources. A combination of community programs, medical referrals and therapy, and mass media campaign for screening and treatment, will decrease risk factor levels and CAD incidence. Industries usually support prevention when their interests are in accord with professional guidelines to change knowledge, attitudes, beliefs, and behavior. Such alignments in interests should be tactically highlighted and Industry as major stakeholder should be brought in. Sustained interventions and continued momentum would be the keys to the success of the public health initiatives and community programs thus formulated.

Barriers to implementation of preventive cardiology are many and include economic constraints, lack of interest by the patient, and lack of skill and/or motivation of the provider. These need to be tackled as well. The participants also addressed the issues related to adherence and behavioral changes to achieve a long-term solution. And, finally, the committee discussed the creation of preventive CAD specialists who can train the other non-cardiology trained practitioners and paramedics in strategies of prevention and health promotion. Prevention is usually not taught in most medical schools in India and fewer specialty training programs teach formal preventive cardiology. A solution is to build prevention-related objectives into global medical curriculum with associated faculty development activity. CV specialists in India must rise to the occasion and address primary as well as primordial prevention and aggressive risk factor control for all Indians. Use of evidence-based prompts and alerts can help guide adherence. A CAD specialist can become a "champion" for prevention and strive to invigorate the generalists and other healthcare providers to achieve this goal.

In summary, in order to reverse the tide of the rising CAD epidemic in Asian Indians, the time has now come for us to develop and implement the population-specific aggressive preventive strategies in India as outlined in this document. To be effective, this should be enforced at all levels—individual, societal, governmental, and the specialty or association levels. While the challenges are paramount, the opportunities are abundant. It will be of paramount importance to aim for the stricter goals and specific thresholds for various risk factors for the Asian Indians as outlined in this document for primordial, primary, and secondary prevention.

Our mantra must be to prevent the development of risk factors in the first place (primordial prevention), to control the risk factors that have already developed early and aggressively (primary prevention), and to detect and treat CAD early with proven medications and lifestyle changes (secondary prevention).[60] We should continue to strive to improve the quality of care to match the new professional standards through continuing education and research. Furthermore, we should rapidly develop and institute public policies, involve private sector, consistently follow through, and above all, measure the success as we go forward. The time is here and now for all the stakeholders to implement the recommendations outlined in this Indo-US Healthcare Summit Report without wasting a moment in order to restrain and reverse the escalating epidemic of CAD in Indians that India can ill afford at a time of mind boggling economic boom.[61]

POST Script

Recently, the "Justification for the Use *of Statins in* Primary *Prevention: an* Intervention *Trial Evaluating Rosuvastatin" (JUPITER trial) that was evaluating the safety, efficacy and outcome of lowering LDL-C by 50% in 17,802 persons with LDL-C < 130 mg/dL (mean 108 mg/dL) with 20 mg rosuvastain/day was terminated by the Data and Safety Monitoring Board due to overwhelming efficacy.*[62] *This study was designed to prove the safety, efficacy and beneficial outcome of long-term lowering LDL-C to <50 mg/dL, in primary prevention, among patients who do not currently qualify for lipid-lowering therapy. Approximately half of these subjects were expected to have LDL lowered to this level. The results of this study further support the recommendations of this report for aggressive treatment of dyslipidemia to reduce the risk of CAD.*

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