

Death by Carbs: Added Sugars and Refined Carbohydrates Cause Diabetes and Cardiovascular Disease in Asian Indians

by Bhaskar Bhardwaj, MD, Evan L. O'Keefe, MS & James H. O'Keefe, MD

Programs to encourage reduction in consumption of sugar and all refined carbohydrates are urgently needed for the primary and secondary prevention of diabetes, stroke, and cardiovascular disease in this high-risk population.



Bhaskar Bhardwaj, MD, practices Family Medicine at the University of Missouri-Kansas City School of Medicine. Evan L. O'Keefe, MS, is at the University of Queensland, Oschner Medical School. James H. O'Keefe, MD, (above) MSMA member since 2003 and *Missouri Medicine* Editorial Board member for Preventive Medicine, is at the University of Missouri-Kansas City School of Medicine and at Saint Luke's Mid America Heart Institute, Kansas City, Missouri. Contact: jokeefe@saint-lukes.org

Abstract

By the year 2030, India will supplant China as the world's most populous nation. Rapid urbanization and an increasingly Westernized diet and lifestyle, in a population with genetic predisposition to insulin resistance is fueling a rising epidemic of non-communicable diseases in India. A diet that is high in processed foods, added sugars and other refined carbohydrates is a principle factor driving the growing epidemics of type 2 diabetes (T2D), hypertension (HTN), and cardiovascular (CV) disease (CVD). Immediate postprandial spikes in the blood levels of glucose and triglycerides cause immediate parallel rises in oxidative stress, inflammation, and endothelial dysfunction; eventually leading to T2D, and CVD. Furthermore the Asian Indian population is particularly susceptible to exaggerated rises in postprandial glucose and triglycerides because they are genetically predisposed to metabolic syndrome (MetSyn), insulin resistance, and T2D. A diet restricting the consumption of refined carbohydrates and limiting added sugars to not more than 5 grams/day should

be adopted by Asian Indians to reduce risk of T2D, HTN, coronary disease, and stroke.

Introduction

Over the span of a few decades the lifestyles of modern humans have changed drastically from physically demanding lives and agrarian diets to physically inactive routines and chronic over-consumption of calorie-dense beverages and processed foods. In particular, the high intake of refined carbohydrates and foods manufactured with added sugars has driven the growing epidemics of type 2 diabetes mellitus (T2D), hypertension (HTN), stroke, and coronary artery disease (CAD).¹

India is projected to overtake China as the world's most populous nation by 2030^{2,3} and India's influence worldwide continues to grow, especially in the United States (U.S.). Over the past half-century, the number of immigrants to U.S. who were born in India has risen 150-fold.³ Now, with about three million Asian Indian immigrants living in the U.S., India is tied with China as the second biggest immigrant group in America by country of origin; only Mexico sends more immigrants to the U.S..³

In the midst of rapid urbanization and modernization,^{4,5} India is in the throes of an escalating epidemic of non-communicable diseases (NCDs),

with the prevalence of CAD, T2D, and stroke rising by at least 100% over the past two decades.⁶⁻⁸ Cardiovascular (CV) disease (CVD) now accounts for about one out of every four deaths on the South Asian subcontinent (defined as the peninsula south of the Himalaya Mountains, which currently includes the following countries: India, Pakistan, Bangladesh, Nepal and Bhutan). Today about half of the total Indian population is ≤ 24 years of age.⁹ India is projected to account for more than 20% of the CAD deaths worldwide by 2025.^{5,7,10} A 15-year-long study comparing various racial groups in Canada reported that Asian Indians had the highest age-adjusted death rate due to CAD compared to other ethnicities including Chinese and European.¹¹ Importantly, the recent atherosclerotic CV risk assessment guidelines acknowledge that the standard risk factors underestimate risk among the Asian Indian population, perhaps due to an inherent predisposition to T2D and CAD.¹²⁻¹⁴

South Asians appear to have a genetic susceptibility to metabolic syndrome (MetSyn) and T2D even with modest increases in intra-abdominal fat. Furthermore, their traditional diet, which is very high in sugar and other refined carbohydrates, may be fueling the burgeoning epidemics of diabetes and heart disease.

Adverse Economic Impact of Epidemic Non-Communicable Diseases

Non-Communicable Diseases (NCDs) adversely not just a person's health, but also their productivity and economic well-being.⁸ Because CV disease tends to present at a younger age in Asian Indians compared to other ethnicities, a larger percentage of fatalities occur during working-age years.^{7,15} In Western nations mortality from CV disease occurs predominantly in older individuals, with only 23% of CV deaths occurring in people under age 70.^{7,8,16} In contrast, in the Asian Indian populace, over half of all CV deaths occur in people younger than 70 years of age.¹⁷ This high rate of early CV mortality causes massive losses in productivity.¹⁶ Developing countries, as compared to the wealthier nations, already have seven times as many residents who have been disabled from stroke.⁵ Unless effective preventive measures are deployed, disability and death related to CV diseases alone will cost India \$2.2 trillion by the year 2030.⁸

Genetic Predisposition to Metabolic Syndrome and Diabetes

Today 67 million people in India have T2D; twice that number will have the disease the year 2030.^{8,18} In part this is due to the large-scale migration from the rural villages into the urban centers of India. Waist circumference, a fundamental risk factor for T2D and CAD, is rapidly

enlarging among the urban South Asians. Consequently, the prevalence of T2D has risen ten-fold over the past four decades in urban India.¹⁹ People who have T2D typically die about 10 years earlier than individuals who do not have diabetes; and about two-thirds of deaths among diabetics are due to CV causes.^{5,6,8,19,20} Added sugars, usually in the forms of sucrose—also known as table sugar, along with high fructose corn syrup (HFCS), are integrally involved in the genesis of T2D, which is especially relevant for individuals genetically predisposed to MetSyn and diabetes.²¹ In fact, recent studies show that high intake of added sugars and other refined carbohydrates can cause T2D even in the absence of other risk factors.²² The emerging body of scientific evidence suggests that excessive intake of processed foods rich in added sugars and other refined carbohydrates is a chief dietary factor driving the rising epidemics of diabetes and CAD, as well as the NCD-related morbidity and premature mortality seen among Asian Indians.

Already today India leads the world in number of residents with pre-diabetic conditions including impaired glucose tolerance and impaired fasting glucose; furthermore about one out of every three adults in India has MetSyn.¹⁵ The South Asian population is particularly vulnerable to the adverse metabolic effects of excess body fat, especially when it is inside the abdominal cavity, which may be increased from consumption of excess caloric loads including added fructose.^{6,23-25} Even so, obesity as defined as a body mass index (BMI) > 30 kg/m² is rare among Asian Indians; in contrast approximately one-third of adults in the U.S. is obese by this definition.⁸ In fact, today among the major countries, India has the lowest rate of obesity in the world.²⁶ Despite their low rates of obesity, the prevalence of T2D and CAD are rising rapidly among Asian Indians.^{22,24} Compared to people with European ancestry, individuals with South Asian ethnicity commonly develop pre-diabetes or frank T2D with even modest increases in weight.²⁷ Healthy waist measurements for most adult populations are < 88 cm for women, and < 102 cm for men.²⁷ Conversely, recent guidelines for optimal health specify that for people of Asian Indian ethnicity the adult waist measurements should be < 85 cm for women and < 90 cm for men.²⁷

Fatty Liver Disease among Asian Indians

Individuals with South Asian ethnicity appear to have a genetic predisposition to non-alcoholic fatty liver disease (NAFLD), also called hepatic steatosis,¹⁵ which has been described as the hepatic manifestation of the MetSyn.²⁸ NAFLD is one of the most pernicious risk factors for CAD,^{28,29} and is caused by chronic overconsumption of sugar and other refined carbohydrates, abdominal adiposity, and sedentary lifestyle, all of which are increasingly common

among the population of India and people with Asian Indian ethnicity.^{11, 25, 28, 30} The latest evidence indicates that although about one out of every three adults among the Asian Indian urban population is afflicted by fatty liver,³¹⁻³³ the vast majority of these people are asymptomatic and unaware of their NAFLD. This is similar to the prevalence of fatty liver disease among the U.S. population, where NAFLD is seen in about 30% of adults.³²⁻³⁴ Individuals with NAFLD are not just predisposed to CAD and cirrhosis, but also to liver cancer and exogenous malignancies of other organs.²⁸

A prospective study recently reported that individuals with NAFLD often also have CAD with high-risk features on coronary angiography.²⁹ Among the 440 patients studied, NAFLD was seen in 40%. These patients with NAFLD were about three times

more likely than people without NAFLD to have high-risk coronary plaque (59% vs 19% respectively). Moreover, the presence of fatty liver predicted dangerous coronary anatomy independent of the traditional CAD risk factors. This pathophysiological link between NAFLD and high-risk coronary plaque

is hypothesized to occur because of shared risk factors and also system-wide inflammation triggered by the excess fat deposition in the liver.

The most effective treatments for regressing NAFLD remain uncertain, but the ones showing most promise include: a diet low in sugar and other refined carbohydrates, weight loss (especially mobilizing excess intra-abdominal fat), omega-3 supplementation, coffee consumption, exercise, avoidance of alcohol, intermittent fasting, and L-carnitine.³⁵

Excess Sugars and Refined Carbohydrates Toxic to Asian Indians

Asian Indians in 350 BC invented refined sugar by crystallizing sugar granules from sugarcane juice.³⁶ The enjoyment of sweets is an integral part of many important traditions in the Indian culture. Indeed, for centuries it

has been customary to “sweeten the mouth” after each meal. Many traditional Indian festivals include exchanging the sweets amongst friends and family. Thus, sugar plays a central role not only as a dietary staple but also as a cherished pleasure in the traditional Indian way of life.

Today, India is the largest consumer of sugar in the world.³⁶ This over-consumption of foods and beverages containing added sugar is among the most serious threats to Asian Indian health and wellness—both for individuals and the society as a whole.^{23, 37}

Recent large and comprehensive analyses of populations from 173 countries found that the per capita sugar consumption is highly correlated with the prevalence of T2D among the various nations.^{22, 38} The correlation between sugar

consumption and adjusted risk of T2D was especially robust among South Asian populations, where even a modest increase in sugar intake (for example, 150 extra calories of added sugar) correlates with a significantly heightened risk for T2D.^{22, 38}

The customary diet of India was already high in sweets, but this



Figure 1
Dietary Suggestions for Asian Indians: Added Sugars

was less problematic as the sugar came from whole-foods (such as fruit that contains fiber, water, antioxidants, and other substances that buffer the sugar load) and was generally consumed in the ancestral rural environments of South Asia where obesity and sedentary lifestyles were virtually nonexistent. In contrast, about 66-70% of total calorie intake in the modern Asian Indian diet comes from carbohydrates, and mostly in the form of refined sugar, white flour, and white rice.³⁹ The World Health Organization (WHO) has described added sugar as a silent killer that is as deadly as tobacco—these two vices kill two people around the world every six seconds—one from sugar and one from tobacco.^{40, 41} The consumption of added sugar and other refined carbohydrates increases the risk of T2D in a dose-dependent fashion. The incidence

of T2D doubles when the consumption of refined carbohydrates/added sugar reaches 330 gm/day, which is the average daily intake for an adult Asian Indian.^{38, 41, 42}

The average U.S. adult consumes about 15% of daily calories in the form of added sugar, compared to 14% for Asian Indian adults.^{36, 37, 39} Other data suggests the average intake is even higher—i.e., 152 lbs. per person per year, with 13% of the U.S. population consuming 25% or more of their total calories from added sugars.^{37, 43, 44} Increased consumption of added sugar worsens risk of CV death in a dose-dependent manner.³⁷ Consensus dietary guidelines for Asian Indians currently recommend restricting sugar intake to less than 10% of total calories consumed.¹⁵ In an effort to curb the obesity epidemic that is blossoming worldwide, the WHO recently went even further and recommended reducing sugar intake to 5% of total calorie intake, or about 25 g of sugar per day for an average-sized person.⁴⁵ The average adult in India consumes 58 g of sugar daily.⁴⁶ (See Figure 1.)

Sweetened Beverages

Sugar-sweetened beverages, perhaps because they are widely available, heavily marketed, and usually contain HFCS have been shown to be very strongly associated with risk of T2D, even after statistical adjustment for total calorie consumption and abdominal obesity.⁴⁷⁻⁵¹ Each additional sugar-sweetened drink consumed on a daily basis raises the risk of developing diabetes by approximately 25%.⁵¹⁻⁵³ Sugar-sweetened beverages, along with other added sugars and refined carbohydrates also increase the risk of obesity, CAD, and CV death.⁵²⁻⁵⁴

In light of the heightened susceptibility of individuals with Asian Indian ethnicity to adverse metabolic effects from consumption of sugar and their propensity to develop T2D, fatty liver, and CAD with modest increases in abdominal fat, it may be particularly important for South Asians to restrict sugar intake to less than 5% of total calories. For the average adult (using 2,000 calories per day as a reference) this translates to not more than about six teaspoons per day, which is the amount of sugar in about six to eight ounces of a sweetened soft drink, for example.⁵⁵

Post Prandial Glucose Spikes Cause Inflammation and CAD

Individuals with Asian Indian heritage are often genetically predisposed to insulin resistance, which makes them particularly susceptible to post prandial hyperglycemia. This issue is exacerbated by the fact that the typical Indian meal is rich in highly processed foods such as refined carbohydrate that trigger exaggerated post-prandial surges

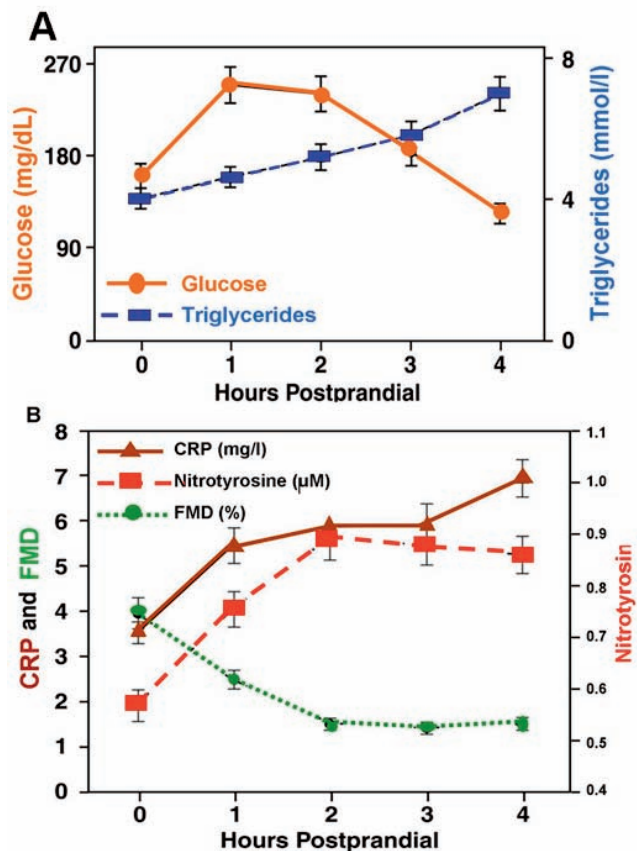


Figure 2

Post prandial stress: The immediate deleterious effects of a beverage containing 75 g glucose mixed with 700 kcal/m² of whipping cream. Within 2 to 4 h glucose and triglyceride levels double, causing immediate oxidant stress (nitrotyrosine), inflammation (C-reactive protein [CRP]), resulting in deterioration in endothelial function.⁵⁶ FMD % = Flow mediated dilation

in blood levels of glucose and triglycerides. These spikes in blood sugar and triglycerides cause parallel and almost instantaneous surges in systemic oxidant stress. The abrupt increase in free radicals in turn causes a cascade of atherogenic disturbances including inflammation, endothelial dysfunction, sympathetic hyperactivity and hypercoagulability. (See Figure 2.) This tendency to have post meal spikes in glucose is an independent predictor of adverse CV events even among individuals without diabetes.⁵⁶

Direct correlations exist between post prandial glucose levels and future risks of both CV death and all-cause mortality.⁵⁷ The CV risk of post-prandial or post-glucose-challenge glycemia also shows a strong relationship with coronary atherosclerosis progression even in people without diabetes.^{56, 58}

Fortunately, dietary modifications can exert dramatic and immediate improvements in post prandial glucose and triglyceride levels and will concomitantly lower

inflammation.⁵⁶ Effective dietary changes to blunt post meal spikes of glucose and triglycerides include: increase intake of minimally processed, high-fiber, plant-based foods such as vegetables and fruits, legumes, and nuts. In addition, lean protein, vinegar, tea, cinnamon, calorie restriction, weight loss, exercise, and fasting will each significantly improve postprandial levels of glucose and triglycerides. This type of anti-inflammatory diet should be promoted to the Asian Indian population for prevention of CAD and T2D.⁵⁶

Nuts and Yogurt—Healthy Options to Substitute for Refined Carbs

Nuts offer a unique and nutritious combination of protein, fiber, essential fats, phytosterols, antioxidants, vitamins, and minerals. A handful (about 1 ounce) of nuts provides a nourishing and satiating snack that is superior to processed food snacks, many of which are high in added sugar and other refined carbohydrates. More than 40 clinical trials have evaluated the effects of nut consumption on various biomarkers of overall and cardiac health, and have generally found improvements in blood glucose and lipid levels, as well as a reduction in markers of inflammation.⁵⁹ A recent trial reported that pistachio nuts when substituted for 20% of calories in a typical Asian Indian diet substantially improved not just glucose and total cholesterol levels, but also reduced abdominal obesity, lowered markers of inflammation and oxidative stress, and raised adiponectin levels.³⁶

Nuts have a low glycemic index, are cholesterol-free, and have been strongly linked to superb health outcomes.⁶⁰ Studies show that eating one to two ounces of tree nuts per day may reduce risk of T2D, myocardial infarction (MI), stroke and CV death.⁵⁶⁻⁵⁸ The benefit of tree nuts may be of special relevance to Asian Indians, considering the high rates of MetSyn, T2D, and CVD in this population.

A prospective epidemiological study reported that a higher intake of yogurt was associated with a reduced risk of T2D; however consumption of other dairy foods and beverages was not linked to lower rates of diabetes.⁶¹ Unsweetened yogurt contains health-promoting nutrients such as probiotics along with calcium, vitamin D, protein and potassium, with lower levels of lactose due to the fermentation process, which metabolizes much of the sugar. These promising findings indicate that yogurt, which has traditionally played an important role the Asian Indian diet, should be encouraged as a healthy food option; though it is best to avoid yogurts with added sugars.

Focus on Prevention

Only one in ten residents of India has medical insurance, thus nine out of ten pay out of pocket for their medications

and health care.⁸ To make matters worse, have of the individuals living in India subsist on just \$1 to \$2 per day.⁶² The most practical and affordable strategy for addressing these worsening pandemics of diabetes and heart disease is prevention, which will require focusing on dietary changes and increased exercise. Successfully deploying such a strategy in India will be difficult, as it has been in the U.S., and progress at a national level may require policy changes. These could ideally involve programs promoting healthy whole foods such as fruits, vegetables, nuts, and low-fat dairy, while at the same time discouraging intake of refined foods and beverages. Other measures might include government subsidies for healthy foods versus unhealthy foods,⁶³ employer-sponsored personal health incentives, and increased opportunities for urban exercise (bicycle paths, parks, etc.) along with other efforts to promote physical activity.^{58, 63-67} Table 1 lists specific strategies for the prevention of diabetes and CVD among Asian Indians.

Conclusion

The excessive intake of sugar along with other refined carbohydrates is a major factor driving the epidemics of T2D and CVD among the Asian Indian population. Programs to encourage reduction in consumption of sugar and all refined carbohydrates are urgently needed for the primary and secondary prevention of diabetes, stroke, and CAD in this high-risk population.

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Disclosure

None reported.

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