



# Interventions to Change Health Behaviors and Prevention of Type 2 Diabetes in Asian Populations

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**D**iabetes is a condition with a huge health impact in Asia. More than half of all people with diabetes live today in Asian countries, creating the potential to overwhelm the capacity of healthcare systems in Asia in the near future.

## The Burden of Type 2 Diabetes in Asia

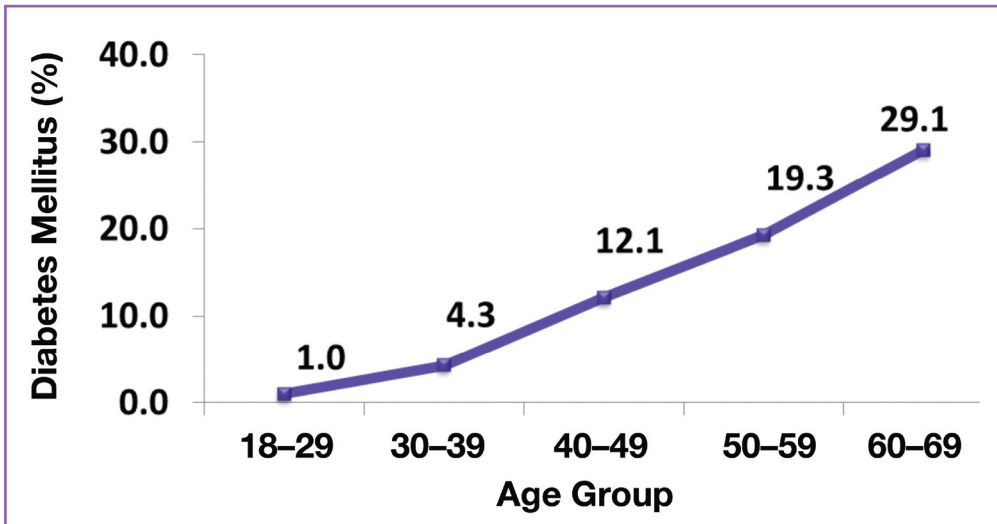
Type 2 diabetes mellitus is a very common chronic disease that can lead to serious complications. It is a metabolic disorder that formerly was known as noninsulin-dependent diabetes or adult-onset diabetes. Type 2 diabetes is characterized by a combination of the body's resistance to the action of the hormone insulin and impaired secretion of insulin by the pancreatic beta cells.

Diabetes can have serious complications, including chronic kidney damage, limb amputations, loss of vision, and cardiovascular diseases, and is rapidly becoming a leading cause of illness and premature death in many countries. Because diabetes is very common, requires chronic treatment, and has serious complications, it imposes a large financial burden on individuals and health systems.

Currently, an estimated 366 million people worldwide have diabetes.<sup>1</sup> This number is expected to rise to 552 million in 2030. The major factors contributing to this increase are population growth, aging populations worldwide, and urbanization with associated lifestyle changes. What was once thought of as a disease of the Western world is now recognized as a worldwide epidemic of type 2 diabetes.

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The prevalence of diabetes in Asia is increasing, with many countries having a prevalence similar to that of Western countries. Currently in Singapore, one in three residents develops diabetes by 70 years of age (Figure).<sup>2</sup>



**Figure. Prevalence of diabetes mellitus according to age in Singapore based on the National Health Survey 2010.<sup>2</sup>**

China and India are the two countries with the largest number of diabetes cases in the world. Asians are more biologically susceptible to developing diabetes and tend to do so at lower levels of adiposity.<sup>3</sup> The diabetes epidemic in Asia is unique because of the rapid increase in the prevalence of type 2 diabetes, which disproportionately affects the younger working population. The diabetes epidemic in Asia is still at an early stage, and diabetes-related costs are expected to become much higher in the future because of a pipeline effect.

Long time lags exist between the development of diabetes risk factors such as overweight/obesity and diabetes onset, and again between diabetes onset and the development of complications such as limb amputations, kidney disease, visual impairment, and cardiovascular diseases. As a result, the full impact on costs related to diabetes complications from the recent increases in diabetes risk factors in Asian countries is expected not to occur until after several decades.

## Risk Factors for Type 2 Diabetes

Genetic characteristics can influence the susceptibility of individuals to the development of type 2 diabetes. However, it is widely recognized that nongenetic determinants play a pivotal role in the etiology of type 2 diabetes (Table 1).<sup>4</sup> Marked increases in the prevalence of type 2 diabetes in populations have occurred too rapidly to have resulted from genetic changes of the population and thus reflect environmental changes possibly modified by genetic predisposition.

**Table 1. Risk Factors for Type 2 Diabetes<sup>4</sup>**

Nonmodifiable Risk Factors	Modifiable Risk Factors
Older age	Energy imbalance leading to excess body fat
Family history of diabetes	Physical inactivity
Ethnicity: <ul style="list-style-type: none"> <li>• Asian</li> <li>• Other non-European ancestry</li> </ul>	Cigarette smoking
Specific genetic risk variants	Alcohol abstinence or high alcohol consumption
	Dietary factors: <ul style="list-style-type: none"> <li>• Low-fiber and whole-grain intake</li> <li>• High consumption of red and processed meat</li> <li>• High intake of saturated and trans fat, and low intake of polyunsaturated fat</li> <li>• High consumption of sugar-sweetened beverages and low consumption of coffee</li> <li>• Inadequate maternal diet, reflected in lower birth weight</li> </ul>

Excess adiposity resulting from an imbalance between energy intake and energy expenditure is the major risk factor for type 2 diabetes. Specific dietary factors, alcohol consumption, smoking, and physical activity also are found to affect

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diabetes risk, independent of adiposity. Intake of polyunsaturated fat, instead of saturated fat, and whole grains, instead of refined grains, is linked to higher insulin sensitivity and a lower risk of type 2 diabetes. The latter is of particular relevance for many Asian populations, where refined grains such as white rice constitute a large part of the diet. Beverage choice also is associated with risk of type 2 diabetes, with sugar-sweetened beverages associated with a higher risk and coffee with a lower risk.

In a cohort of United States women, the combined impact of five lifestyle factors on the incidence of type 2 diabetes was studied.<sup>5</sup> These lifestyle factors included moderate to vigorous activity for at least 30 minutes/day, a reasonably high dietary quality score, no current smoking, light to moderate alcohol consumption, and avoiding excess body weight. An estimated 9 out of 10 new diabetes cases were attributed to lack of adherence to these healthy lifestyle factors. These results suggest that lifestyle changes can largely prevent type 2 diabetes.

### Interventions for the Prevention of Type 2 Diabetes in High-Risk Individuals

Randomized trials in Europe, the United States, India, Japan, and China have consistently shown that improvements in diet, an increase in moderate-intensity physical activity, and modest weight loss lead to a markedly lower risk of type 2 diabetes in individuals who are at high risk for prediabetes. For example, in the Finnish Diabetes Prevention Study, 522 men and women with impaired glucose tolerance were randomized to either a control group or an intervention group consisting of personalized dietary and exercise advice, along with group counseling and supervised training sessions. The groups had follow-up for a mean duration of 3 years. The risk of diabetes was reduced by 58% in the intensive lifestyle intervention group compared to the control group.<sup>6</sup>

Similar results were obtained in other trials in persons with prediabetes. Evidence is emerging that lifestyle interventions implemented in real-life settings still can substantially reduce the risk of type 2 diabetes in persons with prediabetes. In Spain, nurses and general practitioners were trained to provide lifestyle interventions in their high-risk patients. This led to a 37% reduction risk of type 2 diabetes compared with standard care.<sup>7</sup>

### Population-wide Approaches

Lifestyle interventions are shown to lead to marked reductions in risk of type 2 diabetes in persons with prediabetes. However, identification of individuals

with prediabetes is costly, and conversion to diabetes remains high when the intervention is initiated after individuals have developed prediabetes. In addition, these interventions do not target the physical and social environmental factors that are important long-term determinants of diet and physical activity.

Therefore, national policies and community programs to improve dietary and lifestyle habits of the population, as well as to limit the steadily increasing prevalence of overweight and obesity, in many countries seem highly desirable. It is important to base such interventions on an evaluation of relevant determinants of unhealthy lifestyles in specific settings. These determinants can include physical, economical, political, and sociocultural factors on a micro and macro level (Table 2).<sup>8</sup>

**Table 2. Environmental Determinants of Eating Behaviors<sup>8</sup>**

Type/Size	Micro (settings) Neighborhood, household, workplace, and school	Macro (sectors) National and international level
<b>Physical</b> What is available?	<ul style="list-style-type: none"> <li>• Food retailers (eg, supermarkets)</li> <li>• Food service outlets (eg, restaurants)</li> </ul>	<ul style="list-style-type: none"> <li>• Import, production, and distribution of food affecting food composition</li> </ul>
<b>Economical</b> What are the costs?	<ul style="list-style-type: none"> <li>• Prices of food</li> <li>• Household income</li> </ul>	<ul style="list-style-type: none"> <li>• Costs of food importing, production, and distribution</li> <li>• Pricing policies and taxes</li> </ul>
<b>Political</b> What are the rules?	<ul style="list-style-type: none"> <li>• Institutional rules and policies (eg, school food rules)</li> </ul>	<ul style="list-style-type: none"> <li>• Governmental policies, regulations, and laws (eg, food labeling and advertising)</li> </ul>
<b>Sociocultural</b> What are the attitudes and beliefs?	<ul style="list-style-type: none"> <li>• Community’s norms and values related to food</li> <li>• Traditional cuisines</li> </ul>	<ul style="list-style-type: none"> <li>• Mass media (eg, marketing of foods)</li> <li>• Common culture</li> </ul>

**Source:** Swinburn B, Egger G, Raza F. Dissecting obesogenic environments: the development and application of a framework for identifying and prioritizing environmental interventions for obesity. *Prev Med.* 1999;29(6 Pt 1):563-570.

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Consumption of sugar-sweetened drinks, for example, was shown to lead to excess weight gain in children in a large double-blind, randomized controlled trial.<sup>9</sup> In settings where consumption of sugar-sweetened drinks is high, targeting this provides an opportunity to reduce the risk of type 2 diabetes in the population.

Potential determinants of beverage consumption, such as availability, prices, beliefs, and knowledge about the caloric content, sometimes are affected by factors that are targeted in interventions, such as taxation, rules regarding vending machines at schools and workplaces, marketing limitations, and clear food labeling. Similar population interventions were successful in reducing tobacco use in many countries. Such interventions do not only involve the medical sector, but require involvement of different government agencies, as well as communities and the private sector.

### Summary

The importance of preventing diabetes is widely acknowledged. Type 2 diabetes requires continuous treatment and can lead to great suffering for individuals. Randomized trials in Western and Asian populations have shown that intensive lifestyle interventions can reduce the risk of type 2 diabetes in people with prediabetes by more than 50%.

Emerging evidence indicates that such trials also can reduce the incidence of type 2 diabetes in real-life settings. However, a population-wide multisectorial approach is needed to fundamentally address the lifestyle risk factors that lead to the development of type 2 diabetes and various other chronic diseases.

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