

Diabetes and Noncommunicable Disease

Prevent the Preventables

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In this issue of JAMA, Xu et al¹ provide 2010 estimates of the prevalence of diabetes and prediabetes in China. This is the first large survey to use the latest American Diabetes Association criteria, which include glycated hemoglobin A_{1c} (HbA_{1c}), fasting plasma glucose, and 2-hour glucose during a 75-g oral-glucose tolerance test. **The study was a substantial undertaking, striving for representation across 31 provinces and performing all 3 glucose measures in 98 658 Chinese adults.** The authors report a prevalence of 11.6% for diabetes (4.5% by fasting plasma glucose \geq 125 mg/dL and 4.6% by HbA_{1c} \geq 6.5%) and 50.1% for prediabetes (35.4% by HbA_{1c} \geq 5.7%-6.4% and 27.2% by fasting plasma glucose \geq 100-125 mg/dL,). **Among those with diabetes, only 30% had been previously diagnosed and only 26% were treated. Among those treated, only 40% had HbA_{1c} concentrations lower than 7%.¹**

Despite the widely publicized report of 9.7% for diabetes and 15.5% for prediabetes by Yang et al² in the 2007 China survey, the findings reported by Xu et al¹ indicate that **the epidemic of diabetes and prediabetes in China has shown no sign of abating.** In examining the testing patterns by which the diabetes and prediabetes diagnoses were made, the 2-hour glucose measure contributed the least to these diagnoses, uniquely establishing the diagnosis in only 15% of those with newly diagnosed diabetes and 4% of those with prediabetes.



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This finding has 2 important ramifications. **First, the increased prevalence of obesity may have affected the testing characteristics of the population with diabetes or prediabetes.** In contrast to this report, the majority of adults with diabetes or prediabetes in the mid 1990-2000s had high post-glucose loading plasma glucose levels.³ In the 2010 survey, 1 in 3 Chinese adults had either central or general obesity. Among the obese participants, 1 in 2 had prediabetes and 1 in 5 had diabetes. Furthermore, there were associations between diabetes and prediabetes with other cardiometabolic risk factors including dyslipidemia and high blood pressure.⁴ Second, these data support a high diagnostic yield from the combination of the more easily obtained fasting plasma glucose and HbA_{1c} in the Chinese population.

In addition to the value of fasting plasma glucose and HbA_{1c} in diabetes screening, these diagnostic tests also have prognostic value in predicting the onset of chronic disease. In the Emerging Risk Factors Collaboration involving 97 prospective studies of 820 900 people with an accrual of 123 205 deaths, people with diabetes had a 1.3- to 3-fold increased risk of death due to multiple causes including cardiovascular disease, renal failure, mental illnesses, all-site cancer, hepatobiliary disease, and sepsis. Overall, diabetes was associated with reduced life expectancy of 6 years, especially in persons with young onset of disease. Importantly, there were linear rela-

tionships between fasting plasma glucose and hazard ratios of all vascular, cancer, nonvascular, and noncancer events starting from a threshold plasma glucose value of 90 to 108 mg/dL. These hazards were attenuated with adjustment of fasting plasma glucose only, supporting the causal nature of glucotoxicity in multiple organ dysfunction.⁴ Similarly, the near linear relationships between HbA_{1c} and risk of diabetes, cardiovascular disease⁵ and cancer⁶ have been reported in people with or without diabetes. Inadequate control of fasting plasma glucose and HbA_{1c} in China herald a looming and massive epidemic of chronic diseases, if prompt preventive actions are not taken.

Given the magnitude of the problem, what are the priorities in preventive actions? According to the study, **50% of Chinese men were current smokers.** Although Xu et al found negative associations of diabetes and prediabetes with smoking, which might be due to reverse causality, **the dose-response association between smoking and diabetes has been reported in a meta-analysis of prospective studies.**⁷ Although it remains to be proven whether tobacco control would reduce the diabetes-prediabetes epidemic, smoking cessation should help mitigate the amplifying effects of tobacco on the adverse effects of glucotoxicity on organ damage. Asia has the highest population of tobacco users. Although the levels of development, systems of government, and population size differ greatly among countries, there have been successful reports of tobacco control through strong political will and restrictive policies in some areas, such as in New Zealand and Hong Kong.⁸

In the study by Xu et al,¹ 5% to 8% of those in the 18- to 40-year age group had diabetes and 40% to 50% had prediabetes. **Apart from phenotypic and genotypic heterogeneity, which pose therapeutic challenges, these young adults are at high risk of premature mortality and cardiovascular-renal disease during the prime of life.** Yet, in part, due to the nonurgent nature of the condition and competing priorities, these young to middle-aged persons often have high rates of non-adherence, default, and suboptimal risk factor control.⁹ For such populations, a life course and proactive approach starting with protecting maternal and childhood health, promoting a healthy lifestyle, and avoiding obesity from childhood and by launching outreach awareness and detection programs targeting the workforce and early intervention of high-risk individuals with prediabetes, notably those with gestational diabetes and family history of diabetes, are measures that are in line with the World Health Organization (WHO) Global Plan of Action for Control and Prevention of Noncommunicable Diseases.¹⁰

Diabetes is a societal and a health care challenge due to **complex interplays among genetic, perinatal, lifestyle, and environmental factors,** to name but a few. Rapid modernization has resulted in an obesogenic environment characterized by food abundance, physical inactivity, and psychosocial stress.

The lack of awareness, information, and feedback has caused many individuals unknowingly to engage in risk-conferring behaviors. Even when the individual becomes aware of his or her risk conditions, the health care systems in many developing areas are not designed to manage and support a person's multiple health needs for 30 to 40 years or more. These needs include motivation, cognitive-psychological-behavioral support, laboratory assessments, technologies, medications, and hospitalizations.¹¹

In the mid-1990s, the International Diabetes Federation defined the minimum, standard, and comprehensive diabetes care models. Empowerment, protocols, team-based care, peer support, recall, and registry were key features.¹² However, **clinical inertia and treatment gaps remained widespread in real-world practice.**¹³ In a recent meta-analysis examining 123 529 people with diabetes, interventions targeting health care systems with team-based management and patient empowerment had the greatest effect on reducing HbA_{1c} concentration, blood pressure, and lipid levels.¹⁴

In the updated 2013-2020 draft of the Global Plan of Action for the Prevention and Control of Noncommunicable Diseases—defined as diabetes, heart disease, respiratory disease, and cancer—the WHO articulated its vision of a world free of the avoidable burden of noncommunicable diseases and advocated achieving this goal through multisectoral collaboration and cooperation at national, regional, and global levels.

The proposed plan of action highlighted the overarching principles of using a life-course approach to empower people and communities and by adopting an evidence-based and multi-sectorial strategy through partnerships. The document further emphasizes health as a human right with equity and advocates universal health coverage with proper management of real, perceived, or potential conflicts of interests. It also sets out voluntary global targets including reducing premature mortality from noncommunicable diseases; harmful use of alcohol and tobacco; insufficient physical activity; mean population intake of salt or sodium, and the prevalence of increased blood pressure as well as halting the increase in diabetes and obesity and increasing the access to affordable basic technologies and essential medications to prevent and control non-communicable diseases.

It is against the publication of the WHO document that the latest findings of undiagnosed, untreated, and suboptimally managed diabetes and prediabetes in China with a population of 1.3 billion people become even more pressing.¹ In the final analysis, the WHO defines health as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. To this end, government leaderships, partnerships, and community empowerment will be needed to create a health-promoting environment, encourage self-management, and strengthen the health care system to make health a reality.¹⁵

ARTICLE INFORMATION

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