



# The epidemic of diabetes and its impact on cardiovascular health in contemporary China

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## KEYWORDS

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## Summary

**Objectives:** To examine the epidemic of diabetes and its impact on cardiovascular disease (CVD) in China.

**Methods:** We searched PubMed and local databases for studies published since 1980. Information on study design, sample characteristics, diagnosis, and prevalence of diabetes were extracted using a standardized protocol. We calculated average annual increases in rates and the population attributable risk of CVD due to Type 2 diabetes (T2D).

**Results:** Nationwide survey data indicate that the prevalence of T2D in Mainland China has increased from 0.67% in the early 1980s to 3.21% in the mid-1990s and to 5.5% in 2001–02. A 2001–02 national survey among people aged 35–74 showed that the prevalence was 5.2% in men and 5.8% in women. The prevalence increases with age and is higher in urban- than rural areas. The annual increase in the rate of T2D and impaired glucose tolerance were 0.70% and 0.64% point, respectively. People in Hong Kong and Taiwan (approximately 8–10%) had a higher prevalence of T2D than on the Mainland. Chinese adults with diabetes were 1.7 times more likely to develop CVD than those with normal fasting glucose. We estimated that 3.3% of CVD in China is attributable to T2D.

**Conclusions:** The prevalence of T2D has steadily increased in China over the past two decades, although it remains lower than many industrialized countries. Considerable differences in prevalence exist across regions and population groups. Urban and higher-income groups are affected the most, in particular, due to changes in lifestyle and a rising obesity epidemic. Timely national strategies are needed for the prevention, screening, and treatment of T2D.

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## Introduction

Since the economic reform initiated in the late 1970s, China has experienced many dramatic social economic developments, which have significantly affected the daily lives as well as the health of its citizens [1–3]. A growing number of studies show that the prevalence rates of obesity and Type 2 diabetes (T2D) have increased dramatically in China, especially in the past decade [4]. As has been extensively studied, obesity is a serious risk factor for both T2D and cardiovascular diseases (CVD) in addition to many other chronic diseases [5,6]. With the increase in obesity, related chronic diseases have also increased over the past decade and obesity has become an important preventable cause of deaths in China [4]. National surveys and statistics along with findings from other large population-based surveys such as the China Multicenter Collaborative Study of Cardiovascular Epidemiology show that CVD has already become the leading cause of death for both men and women in China [7]. China is currently undergoing rapid demographic, social, economic, and health shifts that may further increase the burden of CVD [8].

Nationally representative surveys show that the combined prevalence of overweight and obesity in China has increased from 14.6% to 21.8% between 1992 and 2002 based on the World Health Organization's (WHO) recommended body mass index (BMI) cut point of 25 [4]. The prevalence of hypertension increased from 11.3% in 1991 to 27.2% in 2000 [4]. T2D has become an important public health challenge in economically developing countries including China [9,10]. The prevalence of T2D in the Chinese adult population has increased from 0.67% in the early 1980s to 5.5% in 2001–2002 [11]. The number of diabetic patients is projected to increase from 20.8 million in 2000 to 42.3 million in 2030 in China [9,12]. On the other hand, although the rising incidence of Type 1 diabetes (T1D) is becoming a global phenomenon [13], the incidence of T1D in China seems to be the lowest ever reported in the world [14,15].

To our knowledge, few studies have systematically examined the trends in the prevalence of T2D and T1D in China. The present study aims to study the trends in diabetes and its impact on the risk of cardiovascular health in China. We focused on representative data collected in Mainland China, but also examined the situation in selected major cities in China and Hong Kong and Taiwan. The latter places where the economy is more developed and the residents are having a more Westernized diet and sedentary lifestyles, may

help shed light on the future situation in Mainland China [16].

## Materials and methods

### Data inclusion criteria

Cross-sectional and longitudinal studies published in Chinese and English that examined the prevalence or incidence of diabetes in China were examined. In Mainland China, we focused on data collected in nationwide surveys to examine the trend for diabetes over time. In addition, we highlighted the situation in Beijing and Shanghai, which are the two largest cities in China and may help show the situation in more economically developed areas in Mainland China. In general, the residents of these areas have been experiencing more dramatic changes in their lifestyles and a greater influence of Western culture and more chronic diseases than their counterparts in other regions. Furthermore, T2D-related large scale studies in Hong Kong and Taiwan were also included.

### Search strategies

To identify related studies, we searched PubMed and local databases in Mainland China and Taiwan for studies published from January 1980 to July 2007, including those published in English and Chinese. Several key terms were used in the search process, such as China, Hong Kong, Taiwan, diabetes, hypertension, cardiovascular disease, fasting glucose, and metabolic syndrome. Titles and abstracts of studies uncovered by the electronic searches were examined on screen. Papers of those studies which could not be excluded on the basis of the abstract were obtained in full and reviewed for suitability for inclusion. In addition, a number of studies identified in the course of reading or brought to our attention by colleagues and experts that we consulted were also included.

### Classification and diagnosis of diabetes

On the basis of its etiology, diabetes is classified into two major types: T1D, caused by immunological destruction of pancreatic islets, is characterized by absolute insulin deficiency and usually occurs in childhood. T2D begins in the middle age or earlier and is characterized by deficient insulin secretion and/or insulin resistance [17,18].

The diagnostic criteria for T2D used by studies we included were summarized in Table 1. Most of

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