



## Women and Diabetes: A Global Perspective

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The epidemic of diabetes is now worldwide. Diabetes affects 347 million people and this number is projected to reach 438 million by the year 2030 [1]. According to the World Health Organization (WHO), diabetes caused 1.3 million deaths worldwide in 2008 [2]. Diabetes increases the risk of both heart disease and stroke. The risk of death for people with diabetes is about twice as high as that for people without diabetes [3]. The cost of diabetes ranges from 0.4% to 2.3% of GDP in some countries in the world [4].

Women suffer from diabetes in both developed and developing countries. Approximately, 2.1 million women die of diabetes each year in the world, making diabetes the ninth leading cause of death among women [5]. In 2010, among 25.8 million people with diabetes in the United States, approximately half were women aged 20 or older (12.6 million), or 10.8% of women [3]. The number of American women diagnosed with diabetes is expected to reach 27.5 million by 2050 [6]. Racial and ethnic minority women have particularly high rates of type 2 diabetes in the U.S. The prevalence is 2 to 4 times higher among Black, Hispanic, American Indian, Asian and Pacific Islander women than among White women [7]. American Women who have had gestational diabetes during pregnancy are 35% to 60% more likely to develop type 2 diabetes, within 10 to 20 years [3]. Diabetes is one of the leading underlying causes of death among American women aged 65 years, and Black and Mexican American women have 2-4 times the death rate from diabetes as that of White women [3].

Asia has the largest population with diabetes in the world accounting for 60% of people with the disease [8]. India has the largest number of people with diabetes, followed by China [9]. In 2008, approximately 10% of women aged 25 or older in Southeast Asia had diabetes [2]. In China, diabetes has reached epidemic proportions, with 9.7% of the adult population (92.4 million adults, 20 years or older) diagnosed with diabetes and 15.5% (148.2 million) with pre-diabetes [10]. The estimates of diabetes among a nationally representative sample of Chinese adults (N=46,239) suggest that 42.2 million women have diabetes and 72.1 million have pre-diabetes; this number increases with age, weight and Body Mass Index (BMI) [10]. Further, 9.4% of Chinese women and 10.8% of Indian women aged 25 or older have an elevated fasting glucose level [11]. Women in India with diabetes die at an average age of 57.4 years; thus, Indian women with diabetes have an average life 9.5 years shorter than Indian women without diabetes [12].

Women with diabetes in the United States have shown poor

diabetes self-management; only 6% effectively manage their diabetes, compared to 13% of men [13]. Women with diabetes are also at increased risk of depression. A higher percentage of women (28%) than men with diabetes (18%) have depression [14]. Women with diabetes who are depressed report less adherence to diabetes self-management, including self-monitoring of blood sugar and diet, than women who have no depression [15].

Modifiable risk factors contributing to diabetes include overweight, obesity and physical inactivity. Globally, the number of people who are overweight (BMI  $\geq 25$  kg/m<sup>2</sup>) is expected to increase from 1.3 billion in 2005 to 2.0 billion by 2030 [16]. The prevalence of obesity in women worldwide increased from 8% in 2000 to 14% in 2008. Women are more likely to be obese than men, which increases the risk of type 2 diabetes, coronary heart disease, stroke, and certain types of cancers [17]. In the U.S., the prevalence of overweight is 66.3% and the number of obese are 32.2% in 2004 [17]. In 2008, approximately 14% of women in Southeast Asia were overweight and 3% were obese [17], while in China, 26.1% women were overweight and 6.5% were obese.

Lifestyle and diet are major factors contributing to the higher prevalence of obesity among women in urban areas than women who live in rural areas in China [18]. With economic development and globalization in China and India, diet has changed to increase more saturated fats, energy-dense foods and fast foods [8]. Previous studies on the prevalence of diabetes in women in Shanghai, China, and adult men and women in Japan, found that the intake of white rice was associated with risk of diabetes [19,20].

Physical inactivity has also been associated with risk of diabetes. WHO has reported that participation in 150 minutes of moderate physical activity each week can decrease the risk of ischaemic heart disease by 30%, diabetes by 27% and breast and colon cancer by 21-25%. Physical activity also lowers the risk of hypertension, stroke and depression [2]. The Physical Activity Guidelines for Americans also recommend 150 minutes/week moderate physical activity, but according to the National Health and Nutrition Examination Survey (NHANES) 2005-2006, fewer than 10% of U.S. adults met these guidelines [21]. Chinese National Health and Nutrition Surveys have reported that weekly physical activity in Chinese adults declined by 32% between 1991 and 2006 [22], despite the fact that both leisure-time activity and daily activity have been shown to reduce the risk of type 2 diabetes among Chinese women in Shanghai [23].

Research has found that lack of exercise, an unhealthy diet, and current smoking are associated with increased risk of diabetes in women. The Nurses' Health Study found that low risk of diabetes in women was associated with a BMI  $< 25$ kg/m<sup>2</sup>, a diet high in cereal fiber and polyunsaturated fats and glycemic load, moderate to vigorous daily physical activity for 30 minutes, absence of smoking, and consumption of a half serving of alcoholic beverage each day [8,24].

Because the prevalence of diabetes is increasing worldwide, diabetes self-management education is imperative to reduce the

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cost and burden of the disease [25]. Health providers can play an important role in educating women on diabetes self-management, and in advocating for programs for women. Health education and intervention programs targeting maintenance of a normal weight, a healthy diet and performance of daily physical activities are critical for women to reduce risk of diabetes. Lifestyle change is a key to prevent diabetes among women [24].

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