

The global pandemic of diabetes

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Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin, or alternatively, when the body cannot effectively use the insulin it produces. Hyperglycaemia, or raised blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels.¹

Diabetes imposes quite a substantial burden on individuals, as well as on healthcare budgets; in the UK alone, annual diabetes-related costs were estimated at £547 million in 1995, with 64% of this figure relating to in-patient care for retinal, renal, neuropathic, cerebrovascular, and cardiac complications that occur with increasing frequency as well as severity as the disease progresses.²

There have been several studies and calls for attention to be paid to the increasing prevalence of diabetes worldwide; some statistics from The World Health Organization (WHO) follow:

- WHO estimates that more than 180 million people worldwide have diabetes. The estimations are likely to more than double by 2030.
- In 2005, an estimated 1.1 million people died from diabetes.
- Almost 80% of diabetes deaths occur in low- and middle-income countries.
- Almost half of diabetes deaths occur in people under the age of 70 years; 55% of diabetes deaths are in women.
- WHO projects that deaths due to diabetes will increase by more than 50% in the next 10 years without urgent intervention. Most notably, diabetes deaths are projected to increase by over 80% in upper-middle-income countries between 2006 and 2015.¹

There is certainly no lack of data to back up the claim of a diabetes pandemic, but is it really everywhere? This article will review the current literature on the subject, comparing some of the projections and trends from different regions to see if we are truly facing a global issue.

Background

Diabetes mellitus is a group of chronic metabolic conditions, all of which are characterised by elevated blood glucose levels resulting from the body's inability

to produce insulin or resistance to insulin action, or both. This group of conditions can be subdivided into four clinically distinct types:

- **Type 1 diabetes** is characterised by a lack of insulin production. Without daily administration of insulin, type 1 diabetes is rapidly fatal.
- **Type 2 diabetes** results from the body's ineffective use of insulin. Type 2 diabetes accounts for 90% of people with diabetes around the world, and is largely the result of excess body weight and physical inactivity. Until recently, this type of diabetes was seen only in adults but it is now also occurring in obese children.
- **Gestational diabetes** is hyperglycaemia which is first recognised during pregnancy. Symptoms of gestational diabetes are similar to type 2 diabetes. Gestational diabetes is most often diagnosed through prenatal screening, rather than reported symptoms.
- A fourth group is composed of other types of diabetes caused by specific genetic defects of beta-cell function or insulin action, diseases of the pancreas, or drugs or chemicals.

In addition to diabetes itself, the condition of impaired glucose tolerance (IGT) also constitutes a cause of major public health concern, both because of its association with diabetes incidence and its own association with an increased risk of the development of cardiovascular disease (CVD). IGT is recognised as being a transient stage from normality to diabetes. Thus, individuals with IGT are at high risk of progressing to type 2 diabetes, although such progression is not inevitable. Some 70% of these individuals, however, are expected to develop the disease.¹⁻³

In the past two decades, we have seen an explosive increase in the number of people diagnosed with diabetes worldwide. This effect is most probably due to the pronounced changes in the human environment, and in human behaviour and lifestyle that have accompanied globalisation, translating into rapidly escalating rates of both obesity and diabetes.⁴

Type 1 diabetes accounts for 5–10% of all cases of diabetes. To date, there are no known ways to prevent type 1 diabetes. Type 2 diabetes accounts for 90–95% of all diagnosed diabetes cases. This form of diabetes generally begins as insulin resistance. Ethnic minority women, women who are obese, women with a family history of diabetes, and women who have had gestational diabetes in a previous pregnancy are at higher risk than other women for developing gestational diabetes. Strict glycaemic control and management of women with gestational diabetes is necessary to prevent birth com-

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plications in the developing infant. Women who have had gestational diabetes have a 20–50% increased risk for developing type 2 diabetes later in life.⁴

Estimates of current and future diabetes prevalence have been published previously, for example the study by King et al⁵ in 1998. The results of this study suggest that for the world as a whole, between the years 1995 and 2025, the adult population will increase by 64%, prevalence of diabetes in adults will increase by 35%, and the number of people with diabetes will increase by 122%.

For developed countries, there will be an 11% increase in the adult population, a 27% increase in the prevalence of adult diabetes, and a 42% increase in the number of people with diabetes. For developing countries, there will be an 82% increase in the adult population, a 48% increase in the prevalence of adult diabetes, and a 170% increase in the number of people with diabetes.

These estimates were revised again in 2004, by Wild et al⁶ using newer data and different methods for estimating age-specific prevalence. As in the first study in 1998, the estimates were based on demographic changes alone with the conservative assumption that other risk factor levels such as obesity and physical activity remain constant (in developed countries) or are accounted for

by urbanisation (in less developed countries).

The most notable of these results are the greatest relative increases that will occur in the Middle Eastern Crescent, sub-Saharan Africa, and India. The greatest absolute increase in the number of people with diabetes will be in India.

Figure 1 presents these trends by region with an emphasis on the first three places on the list: India, China and the United States. It is quite noticeable that with the exception of Europe (a projected 144%), all territories are projected to have an increase of over 200% by 2030, with the Middle East at the top of the list with a whopping estimated increase of 280%.⁷ However when we divide these estimates between developed and developing countries we see quite a contrast in terms of age groups, as seen in Figures 2 and 3 (following page).⁸

From this figure we can see that although there will be similar increases in the different geographic regions, the impact is not the same for developed and developing countries. Whether this is due to levels of urbanisation, obesity, physical activity, detection and medical care, or due to more local factors, is difficult to establish. The remainder of this article will examine in detail the epidemiological situation in different areas of the world.

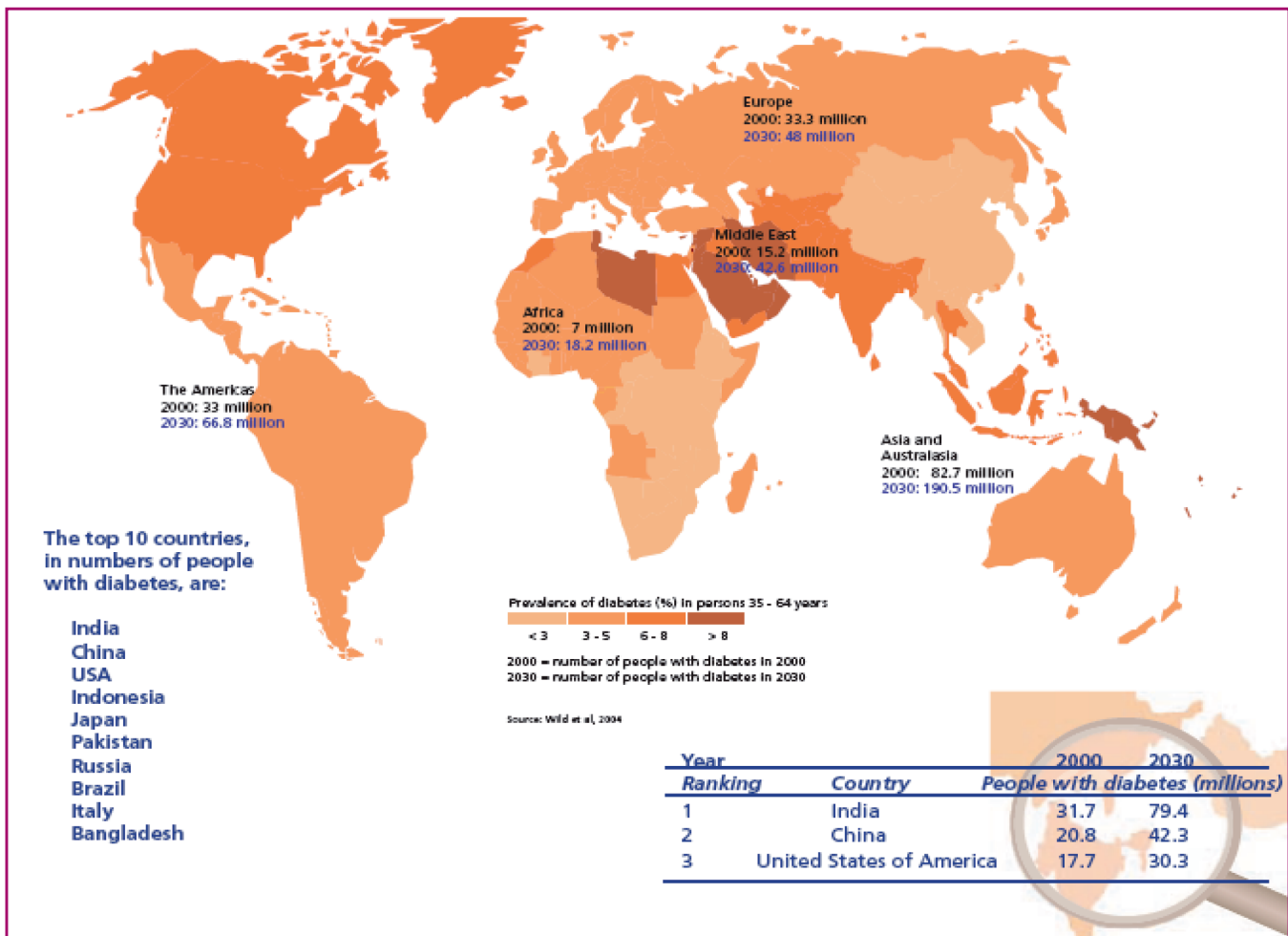


Figure 1 Global diabetes prevalence⁷

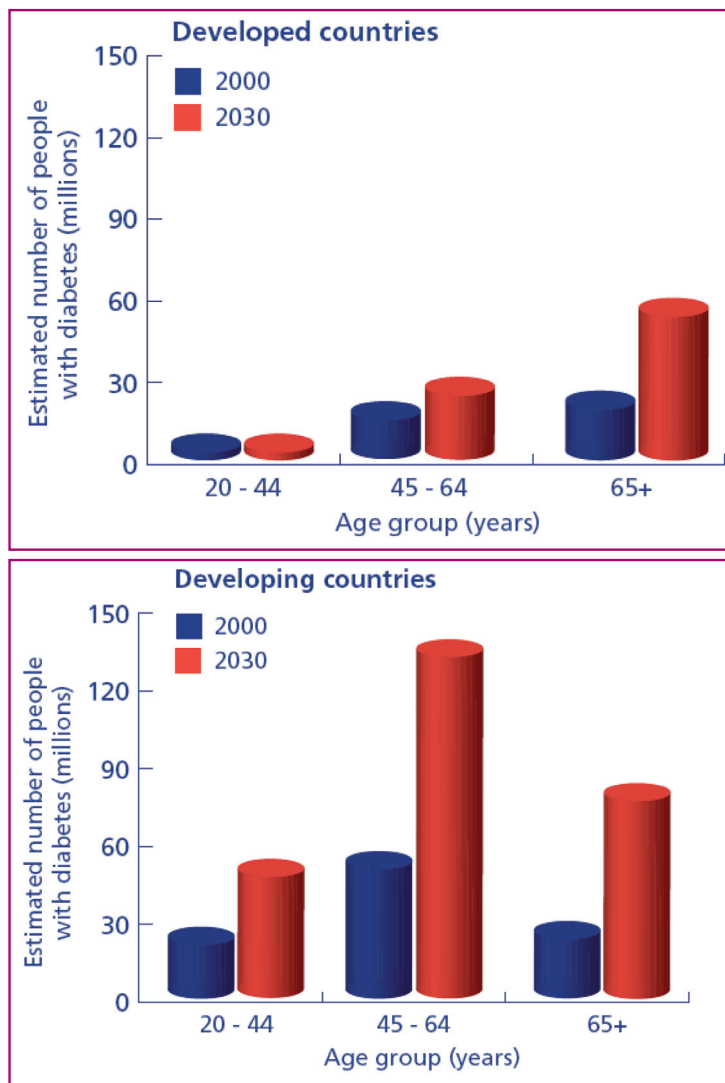


Figure 2 Projected diabetes prevalence increase (2000–2030) in developed (top) and developing (bottom) countries⁸

Diabetes in Africa

Until about 40 years ago, diabetes was considered a rare disease in sub-Saharan Africa. The reported prevalence, using predominantly urine analysis, in localised settings in a number of countries, including Ethiopia, Ghana, Lesotho, Uganda, and Malawi, between 1960 and mid-1985 was around 1%. There were two exceptions, Ivory Coast (5.7%) and South Africa (2.2–2.7%). In contrast, moderate prevalences were reported from South African studies undertaken in different cities and one peri-urban area (4–8%). These differences could be largely due to considerably higher rates of obesity in the South African population compared with other countries in the region.

The major risk factors for diabetes in sub-Saharan Africa are similar to those in other regions of the world, whether this refers to the modifiable risk factors, such as urbanisation, obesity, physical inactivity, or those that are not mutable, such as increasing age and ethnicity. The rising prevalence of diabetes in the region has largely been ascribed to changes in lifestyle and urbanisation,

resulting in greater levels of obesity and physical inactivity. However, obesity has traditionally been uncommon in many parts of the region, largely owing to scarcity of food and high levels of energy expenditure. Cultural perceptions of body size are an important concern as in many of these countries a large body might be associated with attractiveness, health, and happiness. A study by Martorrel et al⁹ on obesity in women, that lists 18 countries of sub-Saharan Africa, found that only 1.0–7.1% of women aged 15–45 years of age in these sub-Saharan Africa countries were obese (as defined by a body mass index (BMI) >30.0), yet at the same time, 31% of South African women were obese.¹⁰

Another important factor to consider is the HIV situation, as sub-Saharan Africa is home to 63% (24.7 million) of all people infected with HIV worldwide. The region also accounts for the majority of HIV deaths globally (72%), placing it at the centre of the global HIV epidemic. Although there is evidence that the spread of HIV is stable or diminishing in the bulk of East and West African countries, the same cannot be said for southern Africa, which in any case accounts for the majority of cases of HIV. Unsurprisingly, a large premature mortality has been observed. In South Africa, for example, which is one of the worst hit countries, the mortality rate for young women has risen five-fold and in men two-fold. As a consequence, the number of people reaching the age of peak incidence of diabetes (40 years) would be expected to fall, as would the population growth rate.¹⁰

Efforts to prevent diabetes and its complications in Africa should be similar to those in the rest of the world. As elsewhere, the potential for intervention in disease development exists because many of the risk factors are modifiable. Moreover, the potential for improvement in outcome is indicated by the disproportionate mortality associated with acute metabolic and infective causes. The success of prevention strategies in Africa is still subject to the variability of existing healthcare at all levels both within and between countries.¹¹

Diabetes in India

India is at the top of the diabetes projections list – with a massive 79.4 million people affected by 2030, with a current national diabetes prevalence of 4.3% and costs already reaching US\$2.2 billion, diabetes poses a major threat to India's emerging economy.¹² Studies conducted in India in the last decade have highlighted that not only is the prevalence of type 2 diabetes high, but also that it is increasing rapidly in the urban population. An urban–rural difference in the prevalence rate was found, indicating that the environmental factors related to urbanisation had a significant role in increasing the prevalence of diabetes as shown in Figure 4.¹³

These findings are further supported by the study

done by Boddula et al¹⁴ that reported a prevalence of diabetes of 21.2% and an IGT rate of 18.2% in an urban high socio-economic group (possibly the highest value reported from India thus far.)

In countries that are currently industrialising, the highest rates of diabetes are found in higher socio-economic groups. Reasons for this include increasing obesity related to changes in diet and reduced physical activity, and although the data from India seem scarce, the results from this study certainly seem to support this trend.¹⁴ Nevertheless, although the prevalence of type 2 diabetes is 4–6 times higher in urban population of India than in the rural areas, the number of people with IGT is high (7–8%) even in the rural population, which may indicate the presence of a genetic basis for type 2 diabetes in this ethnic group.¹³

India needs to implement preventive measures to reduce the burden of diabetes as it poses a medical challenge that is not matched by the budget allocations for diabetes care in India. It is estimated that the annual cost of diabetes care would be approximately 90,200 million rupees (US\$1.8 billion).¹³

Diabetes in the United States

Diabetes and its complications are a major cause of morbidity and mortality in the United States and, like many of the countries experiencing such an increase in cases, it contributes substantially to healthcare costs.¹⁵ An estimated US\$92 billion, plus another US\$40 billion indirectly related to diabetes due to lost productivity (from lost workdays, lost home services, permanent disability, and premature mortality), makes a total cost of US\$132 billion, as calculated in 2002 by the American Diabetes Association.¹⁶

According to the International Diabetes Federation (IDF), The North American Region has a prevalence of diabetes of 7.9%, or 23 million in the adult population, of which a total of 69% resides in the United States. It is expected that a continued rise will occur as the population contin-

ues to age and obesity increases.³ It is clear that there is a growing epidemic of diabetes in the United States, as the country, rated third in terms of the number of people with diabetes in 2003, will keep this ranking according to the projections for 2025 (see Table 1).

Control measures in the United States need to include appropriate diet and exercise behaviour and adherence to medication regimens as well as controlled blood pressure and blood lipids.¹⁵

Diabetes in Mexico

Mexico is a good example for exploring the impact of environmental changes in developing countries composed of genetically predisposed individuals. In less than four decades, diabetes has become the most important health problem in Mexico. It has been the principal cause of death in women and the second among men since the year 2000. It is also the primary cause for premature retirement, blindness, and kidney failure. By the year 2025, close to 11.7 million Mexicans are expected to have diabetes.¹⁷

The prevalence of type 2 diabetes in Mexico has increased in recent years – by close to 25% over a 7-year period (1993–2000). It is difficult to compare individual surveys due to different diagnostic methods. If the same diagnostic criteria are used, prevalence has increased from 6.1 to 8.3%. In the 2000 National Health Survey, an analysis that adjusts for the differences caused by diagnostic methods it was estimated that prevalence could be as high as 12%. These data reinforce the urgent need for diabetes prevention.¹⁷

The age distribution of the population and the growing prevalence of childhood obesity and metabolic syndrome are alarming signs that the worst is still to come. Well-planned strategies are urgently needed to modify the lifestyle of the population and to increase their physical activity. In addition, an enormous effort will be required to educate the population and physicians to improve the diagnosis and treatment of patients with diabetes.¹⁷

2003		2025	
Country	Persons (millions)	Country	Persons (millions)
1 India	35.5	1 India	73.5
2 China, People's Republic of	23.8	2 China, People's Republic of	46.1
3 USA	16.0	3 USA	23.1
4 Russia	9.7	4 Pakistan	11.6
5 Japan	6.7	5 Russia	10.7
6 Germany	6.3	6 Brazil	10.7
7 Pakistan	6.2	7 Mexico	9.0
8 Brazil	5.7	8 Egypt	7.8
9 Mexico	4.4	9 Japan	7.1
10 Egypt	3.9	10 Germany	7.1

Table 1 The 'Top Ten' of countries with patients with diabetes (20–79 years)³ 2003–2025

Conclusions

It is clear that a global pandemic of diabetes has emerged and will continue to do so at a very fast rate, being driven by the rapid increase in obesity. Obesity in people in their 30s is going to translate into diabetes in their 40s. In the UK and the United States it can affect the society at large by means of increased health costs and loss of productivity. Asian countries are going to face an increased health burden, early death, and loss of productivity. Patients in developing countries will find it difficult to support themselves and their families in their most productive years due to diabetes.¹⁸

The increase in the adult population projected for developing countries is estimated to be 82% against just 11% for developed countries.⁵ Of those 333 million people around the globe predicted to have diabetes by 2025, 80% will live in low- and medium-income countries.¹⁹ These are, of course, the countries that will be least able to cope economically with this disease burden.

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