The rising tide of type 2 diabetes

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Abstract

The number of people with diabetes is now considered to have reached epidemic proportions. Globally more than 150 million people have diabetes, accounting for more than 2% of the world’s population and 3–5% of adults in most westernised societies. The incidence rates of type 1 and particularly type 2 diabetes are increasing in all societies and on all continents. Type 2 diabetes accounts for more than 95% of all diabetes. Type 2 diabetes is highly prevalent in the elderly and is now emerging in childhood. In developed countries diabetes and its complications constitute the fourth or fifth leading cause of death, and type 2 diabetes reduces remaining lifespan by 5–10 years. Diabetes (all types) is estimated to affect about 2.4 million people (prevalence of 4%) in the UK, of whom 1.4 million (prevalence of 2.5%) are diagnosed and one million undiagnosed. With the global prevalence of diabetes predicted to exceed 220 million by 2010 and 300 million by 2025 there is a major international challenge for optimal intervention and prevention strategies.

Key words: epidemiology, age, ethnicity, gender, UK prevalence.

Introduction

In the year 2001 it is estimated that more than 150 million people have diabetes.1–3 In the last decade numbers have risen sharply and a continued increase is projected, which will lead to a global prevalence of diabetes in excess of 220 million by 2010 (figure 1). Increases in both type 1 and type 2 diabetes have been observed in all societies studied in the last 30 years.1,2 However type 2 diabetes, which accounts for more than 95% of all diabetes, is showing a greater rate of increase than type 1 diabetes. This review will focus on the anticipated growth of type 2 diabetes over the next decade.

Figure 1. Projected increase in global prevalence of diabetes

Data sourced from Amos et al, 1997.1

Around the world

Although type 2 diabetes is evident in all societies, the prevalence is generally higher in developed countries (figure 2). The reasons for this are complex and warrant a separate review. The global distribution of type 2 diabetes is generally deemed to reflect environmental differences of lifestyle accorded by economic wealth, including improved diet and less physical activity.
exercise as well as better general standards of health and medicine. However the importance of genetic susceptibility must not be underrated since there are many examples of considerable variations in the prevalence of type 2 diabetes amongst different racial groups living in similar socio-economic conditions in the same country. For example 26% of men in Pakistan over 55 years of age have type 2 diabetes, and a similar prevalence is observed amongst men of this age and ethnic background now living in England, compared with about 7% of European men of the same age. In the USA the prevalence of type 2 diabetes in older adults varies substantially in different ethnic groups, ranging from a little over 10% amongst people of European origin, to about 20% of Hispanics and about 50% of native American Pima Indians (figure 3).

The largest numbers of people with type 2 diabetes reside in Asia, and this region is also destined to experience the greatest proportional rise in the prevalence of type 2 diabetes over the next decade. In Asia type 2 diabetes now accounts for less than 2.5% of the population, but it will exceed 3.5% by 2010 (figure 4), with the Indian sub-continent and China expected to experience the brunt of this increase. In India for example, the prevalence of type 2 diabetes is projected to increase from 19 million to 57 million between 1995 and 2025, and a recent study in urban regions of southern India reported an increased prevalence of the condition from 5% in 1985 to 13.9% in 2000. China has experienced a five-fold increase in the prevalence of type 2 diabetes, from 0.6% in the early 1980s to over 3% in the late 1990s. Thus it is anticipated that the number of people with type 2 diabetes in China will increase from 16 million in 1995 to 38 million in 2025.

The lowest prevalence of type 2 diabetes (typically less than 1%) is currently seen amongst African countries, other than South Africa. However the prevalence is likely to increase substantially in most African countries over the coming decade. Interestingly in the Middle East, which includes the oil states, the current prevalence of type 2 diabetes is about 3.5%, and is due to exceed 6.5% by 2010. However, in adult Arab Americans the prevalence of type 2 diabetes is over 18%. Type 2 diabetes already affects more than 3% of people in Latin America, and the prevalence is expected to exceed 4.5% by 2010 (figure 4).

Europe and North America and developed regions of Oceania typically have high prevalence rates for type 2 diabetes, but these regions are predicted to experience proportionally smaller increases in the coming decade. Nevertheless, by 2010 the condition will probably affect 4.3–4.5% of people in Oceania and Europe. In North America where type 2 diabetes already affects about 4.5% of the population, the preva-
ence is expected to rise to 6% by 2010, with a higher than average occurrence amongst some ethnic groups.1,3

Type 2 diabetes in the UK
Various estimates of type 2 diabetes in the UK have been presented in the last two decades, but there is a concerning paucity of wide-ranging or generally applicable data. In the 1980s several small surveys variously assessed the prevalence of all types of diabetes to be in the range 1.0–3.1% in the UK.11,12 However it is not clear that the regions surveyed, or the methods of data collection will have provided representative information for the UK as a whole. Nevertheless these surveys provided valuable insights of particular communities. For example the Poole13 and Oxford14 surveys found an overall diabetes prevalence of just over 1%, which was similar to that of the European population in Southall.15

More recently the 1993 Health and Lifestyle Survey suggested a prevalence of 3.1% in individuals aged over 15 years, and 6.5% in those over 75 years.16 The survey was based on a cohort of over 16 000 adults in England, and suggested that diabetes (all types) affected about 4% of men and 2% of women.16 This is consistent with a greater preponderance of type 2 diabetes in men noted in the United Kingdom Prospective Diabetes Study (UKPDS),17 but reverses the trend towards a greater number of women seen earlier in the last century.18 Since the occurrence of type 2 diabetes is closely associated with obesity and ethnicity it is difficult to find any consistent gender-related data.19

Diabetes UK (formerly British Diabetic Association) has reported the prevalence of all diabetes (diagnosed and undiagnosed) to be about 2.4 million (4% of the population) in the UK, based on data collected in 1993.20 At this time approximately one million people were undiagnosed, leaving the number diagnosed with diabetes at an estimated 1.4 million (2.5% of the population). Within the latter group about 28% were receiving insulin, and 72% were treated by diet and/or oral agents.20

The data reported by Diabetes UK are consistent with pooled data from 10 local diabetes registers which, if extrapolated nationally suggest that more than 1.2 million people have been diagnosed with diabetes in the UK.21 This figure could be increased if areas with a large immigrant population are taken into consideration. Indeed the incidence of diabetes varies widely between regions. For example in 1977–78 an annual incidence of 16 per 100 000 was noted in York, whilst a much higher figure of 100.3 per 100 000 was observed in Wolverhampton.21

The distinction between type 1 and type 2 diabetes is poorly defined in most of the epidemiological surveys and estimates in the UK, but it is assumed that more than 90% of all diabetic patients will have type 2 diabetes. As part of a global analysis it was estimated that in the year 2000 diabetes had a prevalence of 3.5% in the UK (3.2% type 2 and 0.3% type 1).1

Data presented for England and Wales by the Office for National Statistics have shown the prevalence of ‘non-insulin treated diabetes’ in different communities based on samples taken from general practice registers.22 While this is clearly an underestimate of the enormity of the type 2 diabetic population (probably about 20% of type 2 patients receive insulin in the UK) it provides some revealing statistics (figure 5). Type 2 diabetes was consistently higher amongst men than women (approaching a ratio 3:2 in middle life as noted in the UKPDS).17 Comparisons between different communities suggest that ‘non-insulin treated diabetes’ is slightly more common in industrial areas than rural areas (figure 6).22 The prevalence of ‘non-insulin treated diabetes’ was much higher in deprived inner city areas than in so-called prosperous areas.22

Ageing and ethnicity
Declining glucose tolerance is a component of the ageing process, therefore as life expectancy increases a greater proportion of the population moves through impaired glucose tolerance (IGT) to develop type 2 diabetes. This expectation is ver-
ified by the Office of National Statistics which shows that the prevalence of non-insulin treated (presumably type 2) diabetes rises with age (figure 5). A marked increase in the occurrence of type 2 diabetes was evident in those aged over 55, averaging nearly 4% in those of retirement age.

Studies to ascertain both diagnosed and undiagnosed diabetes in the community have unmasked an unexpectedly high number of older people with diabetes. For example, the Islington Diabetes Survey showed that more than 5% of people aged 70–79 had undiagnosed diabetes, whilst the Melton Mowbray study noted that amongst people aged 65–85 years 6% had diagnosed diabetes, with the prevalence of undiagnosed diabetes being 3.3%. A higher prevalence (4.5%) of previously undiagnosed diabetes was noted in a younger age group – 40–65 years – in the Isle of Ely project. The Coventry Diabetes Study also noted that the prevalence of diabetes rises with age and ethnicity, for example European women aged 60–69 years showed a prevalence of 10% whilst their Indo-Asian counterparts had a prevalence of 25% (figure 7). Interestingly previously undiagnosed diabetes was commoner in Europeans, with the survey unmasking type 2 diabetes in two-thirds of Europeans and over one-third of Indo-Asians.

There are ethnic variations in the prevalence of diabetes (figure 3). In the UK people of Afro-Caribbean and Indo-Asian origin have a 2–5-fold higher prevalence of diabetes than those of European origin (figure 8). Indeed there is a five-fold excess prevalence of type 2 diabetes in Asians aged 40–60 years, and about a three-fold excess in Afro-Caribbeans aged 40–64 years. Similar prevalence rates have been reported in these ethnic groups when men aged 40–69 years had diabetes confirmed by a two-hour oral glucose tolerance test in a single study.

In Britain about one person in 15 is from an ethnic minority group, and in general ethnic minorities have a younger age structure than the Europeans population, reflecting past immigration and fertility patterns. For example in 1998–99, 43% of Bangladeshis were under 16 years, compared with 23% and 20% of Afro-Caribbeans and Europeans respectively. However 16% of Europeans were aged 65 and over compared with 9% of Afro-Caribbeans and 3% of Bangladeshis, with both the Afro-Caribbeans and Bangladeshis showing a 1% increase in the ageing population in 1999–2000.

It is noteworthy that type 2 diabetes generally presents at an earlier age in people of Indo-Asian origin, and in one study seven times as many Asians as Europeans were diagnosed between 30 and 64 years of age. People of this age are usually economically active, but their contributions to society are likely to be
reduced since morbidity is increased when IGT and type 2 diabetes are present at a younger age. The age structure of the major ethnic populations in Britain indicates that type 2 diabetes is a major healthcare problem of growing significance.

**Childhood**

Less than 20 years ago type 2 diabetes was generally known as maturity onset diabetes, reflecting its diagnosis in older adults, but the condition is now being diagnosed in people under 20 years of age. In the 1970s there were reports of type 2 diabetes in adolescents from the Amerindians and First Nations populations of North America, but type 2 diabetes in all ethnic groups now accounts for 8–45% of newly diagnosed diabetes in large paediatric centres in the USA.\(^\text{30}\) The incidence of type 2 diabetes in children and adolescents is increasing throughout the world (figure 9), but it was only recognised as a pre-adult condition in the 1990s.\(^\text{30}\) Alarmingly in Singapore, for example the incidence of type 2 diabetes in children attending one hospital rose from an average of only 10 per year, in the mid-late 1990s to more than 50 per year by 2000.\(^\text{31}\)

Obesity is a recognised risk factor for the development of type 2 diabetes in adults and it would appear that the increasing prevalence of type 2 diabetes in childhood is following the growing trend in childhood obesity. For example in Tokyo, between 1975 and 1995, the prevalence of childhood obesity rose from less than 5% to more than 8%, whilst there was a more than three-fold increase in the incidence of type 2 diabetes.\(^\text{30}\)

The link between obesity and diabetes is of particular concern in the UK where the prevalence of childhood obesity is increasing. In 1994 the prevalence of obesity in children aged 4–11 in England was about 2% (boys 1.7%; girls 2.6%) and in Scotland it was nearer 2.5% (boys 2.1%; girls 3.2%),\(^\text{32}\) whilst in the decade 1989–98 the prevalence of obesity almost doubled from 5.4% to 9.2% in children under four years old in England.\(^\text{33}\) In children, direct associations between adiposity and insulin resistance, as well as evidence of other features of metabolic syndrome such as dyslipidaemia have been reported.\(^\text{34}\)

Type 2 diabetes is more prevalent in children from ethnic backgrounds with a high prevalence of type 2 diabetes and in the UK the only published cases have been in children of Indo-

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**Figure 9.** Estimated incidence of type 2 diabetes in children and adolescents

Based on data sourced from Fagot-Campagna 2000.\(^\text{30}\)

**Key messages**

- The global prevalence of diabetes is projected to rise from at least 150 million today to in excess of 220 million in 2010
- There is a wide variation in the prevalence of diabetes amongst different racial groups
- In the UK people of Afro-Caribbean and Indo-Asian origin have a 2–5-fold higher prevalence of diabetes than the indigenous population
- An estimated 4% of the UK population has diabetes, with only 2.5% having the condition diagnosed
- The increasing prevalence of type 2 diabetes in childhood is following the growing trend in childhood obesity
- Type 2 diabetes is more prevalent in children from those ethnic backgrounds with a high prevalence of type 2 diabetes in adulthood
Asian and Arabic origin.\(^{35,36}\) All the children were obese at diagnosis with a positive family history of type 2 diabetes. There are anecdotal accounts of type 2 diabetes being diagnosed in Europeans girls, and a recent study of 34 obese white children detected one child with type 2 diabetes. This study observed metabolic abnormalities predictive of type 2 diabetes, such as hyperinsulinaemia, in the remainder of the cohort.\(^{37}\) In the UK, as in the USA, more girls have been diagnosed with type 2 diabetes and many children present with acanthosis nigricans which provides a cutaneous marker of insulin resistance.\(^{29,34}\)

**Conclusion**

Large increases in world population are predicted during the 21st century, which accompanied by changes in age structure and ethnic mix will swell the rising tide of type 2 diabetes. The burden of type 2 diabetes and its complications pose a major healthcare challenge which, if unchecked is destined to bankrupt healthcare systems. Thus there is an urgent need for major improvements in the prevention, detection and employment of optimal strategies for the treatment of type 2 diabetes.

**References**


