



HbA1c and glycaemic control in Type 1 diabetes

A GLOBAL PERSPECTIVE

Increased HbA1c is associated with microvascular and macrovascular complications in Type 1 diabetes. A new study, covering patients in 19 different countries, shows that the majority do not achieve recommended HbA1c, which has implications for long-term clinical outcomes, as well as for healthcare professionals and policy makers

Twenty years ago, the Diabetes Control and Complications Trial (DCTT) showed that lower HbA1c among people with Type 1 diabetes is associated with a lower risk of early microvascular and neuropathic complications. Follow-up of this patient cohort, in the Epidemiology of Diabetes Interventions and Complications study, confirmed that lower HbA1c also reduces the risk of late macrovascular complications. Thus, many national and international diabetes associations recommend a target HbA1c of 48–58mmol/mol for most people with Type 1 diabetes.

Since the DCTT, there have been some changes in the way Type 1 diabetes is treated. These include the introduction of the insulin analogues, which have a more ‘physiological’ effect, education programmes like Dose Adjustment For Normal Eating and improvements in delivery of continuous subcutaneous insulin infusion. Despite these advances, various national and international audits suggest that there has not been a

corresponding improvement in target HbA1c levels among people with Type 1 diabetes.

Most of these audits have focused on the paediatric population. There is little data relating to glycaemic control among adults with Type 1 in different countries. Therefore, a new paper which compares HbA1c among Type 1 patients of all ages in 19 different countries in Australasia, Europe and North America is of special interest.

International data gathering

Lead authors John McKnight, Western General Hospital, Edinburgh, and Sarah Wild, Centre for Population Health Sciences, Edinburgh, developed a collaboration of diabetes registries through the European Diabetes Epidemiology Group and other contacts. In all, over 30 authors were involved in the study. Data, including age and HbA1c, were supplied in an agreed standardised



Worldwide, HbA1c levels in Type 1 diabetes are higher than recommended

format. The period 2010 to 2013 was studied for all countries, except for New Zealand, where data came from 2005. The registries from which data were drawn were either national, regional or based in a diabetes clinic.

All statistical analyses were carried out on three age groups: less than 15 years, 15–24 years and 25 or over. Where data were available for fewer than 100 people in a country or region, these were not included. Descriptive statistics were then reported for each country or region. Proportions of people with HbA1c < 58mmol/mol, 58–74mmol/mol and ≥ 75mmol/mol were then calculated by age, sex and source of data. Comparison calculations of HbA1c < 58mmol/mol with HbA1c ≥ 58mmol/mol by age group, sex and country were carried out. Data on insulin pump use by sex, country or region was also gathered for each age group.

HbA1c – the international picture

The study obtained data on 324,501 people with Type 1 diabetes from: Western Australia, Austria, Denmark,

England, Champagne-Ardenne (France), Germany, Epirus, Thessaly and Thessaloniki (Greece), Galway (Ireland), several Italian regions, Latvia, Rotterdam (The Netherlands), Otago (New Zealand), Norway, all adult hospital clinics in Northern Ireland, Scotland, Sweden, Volyn (Ukraine) and selected clinics in the USA and Wales. Data were available for people aged < 15 years from 11 countries or regions and aged ≥ 25 years from 17 countries or regions. Sample size varied from 355 (Greek clinic data) to 213,960 (English and Welsh National Diabetes Audit data).

Median HbA1c levels varied between 57 and 79mmol/mol according to country and age group. For instance, in the under-15 age group, median HbA1c was highest in Latvian children and lowest in Austrian, German and Italian children. In the older age groups, however, median HbA1c was highest in Scottish individuals and lowest in Ukrainian individuals. The highest proportion with HbA1c ≥ 58mmol/mol were lower in data from clinics than from population-based data sources, at 66.2 per cent and 73.0 per

cent respectively. The highest proportion with HbA1c ≥ 58mmol/mol was among Irish individuals in the 15–24 age group at 91.1 per cent, and the lowest was among German individual age ≥ 25 years at 46.4 per cent. Finally, the highest proportion with HbA1c ≥ 75mmol/mol was found among Latvian under-15s at 58.0 per cent, while the lowest proportion occurred among Dutch individuals in the ≥ 25-year age group at 7.8 per cent.

Overall, the 15–24 age group had lower proportions of people with HbA1c < 58mmol/mol than the older and younger age groups. The proportions of those with HbA1c < 58mmol/mol was lower among females than among males across all three age groups. Analysis of the whole database showed that 7.1 per cent of people had HbA1c < 48mmol/mol, 8.7 per cent were in the 48–53mmol/mol category and 12.3 per cent were in the 53–58mmol/mol category. Finally, there was wide variation in the use of insulin pump therapy between populations. This could be due to selection bias among the clinic populations. In population-based registers, however, pump use varied from 1–93 per cent. In most age and country groups, a higher proportion of females than males used insulin pump therapy.

Spotlight on teenagers and young adults

This study shows that the majority of people with Type 1 diabetes around the world do have higher than recommended HbA1c levels. They are thus at higher risk of both microvascular and macrovascular complications than those with better glycaemic control. The data also show that those in the 15–24 age group tend to have higher HbA1c than those in younger and older age groups. Other research has also revealed that teenagers and young adults face special challenges in managing their blood glucose. This arises not just from the emotional lability that may accompany the transition to adulthood, but also from practical issues around leaving the parental home and starting work or university.

Typically, the transition from paediatric to adult care occurs between the age of 15 to 24 years. This new study suggests that this transition needs to be better managed to improve HbA1c levels and subsequent outcomes. It could be worthwhile carrying out a more detailed analysis of glycaemic control in this age group, perhaps comparing the impact of social structures in different countries. Maybe this would provide insights and

suggest strategies to better support young people with Type 1 diabetes.

National and regional variations

This study identifies significant differences in diabetes control between countries and regions. Different approaches to the identification of Type 1 diabetes may have influenced this variation. The authors also suggest a number of other factors which may contribute to the variations observed – namely, differences in:

- diabetes education
- frequency of contact between the patient and diabetes team
- ethnic/racial/cultural diversity
- socioeconomic status
- rural/urban locations and impact on travel to diabetes centre
- access to specialist care and treatments
- training of diabetes healthcare professionals
- HbA1c goals recommended by national or regional organisations.

Analysis of the data showed no obvious connection between glycaemic control and type of health service, gross domestic

product (GDP) per capita, or proportion of GDP spent on healthcare. The GDP per capita varied from \$23,028 for Latvia to \$65,461 for Norway. Proportion of GDP per capita spent on healthcare varied from 6.0 per cent for Latvia to 12.4 per cent for The Netherlands.

Lessons to be learned

This new report is the first very large international study of glycaemic control among people with Type 1 diabetes that covers all age groups. It reveals that there is room for improvement in glycaemic control in all 19 countries surveyed. The findings raise some important questions for healthcare professionals to consider, such as:

- Why do the majority of people with Type 1 diabetes in all populations have high-risk glucose levels?
- Does the widespread failure to achieve good glycaemic control arise from a fundamental limitation of available therapies, or are optimal treatments and systems of care not being deployed as effectively as they could be?
- Can further data be gathered to explain the variation in HbA1c between

countries and can this information be used to improve outcomes for patients?

The authors hope that their findings can act as a stimulus to all countries to carry out a critical evaluation of obstacles to better treatment outcomes in their patients with Type 1 and use this to take corrective action where possible. Furthermore, individual clinics and practitioners should be encouraged to undertake regular reviews of the HbA1c profile of their local population. This can be used to drive quality improvement programmes targeting better glycaemic control, which will lead to a brighter long-term outlook for Type 1 patients.

i This is a digested version of **McKnight JA, Wild SH and Lamb MJE et al (2015). Glycaemic control of Type 1 diabetes in clinical practice early in the 21st century: an international comparison. *Diabetic Medicine* 32 (8); 1036–1050. To download the article, go to: <http://onlinelibrary.wiley.com/doi/10.1111/dme.12676/pdf>**

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