Implications of developing type 2 diabetes in childhood

Julian Hamilton-Shield
Professor of Diabetes and Metabolic Endocrinology, University of Bristol & Bristol Royal Hospital for Children

A significant proportion of our child and adolescent population in the UK are overweight, as recent figures suggest that around one in five children aged 11–15 year of age are obese (Public Health England, 2014). The rise in child and adolescent obesity has come with a parallel increase in the numbers of young people developing type 2 diabetes and presenting to paediatric diabetes units. Whilst figures from the National Paediatric Diabetes Audit 2013–14 show that type 1 diabetes is by far and away the most common form of diabetes treated in paediatric and young adult diabetes clinics (n=25 357), there are now sufficient numbers of children and young people with type 2 diabetes (n=507 [Royal College of Paediatrics and Child Health, 2015]) that the majority of UK clinics will need to deal with a clinical problem that is new to our speciality. Type 2 diabetes disproportionately affects the most deprived in socio-economic terms and is far more frequent amongst those of South-Asian extraction, accounting for 10% of South-Asian children with diabetes (Royal College of Paediatrics and Child Health, 2015). Thus, some clinics where there is a large South-Asian population, such as the West Midlands and London, carry a disproportionate burden of cases. The audit has also revealed that nearly all cases of type 2 diabetes diagnosed in childhood occur around puberty, just over two-thirds of cases are female and most have a strong family history of type 2 diabetes, usually in a parent.

There are particular problems in managing adolescents with type 2 diabetes. Unlike type 1 diabetes, weight management is a cornerstone of treatment in type 2 diabetes. Despite this, in a previous UK study of type 2 diabetes management in the first year after diagnosis, only 15% of children managed to lose more than 0.5 kg/m^2 of a BMI standard deviation score (Shield et al, 2009). Furthermore, a study from Germany demonstrated that 60% of adolescents diagnosed with type 2 diabetes had dropped out of clinic attendance within 2 years of diagnosis (Reinehr et al, 2008), a finding anecdotally in accordance with my experience and experiences of other UK clinics. Furthermore, compliance with medication regimens tends to be poor (Turner et al, 2015). Perhaps not surprisingly, given these negative attitudes to compliance, the prognosis for those with type 2 diabetes diagnosed in childhood is currently woeful. Whilst we do not have UK data available yet, evidence from across the Atlantic suggests that levels of morbidity and mortality are far higher in those with type 2 diabetes than in those diagnosed with type 1 diabetes in childhood. Many more adolescents with type 2 diabetes have evidence of kidney disease, hypertension and dyslipidaemia at diagnosis (Amed et al, 2010). Furthermore, current figures suggest that within 20 years of diagnosis, 50% of children with type 2 diabetes will have developed a serious comorbidity, such as end-stage renal disease, blindness or limb amputation. To put this in context, very few people with type 1 diabetes will have any of these complications 20 years after diagnosis (Dart et al, 2014).

It is probably fair to conclude we simply do not have the answers for optimising type 2 diabetes management in adolescence at present. We are hampered by the relative rarity of the condition, the understandable greater emphasis on well-developed guidelines for type 1 diabetes in childhood and the difficulty engaging this particular group of individuals. However, we will do our patients a disservice if we ignore evidence from adult practice that might be transferable into paediatric clinics. The use of glucagon-like-peptide 1 (GLP-1) receptor agonists in adults improves glycaemic control and aids weight loss (Garber et al, 2011). Whilst GLP-1 receptor agonists are not yet licenced for children, we do have some evidence that adolescents attain the same benefits (Turner et al, 2015) although a full clinical trial is required to establish efficacy and safety. Another area worth exploring is that of bariatric surgery. Data from a large adolescent study in Sweden has demonstrated excellent weight loss

and improvements in metabolic status in severely obese adolescents after laparoscopic Roux-en-Y gastric bypass, although around 33% had an adverse event following bypass surgery (Olbers et al, 2012). Finally and perhaps most importantly, if the prognosis is to improve we need to understand why this group is hard to engage, what specific barriers reduce compliance and how to overcome these obstacles. ■

Amed S, Dean H, Panagiotopoulos C et al (2010) Type 2 diabetes, medication-induced diabetes, and monogenic diabetes in Canadian children: a prospective national surveillance study. *Diabetes Care* **33**: 786–91

Dart AR, Mratens PJ, Rigatto C et al (2014) Earlier onset of complications in youth with type 2 diabetes. *Diabetes Care* **37**: 436–43

Garber AJ (2011) Long-acting glucagon-like peptide 1 receptor agonists: a review of their efficacy and tolerability. *Diabetes Care* **34**(Suppl 2): S279–84

Olbers T, Gronowitz E, Werling M et al (2012) Two-year outcome of laparoscopic Roux-en-Y gastric bypass in adolescents with severe obesity: results from a Swedish Nationwide Study (AMOS). *Int J Obes (Lond)* **36**: 1388–95

Public Health England (2014) *Child weight data factsheet*. Public Health England, London. Available at http://bit.ly/1S2cQGc (accessed 29.06.15)

Reinehr T, Schober E, Roth CL et al (2008) Type 2 diabetes in children and adolescents in a 2-year follow-up: insufficient adherence to diabetes centers. *Horm Res* **69**: 107–13

Royal College of Paediatrics and Child Health (2015) *National Paediatric Diabetes Audit 2013-14. Report 1: Care processes and outcomes*. RCPCH, London. Available at http://bit.ly/1AObRXV (accessed 29.06.15)

Shield JP, Lynn R, Wan KC et al (2009) Management and 1 year outcome for UK children with type 2 diabetes. *Arch Dis Child* **94**: 206–9

Turner KM, Percival J, Dunger DB et al (2015) Adolescents' views and experiences of treatments for type 2 diabetes: a qualitative study. *Diabet Med* **32**: 250–6

"If the prognosis for children with type 2 diabetes is to improve, we need to understand why this group is hard to engage, what specific barriers reduce compliance and how to overcome these obstacles."