

## Early-onset type 2 diabetes

### Recommendations

Recommendation	Reference	Grade*
All children, adolescents and young adults (aged <25 years) with type 2 diabetes should be referred to an endocrinologist or, if not accessible, a specialist physician with an interest in diabetes	RACGP Diabetes Handbook working groups, 2020	Consensus
For people aged ≥25 years with early-onset type 2 diabetes, due to the complexity of management and higher risk of complications, consider timely referral to an endocrinologist and/or management through a shared care arrangement	RACGP Diabetes Handbook working groups, 2020	Consensus

\*Refer to '[Explanation and source of recommendations](#)' for explanations of the levels and grades of evidence.

### Clinical context

In recent years there has been an increase in the incidence and prevalence of type 2 diabetes in children, adolescents and young adults.<sup>1,2</sup> This early-onset (also called 'young-onset') type 2 diabetes is concerning, as it results in a longer lifetime exposure to hyperglycaemia and the consequent complications. There is also emerging evidence that early-onset type 2 diabetes is a more aggressive disease compared with later-onset type 2 diabetes, and is accompanied by earlier onset and more rapid progression of macrovascular and microvascular complications.<sup>2-4</sup>

### Definitions and diagnosis

Early-onset type 2 diabetes is usually defined as occurring under the age of 40 years. This can be further separated into child and adolescent (<18 years) and young adult (<25 years). However, there is no consistency of definitions across the literature, especially of the upper age limit. Although this handbook refers only to the young adult group, there is clearly a continuum across the age groups.

Unlike older-onset type 2 diabetes, this group can offer a diagnostic challenge for general practitioners (GPs) to differentiate between type 1 diabetes, latent autoimmune disease of adults, type 2 diabetes and maturity-onset diabetes of the young (MODY; Table 1). Careful diagnostic assessment is required, as this has a major impact on management and outcome.<sup>5</sup>

For children and adolescents, hyperglycaemia (at levels diagnostic of diabetes) can be a medical emergency, and immediate referral to an emergency department or, if not available, urgent consultation with a specialist is strongly recommended. Refer to The Royal Australian College of General Practitioners' (RACGP's) [Emergency management of hyperglycaemia in primary care](#) for more information.

**Table 1. Comparison of type 1 diabetes, type 2 diabetes and maturity-onset diabetes of the young (MODY)<sup>5-7</sup>**

	Type 1 diabetes	Type 2 diabetes	MODY
<b>Proportion of cases of diabetes onset at young age</b>	In general population: >90%	In general population: <10% Among Aboriginal and Torres Strait Islander peoples: 89% (20–29 years) 97% (30–39 years) More prevalent in young people of Pacific Islander, Hispanic or Asian background	1–3%
<b>Clinical features</b>			
Usual onset	Acute	Insidious	Variable
Osmotic symptoms	Pronounced	Often not present, but can be severe in some cases	Variable
Ketosis	Usually present	Unlikely to be present (except in people of Afro-Caribbean origin)	Common in neonatal forms; rare in others
Obesity	Can co-exist as per general population	Often obese – up to 85%	Usually not obese
Signs of insulin resistance (eg acanthosis nigricans)	Rare	Often present	Rare
<b>Family history in parents</b>	2–4%	80%	90%
<b>Diagnostic aid biomarkers</b>			
Antibodies	IAA, ICA, GAD, IA-2, IA-2 $\beta$ , or ZnT8 antibodies present in 85–95% of cases	Usually not present	Not present
C-peptide	Below normal range (<0.2 nmol/L) <sup>8</sup>	Normal or above normal range (>0.2 nmol/L) <sup>8</sup>	Normal

## Screening and risk factors

Risk factors for early-onset type 2 diabetes include overweight/obesity, sedentary behaviour, lower socioeconomic status, ethnicity (eg Australian Aboriginal and Torres Strait Islander peoples, Pacific Islander, Hispanic, Asian peoples), a strong family history of type 2 diabetes, previous gestational diabetes, in utero exposure to type 2 diabetes and low birth weight. The risk is also significantly higher in women diagnosed with polycystic ovary syndrome.<sup>2,5,9</sup>

There are no specific tools currently available for screening or early detection of early-onset type 2 diabetes, other than maintaining a high index of suspicion, especially in high-risk groups.

## Treatment challenges

Compared with late-onset type 2 diabetes, the early-onset group is more likely to have sub-optimal glycaemic control, diastolic hypertension, earlier need to initiate insulin, and a greater burden of diabetes-related complications (Box 1), resulting in a reduced quality of life, greater morbidity and premature mortality.

In early-onset type 2 diabetes, life expectancy is reduced by 14 years in males and 16 years in females compared with their non-diabetic cohort.<sup>2</sup> An Australian study showed 11% mortality over 20 years in a cohort of young adults diagnosed between 15 and 30 years of age.<sup>10</sup>

### Box 1. Complications in early-onset type 2 diabetes compared with older-onset type 2 diabetes<sup>2,9</sup>

Lifetime risk of complications greater with onset at a younger age

Life expectancy reduced

Non-alcoholic fatty liver disease is twice as common

Earlier onset of microalbuminuria and end-stage renal failure

Earlier onset and greater prevalence of diabetic retinopathy

Earlier onset of neuropathy

Apolipoprotein B concentration is higher despite statin therapy

Risk of myocardial infarction is 14 times higher compared with age cohort, while older-onset type 2 diabetes risk is 2–4 times higher

Early-onset of diastolic myocardial dysfunction

Reduced fertility, and greater pregnancy complications

Risk of premature decline in cognitive function

Higher rate of diabetes-related psychological distress and psychological issues, especially depression

Limited work capacity and consequent socioeconomic impact

Reduced quality of life

## In practice

Treatment of early-onset type 2 diabetes is limited by a lack of evidence, and current recommended treatment strategies are extrapolated from the evidence base for older-onset type 2 diabetes.<sup>5</sup>

Structured education is fundamental to long-term self-care. However, there are obstacles in engaging young adults, including a lack of specific programs for their needs and higher rates of diabetes-related distress, depression and other socioeconomic issues that may adversely impact their participation.

Lifestyle changes, including weight loss and exercise, are recommended as first-line therapy. However, limited studies are available to inform management. While lifestyle changes can provide benefits, emerging evidence suggests these changes are not maintained once the program ceases, and there is no evidence that the period of benefit provides any protection against future cardiovascular disease. Limited data suggest that metabolic surgery may be a treatment option for some.<sup>9</sup>

Use of glucose-lowering medication is generally extrapolated from management algorithms for older-onset type 2 diabetes patients. There is a paucity of data, especially with the newer therapies, in people aged <18 years. It is likely that early-onset type 2 diabetes patients will require early initiation of insulin.<sup>5</sup>

Treatments to address cardiovascular risk factors are again based on evidence from older patient groups. To reduce lifetime risk of coronary heart disease, early and aggressive treatment of cardiovascular risk factors in young people with type 2 diabetes is recommended;<sup>9,11</sup> however, there is evidence that use of cardioprotective treatments, such as statins and anti-hypertensive medication, in the younger age group is suboptimal.<sup>2</sup> This might be due to reluctance by doctors to prescribe such lifelong therapies to younger people, especially women,<sup>9</sup> and the fact that cardiovascular risk calculators are reliable in older age groups only.

Adherence to medication and follow-up is also a problem in younger age groups. This can be a challenge for adequate management, and it emphasises the need for education and for healthcare providers to ensure they provide accessible, patient-centred, coordinated and continuous effective care during this period.

Pre-pregnancy counselling and/or contraception is imperative in this age group to offset preventable diabetes-related pregnancy and fetal complications (refer to the section '[Type 2 diabetes, reproductive health and pregnancy](#)').

It is recommended that all child, adolescent and young-adult (aged <25 years) patients with type 2 diabetes be referred to an endocrinologist or, if not accessible, a specialist physician with an interest in diabetes. For patients aged ≥25 years with early-onset type 2 diabetes, consider referral and/or shared care, as management can be difficult and there is a high burden of complications.

## References

1. Cho N, Shaw J, Karuranga S, et al. IDF Diabetes atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. *Diabetes Res Clin Pract* 2018;138:271–81.
2. Lascar N, Brown H, Pattison A, et al. Type 2 diabetes in adolescents and young adults. *Lancet Diabetes Endocrinol* 2018;6(1):69–80.
3. Hillier T, Pedula K. Complications in young adults with early-onset type 2 diabetes. *Diabetes Care* 2003;26(11):2999.
4. Al-Saeed A, Constantino M, Molyneaux L, et al. An inverse relationship between age of type 2 diabetes onset and complication risk and mortality: The impact of youth-onset type 2 diabetes. *Diabetes Care* 2016;39(5):823–29.
5. Htike A, Webb D, Khunti K, Davies M. Emerging epidemic and challenges of type 2 diabetes in young adults. *Diabetes Manag* 2015;5(6):473–83.
6. Australian Institute of Health and Welfare. Type 2 diabetes in Australia's children and young people: A working paper. Diabetes Series no. 21. Cat. no. CVD 64. Canberra: AIHW, 2014.
7. Kao K-T, Sabin MA. Type 2 diabetes mellitus in children and adolescents. *Aust Fam Physician* 2016;45(6):401–06.
8. Leighton E, Sainsbury CAR, Jones GC. A practical review of C-peptide testing in diabetes. *Diabetes Ther* 2017;8(3):475–87.
9. Wilmot E, Idris I. Early onset type 2 diabetes: Risk factors, clinical impact and management. *Ther Adv Chronic Dis* 2014;5(6):234–44.
10. Constantino M, Molyneaux F, Limacher-Gisler A, et al. Long-term complications and mortality in young-onset diabetes. *Diabetes Care* 2013;36:3863–69.
11. Rhodes ET, Presser LA, Hoerger TJ, Lieu T, Ludwig DS, Laffel LM. Estimated morbidity and mortality in adolescents and young adults diagnosed with type 2 diabetes mellitus. *Diabet Med* 2012;29(4):453–63.

## Further reading

- Alberti G, Zimmet P, Shaw J, Bloomgarden Z, Kaufman F, Silink M. Type 2 diabetes in the young: The evolving epidemic: The International Diabetes Federation consensus workshop. *Diabetes Care* 2004;27:179.
- Arslanian S, Bacha F, Grey M, Marcus MD, White NH, Zeitler P. Evaluation and management of youth-onset type 2 diabetes: A position statement by the American Diabetes Association. *Diabetes Care* 2018;41(12):2648–68.
- Azzopardi P, Brown AD, Zimmet P, et al; Baker IDI Heart, Diabetes Institute. Type 2 diabetes in young Indigenous Australians in rural and remote areas: Diagnosis, screening, management and prevention. *Med J Aust* 2012;197(1):32–36.
- Charles J, Pollack A, Britt H. Type 2 diabetes and obesity in young adults. *Aust Fam Physician* 2015;44(5):269–70.
- Chen L, Magliano DJ, Zimmet PZ. The worldwide epidemiology of type 2 diabetes mellitus – Present and future perspectives. *Nat Rev Endocrinol* 2011;8(4):228–36.
- Ke C, Lau E, Shah BR, et al. Excess burden of mental illness and hospitalization in young-onset type 2 diabetes: A population-based cohort study. *Ann Intern Med* 2019;170(3):145–54.
- Nadeau KJ, Anderson BJ, Berg EG, et al. Youth-onset type 2 diabetes consensus report: Current status, challenges, and priorities. *Diabetes Care* 2016;39:1635.
- Sattar N, Rawshani A, Franzén S, et al. Age at diagnosis of type 2 diabetes mellitus and associations with cardiovascular and mortality risks findings from the Swedish National Diabetes Registry. *Circulation* 2019;139(19):2228–37.
- Song SH. Complication characteristics between young-onset type 2 versus type 1 diabetes in a UK population. *BMJ Open Diabetes Res Care* 2015;3(1):e000044.

### Disclaimer

The information set out in this publication is current at the date of first publication and is intended for use as a guide of a general nature only and may or may not be relevant to particular patients or circumstances. Nor is this publication exhaustive of the subject matter. It is no substitute for individual inquiry. Compliance with any recommendations does not guarantee discharge of the duty of care owed to patients. The RACGP and its employees and agents have no liability (including for negligence) to any users of the information contained in this publication.

© The Royal Australian College of General Practitioners 2020

This resource is provided under licence by the RACGP. Full terms are available at [www.racgp.org.au/usage/licence](http://www.racgp.org.au/usage/licence)

*We acknowledge the Traditional Custodians of the lands and seas on which we work and live, and pay our respects to Elders, past, present and future.*