

Suboptimal Glycaemic Control and Its Contributing Factors in Children and Adolescents with Type 1 Diabetes

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Type 1 diabetes (T1D) is a chronic autoimmune disease characterized by destruction of pancreatic beta cells, leading to absolute insulin deficiency. The disease progresses from asymptomatic autoimmunity to overt diabetes requiring lifelong insulin therapy.¹

The global burden of T1D is increasing, particularly among children and adolescents. In 2024, an estimated 9.15 million individuals were living with T1D worldwide, including 1.81 million under 20 years of age.² Several Arab countries rank among those with the highest incidence rates in children.³ In this issue of the Journal of the Best Available Evidence in Medicine, Boud et al. provide further evidence regarding the increasing incidence of the disease in Libya, amounting to over 9,000 children and adolescents living with T1D.⁴⁻⁶

Achieving optimal glycaemic control remains a major challenge, especially in resource-limited settings. Advances such as continuous glucose monitoring, insulin pumps, and hybrid closed-loop systems have improved outcomes in high-income countries, but limited access restricts their use elsewhere.

Poor glycaemic control is strongly associated with acute complications such as hypoglycaemia and diabetic ketoacidosis, as well as long-term microvascular and macrovascular complications.⁷⁻⁹ Evidence from the DCCT and EDIC studies shows that intensive glycaemic control significantly reduces complication risk, particularly when achieved early.^{8,9} Current guidelines recommend maintaining HbA1c levels below 7.5% (58 mmol/mol) in children and adolescents.¹⁰

Boud et al. highlight how suboptimal glycaemic control remains highly prevalent, which is a challenge to 70–90% of children with T1D in resource-limited settings.^{4,5} Multiple factors contribute to this problem. Socioeconomic factors—including low income, limited healthcare access, and reduced parental supervision—are consistently linked to poorer outcomes.¹¹ Parental education, particularly maternal education, plays a key role.^{11,12} Modifiable factors are especially important. Poor adherence to insulin therapy, inadequate glucose monitoring, improper carbohydrate counting, unhealthy diet, and obesity all contribute to elevated HbA1c levels.^{11,12} Studies also highlight associations with age, caregiver education, and dietary patterns.^{13,14} Addressing these factors through structured education and improved access to supplies can significantly improve control.

Adolescence presents additional challenges. Puberty is associated with increased insulin resistance, while behavioural factors such as risk-taking and reduced adherence complicate disease management.^{15,16} Children aged 10–14 years are particularly vulnerable to poor control, especially when obesity is present.¹⁶ Boud et al. emphasize the importance of practical issues such as prolonged use of insulin pens without adequate needle replacement may lead to poor glycaemic control, highlighting a simple but modifiable barrier to effective management.⁴ However, improving glycaemic control requires a comprehensive, context-sensitive approach: early identification of at-risk children allows for targeted interventions, including structured education, nutritional counselling, and enhanced parental involvement. Similarly, ensuring access to essential supplies and technologies is equally important.

In conclusion, suboptimal glycaemic control in children and adolescents with T1D remains a major public health challenge, particularly in resource-limited set-

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tings such as Libya.⁴ Rising incidence, socioeconomic disparities, limited access to advanced technologies, and the challenges of adolescence all contribute to poor outcomes. A coordinated, family-centred approach is essential to improve glycaemic control and reduce long-term complications.

Disclosure Statement

The author declares no conflicts of interest.

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