

Review Article

Diabetes Management Challenges During Intermittent Fasting Among Adolescents: A Narrative Review of Recent Evidence

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Abstract

Intermittent fasting is increasingly practiced by adolescents for religious, cultural, and lifestyle reasons, yet its implications for diabetes management during this critical developmental period remain insufficiently defined. Adolescents with diabetes represent a uniquely vulnerable population due to pubertal insulin resistance, dynamic hormonal changes, evolving self-management capacity, and heightened psychosocial influences. This narrative review synthesizes evidence from the past 10–15 years on the glycemic, metabolic, treatment-related, psychosocial, and health system challenges associated with intermittent fasting among adolescents with diabetes. Available evidence indicates that fasting may increase the risk of hypoglycemia, hyperglycemia, ketosis, dehydration, and psychological distress, with risk profiles varying by diabetes type, fasting pattern, treatment regimen, and sociocultural context. Insulin-treated adolescents, particularly those with type 1 diabetes, are at heightened risk of acute metabolic decompensation, while those with type 2 diabetes face challenges related to medication tolerability, hydration, and adherence. Psychosocial factors, including peer influence, social media-driven fasting behaviors, family expectations, and faith-based obligations, play a central role in shaping fasting decisions and safety. Structural inequities, including limited access to diabetes technologies and inconsistent clinical guidance, further exacerbate risk, especially in low- and middle-income settings. This review highlights the need for individualized, context-sensitive management strategies grounded in pre-fasting risk assessment, shared decision-making, tailored treatment and monitoring adaptations, and adolescent-centered education. Future research priorities include adolescent-specific clinical trials, longitudinal evaluation of developmental outcomes, integration of behavioral science with endocrinology, and the development of ethical, evidence-based guidelines to support safe fasting practices in this population.

1. Introduction

Diabetes mellitus among adolescents has emerged as a major and growing global public health concern. The incidence of type 1 diabetes continues to rise worldwide. In contrast, type 2 diabetes, once considered rare in youth, is increasingly diagnosed in adolescents in

parallel with escalating rates of obesity, sedentary behavior, and cardiometabolic risk. This dual burden exposes adolescents to early-onset complications, lifelong treatment dependence, and substantial psychosocial stress during a critical period of physical and neurodevelopment [1, 2].

Concurrently, intermittent fasting (IF) has gained popularity among adolescents for diverse reasons, including religious observance (notably Ramadan), cultural practices, perceived metabolic or weight-control benefits, and lifestyle trends amplified by social media [3]. While fasting is often regarded as benign or even beneficial in healthy individuals, its application in adolescents with diabetes presents complex clinical challenges. Adolescence is characterized by dynamic hormonal changes, pubertal insulin resistance, evolving self-management capacity, and heightened sensitivity to peer and social influences, all of which may destabilize glycemic control during prolonged or repeated fasting periods [4, 5].

1.1. Rationale for the Review

Despite the increasing convergence of adolescent diabetes and intermittent fasting, clinical guidance remains fragmented and largely extrapolated from adult populations. Existing recommendations are frequently limited to short-term religious fasting or based on expert opinion rather than robust adolescent-specific evidence. Moreover, adolescents are systematically underrepresented in fasting-related diabetes studies, resulting in significant gaps in understanding age-specific metabolic responses, behavioral risks, and safety thresholds [6].

Given the expanding adoption of IF and the heterogeneity of fasting patterns, there is a pressing need to synthesize contemporary evidence spanning clinical outcomes, metabolic effects, treatment challenges, and psychosocial dimensions. A focused narrative review integrating findings from the past 10–15 years can clarify areas of consensus and controversy, identify knowledge gaps, and support more nuanced, adolescent-centered clinical decision-making.

1.2. Objectives and Review Questions

The primary objective of this narrative review is to critically synthesize recent evidence on diabetes management challenges during intermittent fasting among adolescents, with emphasis on clinical safety, metabolic stability, and psychosocial well-being.

Specifically, this review addresses the following questions:

- What are the principal glycemic, metabolic, and psychosocial challenges associated with intermittent fasting in adolescents with diabetes?
- How do these challenges vary according to diabetes type (type 1 vs type 2), fasting pattern, and sociocultural context?
- What evidence-informed strategies have been proposed or evaluated to mitigate risk and optimize outcomes in adolescents who fast?

By addressing these questions, this review aims to inform clinical practice, guide patient and family counseling, and highlight priorities for future adolescent-focused research and guideline development.

This review prioritizes evidence derived from adolescent populations. However, due to the limited number of fasting-related diabetes studies conducted exclusively in adolescents, selected adult studies were included to provide mechanistic and contextual insight. Adult-derived evidence is explicitly identified throughout the manuscript and should be interpreted cautiously, as adolescents differ from adults in pubertal physiology, insulin sensitivity, growth requirements, psychosocial development, and self-management capacity.

2. Conceptual and Physiological Framework

This section outlines the mechanistic basis through which intermittent fasting interacts with adolescent physiology and diabetes pathophysiology, providing a foundation for interpreting clinical risks and management challenges.

2.1. Intermittent Fasting Patterns Relevant to Adolescents

Intermittent fasting encompasses heterogeneous eating–fasting cycles that differ in duration, frequency, and intent, each with distinct implications for glycemic control in adolescents with diabetes.

Time-restricted eating (TRE) typically confines daily caloric intake to a defined window (e.g., 6–10 hours), extending the overnight fast. Although often perceived as low risk, TRE may overlap with school schedules, physical activity, and nocturnal insulin action, increasing vulnerability to unrecognized hypoglycemia [7].

Alternate-day fasting (ADF) involves fasting or severe caloric restriction on alternating days. This pattern is uncommon in clinical pediatric practice but may be adopted informally through online trends. Its prolonged fasting intervals pose substantial risks for adolescents requiring continuous glucose availability and stable insulin dosing [8].

Religious fasting, most prominently Ramadan, entails daily abstinence from food and drink from dawn to sunset over several weeks. This pattern introduces predictable but prolonged fasting periods, meal timing shifts, and altered sleep cycles, all of which challenge conventional diabetes management regimens [9].

Informal or social-media–driven fasting behaviors represent an emerging concern. Adolescents may engage in unsupervised fasting for weight control or perceived health benefits, often without medical guidance, increasing the risk of unsafe insulin omission, dehydration, and disordered eating behaviors [10].

2.2. Adolescent Metabolic and Hormonal Considerations

Adolescence is marked by profound metabolic and hormonal changes that fundamentally alter glucose homeostasis [11]. Pubertal insulin resistance, driven by increases in growth hormone and sex steroids, results in higher basal and prandial insulin requirements compared with prepubertal children. During fasting, this physiological insulin resistance can amplify glycemic variability and complicate dose adjustments [12].

Fluctuations in growth hormone and cortisol, particularly overnight and in the early morning, enhance hepatic glucose production and lipolysis. When combined with prolonged fasting, these counter-regulatory responses may precipitate early-morning hyperglycemia or, conversely, late-day hypoglycemia once hepatic glycogen stores are depleted [13].

Ongoing neuroendocrine maturation and elevated energy demands further distinguish adolescents from adults. Adequate and regular energy intake is essential for growth, pubertal progression, and cognitive function, rendering prolonged or repeated fasting potentially disruptive to both metabolic stability and developmental trajectories [14].

2.3. Pathophysiology of Fasting in Diabetes

Fasting in individuals with diabetes alters the balance between insulin action and glucose counter regulation, primarily through glucagon, catecholamines, cortisol, and growth hormone. In healthy adolescents, these mechanisms maintain euglycemia during fasting; however, in diabetes, impaired insulin delivery or action destabilizes this balance [15].

The most immediate risk during fasting is hypoglycemia, particularly in insulin-treated adolescents who continue basal insulin without adequate caloric intake. Conversely, hyperglycemia and ketosis may occur when insulin doses are inappropriately reduced or omitted, increasing the risk of diabetic ketoacidosis, especially in type 1 diabetes. Dehydration, exacerbated by prolonged fluid restriction during religious fasting, further compounds these risks by impairing renal glucose clearance and concentrating ketone bodies [16].

Importantly, pathophysiological responses differ between insulin-dependent and non-insulin-dependent states. Adolescents with type 1 diabetes are uniquely vulnerable to rapid metabolic decompensation during fasting, whereas those with type 2 diabetes may experience relative glycemic stability but remain at risk for hypoglycemia with insulin or insulin secretagogues. These distinctions underscore the need for diabetes-type-specific risk assessment and management strategies [17].

The interaction between intermittent fasting patterns, adolescent physiological modifiers, and diabetes-related metabolic and psychosocial risks is summarized in Figure 1.

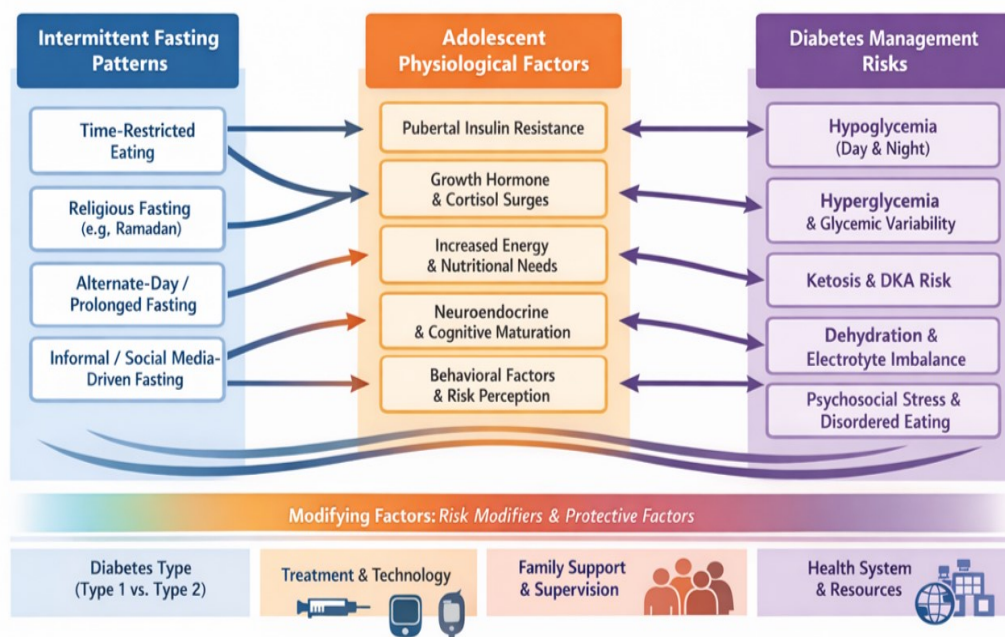


Figure 1: Conceptual framework linking intermittent fasting, adolescent physiology, and diabetes management risks

Figure 1 Intermittent Fasting–Related Mechanisms and Diabetes Management Risks in Adolescents. Conceptual framework showing how intermittent fasting interacts with adolescent physiology to influence glycemic, metabolic, and psychosocial risks in diabetes management, with effects modified by diabetes type, treatment, and contextual factors.

3. Methods

3.1. Review Design

This study was conducted as a narrative review incorporating systematic elements to ensure transparency, reproducibility, and balanced evidence synthesis. A narrative approach was selected to accommodate the substantial heterogeneity in fasting patterns, study designs, outcome measures, and age group definitions across the available literature, which precluded formal meta-analysis. Systematic components including a predefined search strategy, explicit eligibility criteria, and structured thematic synthesis were integrated to enhance methodological rigor.

3.2. Literature Search Strategy

A structured literature search was performed across PubMed/MEDLINE, Scopus, and Web of Science to identify relevant studies published between January 2010 and December 2025. This time frame was selected to capture contemporary fasting practices, advances in diabetes management technologies, and evolving adolescent health contexts.

Search terms combined controlled vocabulary and free-text keywords related to adolescents, diabetes, and fasting practices, including: “adolescent,” “youth,” “children,” “diabetes mellitus,” “type 1 diabetes,” “type 2 diabetes,” “intermittent fasting,” “time-restricted eating,” “Ramadan fasting,” and “religious fasting.” Reference lists of relevant reviews and clinical guidelines were also manually screened to identify additional pertinent studies.

3.3. Study Selection and Eligibility Criteria

The database search yielded approximately 300–350 records. Following removal of duplicates and title–abstract screening, about 70–80 articles were assessed in full text. Of these, approximately 40–45 publications were included in the final synthesis.

Studies were eligible for inclusion if they:

- Addressed intermittent fasting or prolonged fasting practices in individuals with diabetes
- Included adolescents (generally defined as ages 10–19 years), or mixed-age populations with findings relevant to adolescents
- Reported metabolic, glycemic, treatment-related, psychosocial, or health system outcomes

When adolescent-specific data were unavailable, adult studies were included selectively for mechanistic or contextual insight and were explicitly identified as extrapolative. Non-English publications, conference abstracts without full text, and studies lacking relevance to diabetes management during fasting were excluded.

3.4. Evidence Synthesis and Data Presentation

Included studies comprised observational studies, small clinical trials, qualitative research, narrative and systematic reviews, and international clinical guidelines. Given the diversity of methodologies and outcomes, findings were synthesized using a thematic analytical framework aligned with the review objectives.

Evidence was organized into major domains:

1. glycemic and metabolic risks,
2. treatment-related challenges,
3. psychosocial and ethical considerations, and
4. health system and equity factors.

Key fasting-related challenges, associated risks, and recommended mitigation strategies—stratified by diabetes type are summarized in Table 1, enhancing transparency and clinical applicability of the evidence base.

3.5. Methodological Limitations

This review is subject to limitations inherent to narrative synthesis, including reliance on heterogeneous study designs and partial extrapolation from adult data due to the underrepresentation of adolescents in fasting-related diabetes research. Nevertheless, the integration of systematic search procedures and explicit eligibility criteria strengthens the credibility and interpretability of the findings.

4. Glycemic and Metabolic Challenges During Intermittent Fasting

4.1. Hypoglycemia Risk

Hypoglycemia represents the most frequently reported acute complication of intermittent fasting in adolescents with diabetes, particularly among those receiving insulin therapy. Observational studies and Ramadan-focused cohorts that include adolescents or mixed-age populations report hypoglycemic events in approximately 10–30% of insulin-treated individuals during fasting periods, with higher frequencies observed during prolonged daily fasts and in those with prior hypoglycemia history [6, 18].

Late-day hypoglycemia appears especially common, coinciding with depletion of hepatic glycogen stores and continued basal insulin exposure. Nocturnal hypoglycemia has also been reported, particularly when extended fasting overlaps with altered sleep–wake cycles. Although precise adolescent-specific incidence estimates remain limited, available data suggest that risk magnitude in adolescents is at least comparable to, and potentially greater than, that observed in adults, likely reflecting pubertal insulin resistance, variable activity levels, and inconsistent glucose monitoring [19–21].

4.2. Hyperglycemia and Ketosis

Hyperglycemia during intermittent fasting is frequently linked to compensatory behaviors, including inappropriate insulin dose reduction or omission. Studies examining fasting individuals with diabetes report transient hyperglycemia in approximately 15–40% of fasting participants, with variability driven by insulin regimen, fasting duration, and adherence.

The risk of ketosis and diabetic ketoacidosis (DKA) is disproportionately concentrated among adolescents with type 1 diabetes. Case series and observational reports indicate that DKA accounts for a small but clinically significant proportion of fasting-related complications,

particularly in individuals with poor baseline glycemic control or dehydration. While absolute incidence remains low, adolescents are vulnerable to rapid metabolic decompensation, and even short periods of insulin omission during fasting may precipitate ketosis [22].

The risk of diabetic ketoacidosis (DKA) is particularly pronounced in adolescents with type 1 diabetes, in whom even short periods of insulin deficiency can precipitate rapid metabolic decompensation. Prolonged fasting combined with dehydration, especially during religious fasting that restricts fluid intake, further exacerbates ketone accumulation and impairs renal clearance of glucose and acids [23]. While adolescents with type 2 diabetes generally face a lower DKA risk, those treated with insulin or insulin secretagogues remain vulnerable to both hyperglycemia and hypoglycemia during fasting [24].

4.3. Weight, Lipid, and Metabolic Effects

Comparative Risk Context

Overall, insulin-treated adolescents with type 1 diabetes carry the highest fasting-related risk, followed by insulin-treated type 2 diabetes, while adolescents managed with non-insulin therapies generally experience lower acute metabolic risk. However, even in lower-risk groups, dehydration, symptomatic hyperglycemia, and treatment nonadherence remain clinically relevant concerns [25, 26].

Importantly, the available evidence base does not permit precise age-stratified risk quantification. Most incidence estimates are derived from adult or mixed-age cohorts, underscoring the need for adolescent-specific prospective studies. Nevertheless, the consistency of reported complications across studies supports the conclusion that intermittent fasting introduces measurable and clinically meaningful metabolic risk in adolescents with diabetes [11, 27].

5. Treatment-Related Challenges

Effective diabetes management during intermittent fasting requires careful adaptation of pharmacologic therapy and monitoring strategies. In adolescents, these adjustments are particularly challenging due to developmental factors, variable adherence, and limited evidence to guide age-specific decision-making. Treatment-related barriers frequently amplify fasting-associated metabolic risks and contribute to clinical uncertainty for both patients and providers.

5.1. Insulin Therapy Adjustments

Insulin dose modification represents one of the most complex aspects of fasting management in adolescents with diabetes. For those on basal-bolus regimens, prolonged fasting necessitates reductions in prandial insulin, while basal insulin often requires cautious adjustment to balance the competing risks of hypoglycemia and hyperglycemia. Over-reduction of basal insulin may predispose to ketosis and hyperglycemia, whereas insufficient adjustment increases the likelihood of fasting-related hypoglycemia, particularly in the late fasting period [28].

Adolescents using insulin pumps or hybrid closed-loop systems may benefit from greater dosing flexibility; however, these technologies are not without challenges. Automated insulin delivery algorithms are typically calibrated for regular meal patterns and may not fully account for prolonged fasting, altered sleep schedules, or irregular physical activity [29, 30]. In addition, adolescents may disengage from device alerts or override recommended adjustments during fasting, undermining system effectiveness. Limited access to advanced technologies in many settings further constrains their potential benefits.

5.2. Oral and Injectable Non-Insulin Therapies

For adolescents with type 2 diabetes, non-insulin therapies such as metformin and glucagon-like peptide-1 (GLP-1) receptor agonists are commonly used. While these agents generally carry a lower intrinsic risk of hypoglycemia, safety concerns arise during prolonged fasting, particularly when caloric intake is markedly reduced or fluid restriction is observed. Gastrointestinal adverse effects associated with metformin or GLP-1 receptor agonists may be exacerbated during fasting and contribute to dehydration or reduced adherence [31].

The evidence base guiding the use of newer injectable or adjunctive therapies in fasting adolescents is limited, and clinical decisions are often extrapolated from adult data. This lack of adolescent-specific evidence complicates risk-benefit assessment and may result in overly conservative or inconsistent management strategies [32].

5.3. Monitoring Challenges

Adequate glucose monitoring is central to safe fasting; however, adolescents face multiple monitoring-related barriers. Self-monitoring of blood glucose may be performed inconsistently due to discomfort, inconvenience during school hours, or misconceptions that glucose testing invalidates fasting. Reduced monitoring frequency increases the risk of unrecognized hypoglycemia or hyperglycemia during prolonged fasting intervals [33, 34].

Continuous glucose monitoring (CGM) offers significant advantages by enabling real-time glucose tracking, trend analysis, and hypoglycemia alerts. Nevertheless, accessibility and affordability remain uneven, particularly in low-resource settings. Even when available, adolescents may experience alert fatigue, device-related stigma, or limited caregiver oversight, reducing effective utilization. These monitoring challenges underscore the importance of individualized education, family engagement, and health-system support when advising adolescents with diabetes who choose to fast [35]. *Diabetes-specific challenges, associated risks, and recommended mitigation strategies are summarized in Table 1.*

Table 1: Diabetes-Specific Challenges, Risks, and Risk-Mitigation Strategies During Intermittent Fasting in Adolescents

Diabetes Type	Key Fasting-Related Challenge	Associated Clinical Risks	Recommended Risk-Mitigation Strategies
Type 1 Diabetes [36]	<ul style="list-style-type: none"> • Prolonged insulin–fast mismatch • Pubertal insulin resistance • Insulin omission or over- reduction 	<ul style="list-style-type: none"> • Hypoglycemia (daytime and nocturnal) • Hyperglycemia and ketosis • Diabeti ketoacidosis (DKA) • Dehydration 	<ul style="list-style-type: none"> • Pre-fasting risk stratification • Cautious basal insulin adjustment (avoid omission) • Frequent glucose monitoring or CGM use • Clear criteria for breaking the fast
Type 2 Diabetes (insulin-treated) [37]	<ul style="list-style-type: none"> • Variable insulin sensitivity • Reduced caloric intake with fixed insulin dosing 	<ul style="list-style-type: none"> • Hypoglycemia • Glycemic variability • Dehydration 	<ul style="list-style-type: none"> • Individualized insulin dose reduction • Monitoring during late fasting periods • Nutritional planning during eating windows
Type 2 Diabetes (non-insulin therapy) [38]	<ul style="list-style-type: none"> • Gastrointestinal intolerance during fasting • Reduced hydration • Inconsistent adherence 	<ul style="list-style-type: none"> • Dehydration • Symptomatic hyperglycemia • Reduced treatment adherenc 	<ul style="list-style-type: none"> • Review medication timing and tolerability • Emphasize hydration • Monitor symptoms rather than fasting duration
All diabetes types [39]	<ul style="list-style-type: none"> • Peer and cultural pressure to fast • Limited supervision during school hours • Inconsistent glucose monitoring 	<ul style="list-style-type: none"> • Unrecognized hypoglycemia • Psychological distress • Disordered eating behaviors 	<ul style="list-style-type: none"> • Shared decision-makin with adolescents and caregivers • Education on symptom recognition • Culturally sensitive counseling and follow-up

6. Psychosocial and Ethical Considerations

Intermittent fasting among adolescents with diabetes raises important ethical considerations that extend beyond metabolic risk and intersect with accepted principles of pediatric bioethics, including respect for emerging autonomy, beneficence, non-maleficence, and shared responsibility between adolescents, caregivers, and clinicians. Ethical decision-making in this context must balance adolescents' developing capacity for informed choice with the obligation to prevent avoidable harm during a vulnerable developmental period.

6.1. Autonomy, Assent, and Shared Decision-Making

In pediatric care, adolescents are not regarded as fully autonomous decision-makers; however, their assent and preferences are ethically significant and should be actively incorporated into clinical discussions. Decisions regarding intermittent fasting should therefore be guided by shared decision-making models that engage adolescents and caregivers while ensuring that medical risks are clearly communicated [40].

Professional guidelines for pediatric diabetes management emphasize that adolescents should be supported in health decisions without being exposed to undue risk. When fasting poses a high likelihood of hypoglycemia, ketoacidosis, or psychological harm, clinicians have an ethical duty grounded in non-maleficence to recommend modification or avoidance of fasting, even when adolescents express a strong desire to participate [41].

6.2. Cultural, Religious, and Family Contexts

Cultural and religious fasting practices, particularly during observances such as Ramadan, introduce ethical tensions between social inclusion and medical safety. While many religious traditions provide explicit exemptions for individuals with chronic illness, adolescents with diabetes may experience family or community pressure to fast despite medical risk [42, 43].

Ethically appropriate care requires culturally sensitive counseling that respects religious values while prioritizing health protection. Clinicians should explicitly discuss religious exemptions, alternative forms of participation, and clear criteria for breaking the fast when safety thresholds are exceeded. This approach aligns with pediatric ethical standards by promoting beneficence while respecting family and cultural contexts [44].

6.3. Ethical Responsibility to Prevent Harm

The principle of non-maleficence is particularly salient in adolescents with diabetes, given their heightened vulnerability to acute metabolic decompensation. Allowing or implicitly endorsing fasting without adequate risk stratification, monitoring, and contingency planning may expose adolescents to preventable harm [45].

Official pediatric diabetes guidelines emphasize that medical safety takes precedence over voluntary practices when risk is substantial. Ethical care therefore includes proactive risk assessment, documentation of counseling discussions, and clear communication that fasting should be discontinued in the presence of hypoglycemia, hyperglycemia, ketosis, dehydration, or psychological distress [46].

6.4. Equity and Ethical Access to Care

Ethical fasting guidance must also consider health system inequities. Adolescents without access to continuous glucose monitoring, diabetes education, or specialist care may face disproportionately higher risks during fasting. Advising fasting in such contexts without adequate support raises concerns related to justice and fairness.

Clinicians should incorporate health system capacity into ethical decision-making and avoid one-size-fits-all recommendations. Where safe fasting cannot be reasonably supported, clinicians are ethically justified in advising against fasting and in advocating for adolescent health over social conformity.

7. Health System and Equity Challenges

Health system capacity and structural inequities play a critical role in shaping the safety and feasibility of intermittent fasting among adolescents with diabetes. These challenges are particularly salient in low- and middle-income settings and contribute substantially to the heterogeneity of fasting-related outcomes observed across populations.

7.1. Access to Diabetes Technology and Specialist Care

Access to diabetes technologies, including continuous glucose monitoring (CGM) systems and insulin pumps, remains highly uneven across and within countries. Adolescents in well-resourced health systems may benefit from real-time glucose data, automated insulin delivery, and specialist-led education that enable safer adaptation to fasting. In contrast, many adolescents rely solely on intermittent self-monitoring of blood glucose and fixed insulin regimens, limiting their ability to detect and respond promptly to fasting-related glycemic excursions [47].

These disparities are most pronounced in low- and middle-income countries, where financial constraints, limited insurance coverage, and shortages of trained pediatric endocrinology specialists restrict access to advanced care. In such settings, adolescents may fast without individualized risk assessment or medical supervision, increasing vulnerability to hypoglycemia, hyperglycemia, and acute complications. Health system fragmentation and inconsistent follow-up further exacerbate these risks, underscoring the inequitable distribution of fasting-related harms [48].

7.2. Variability in Clinical Guidance

Clinical guidance on intermittent fasting in adolescents with diabetes is limited and inconsistent, reflecting a broader evidence gap. Existing recommendations are often extrapolated from adult populations or focused narrowly on religious fasting, with minimal consideration of adolescent-specific physiological and psychosocial factors. As a result, clinicians may deliver divergent advice regarding insulin adjustments, monitoring frequency, and fasting eligibility [49].

Inconsistent counseling practices can undermine trust and lead to confusion among adolescents and families, particularly when medical advice conflicts with cultural or religious expectations. Some clinicians may adopt overly restrictive approaches that fail to engage adolescents in shared decision-making, while others may permit fasting without adequate risk mitigation. The absence of standardized, adolescent-centered guidelines highlights the urgent need for consensus-driven recommendations that integrate clinical evidence, ethical considerations, and health system realities [50].

8. Clinical Strategies and Risk-Mitigation Approaches

Translating evidence into practice is essential for reducing fasting-related complications among adolescents with diabetes. Effective strategies must be individualized, developmentally appropriate, and context-sensitive, integrating medical, psychosocial, and technological considerations.

8.1. Pre-Fasting Risk Assessment and Counseling

Pre-fasting risk assessment is a critical first step in determining whether intermittent fasting can be undertaken safely. Risk stratification should account for diabetes type, prior history of hypoglycemia or ketoacidosis, glycemic control, treatment regimen, comorbidities, and the adolescent's capacity for self-management. Adolescents at high risk, such as those with recurrent severe hypoglycemia, poor glycemic awareness, or recent diabetic ketoacidosis, may require strong recommendations against fasting or substantial modifications [51].

Counseling should be grounded in shared decision-making, recognizing adolescents' emerging autonomy while ensuring informed understanding of potential risks [52]. Collaborative discussions involving adolescents and caregivers can help align medical guidance with personal, cultural, or religious values, clarify medical exemptions when appropriate, and establish clear safety thresholds for breaking the fast.

8.2. Treatment and Monitoring Adaptations

Safe fasting requires proactive treatment and monitoring adjustments. Insulin dose modification principles should emphasize cautious basal insulin reduction, avoidance of complete insulin omission, and individualized prandial dosing during eating windows. For adolescents using automated insulin delivery systems, algorithm settings may require temporary adjustments to accommodate prolonged fasting and altered activity patterns [37].

Nutritional strategies during eating periods are equally important. Balanced meals that include complex carbohydrates, adequate protein, and healthy fats can support more stable glycemic profiles and reduce post-prandial excursions. Attention to hydration, particularly when fasting restricts fluid intake, is essential to mitigate dehydration and ketosis risk. Adolescents should also receive explicit guidance on recognizing warning signs that necessitate termination of the fast [53].

8.3. Role of Digital Health and Education

Digital health tools offer promising avenues for enhancing safety and engagement. Telemedicine enables pre-fasting planning, real-time troubleshooting, and follow-up without disrupting school or family routines. Remote consultations may be particularly valuable in settings with limited access to pediatric diabetes specialists.

Mobile applications and adolescent-friendly education platforms can reinforce self-monitoring, insulin adjustment guidance, and symptom recognition through interactive and culturally tailored content [54]. When integrated with CGM data, digital tools can facilitate timely intervention and promote self-efficacy. However, equitable access and digital literacy must be addressed to ensure these innovations do not widen existing disparities [55].

“Key clinical considerations and practice implications are summarized in Box 1.”

Box 1. Key Clinical Considerations for Intermittent Fasting in Adolescents With Diabetes

What is already known ?

- Intermittent fasting is increasingly practiced by adolescents for religious, cultural, and lifestyle reasons.
- Adolescents with diabetes face heightened vulnerability to glycemic instability due to pubertal insulin resistance, hormonal fluctuations, and evolving self-management capacity.
- Existing fasting guidance is largely extrapolated from adult populations and short-term studies.

What this review adds ?

- Intermittent fasting in adolescents with diabetes is associated with increased risks of hypoglycemia, hyperglycemia, ketosis, dehydration, and psychosocial distress.
- Risks vary substantially by diabetes type, fasting pattern, treatment regimen, and sociocultural context.
- Psychosocial and ethical factors, including peer influence, family expectations, and religious obligations, are central determinants of fasting-related safety and adherence.

Implications for clinical practice

- Pre-fasting risk stratification and shared decision-making are essential to determine fasting suitability and safety.
- Insulin dose adjustment, structured glucose monitoring, and tailored nutritional strategies are critical risk-mitigation measures.
- Digital health tools and adolescent-centered education can enhance monitoring, engagement, and equitable care when accessible.

9. Research Gaps and Future Directions

Despite growing clinical and public interest in intermittent fasting, the evidence base guiding its application in adolescents with diabetes remains limited. Addressing these gaps is essential to inform safe, equitable, and developmentally appropriate care.

First, there is a critical need for adolescent-specific clinical trials that directly evaluate the safety and efficacy of intermittent fasting across diabetes types. Most existing data are extrapolated from adult populations or derived from small observational studies, limiting their applicability to adolescents with distinct physiological and psychosocial profiles. Future trials should incorporate diverse fasting patterns, standardized outcome measures, and stratification by treatment modality.

Second, the long-term metabolic and developmental consequences of intermittent fasting in adolescents with diabetes are poorly understood. Longitudinal studies are needed to assess effects on growth, pubertal progression, bone health, insulin sensitivity trajectories, and cardiometabolic risk, as well as to distinguish transient metabolic adaptations from sustained benefits or harms.

Third, meaningful progress requires integration of behavioral science and endocrinology. Research frameworks should account for adolescent decision-making, risk perception, family dynamics, and social influences, including the role of digital media. Mixed-methods approaches that combine metabolic endpoints with qualitative insights can better capture the real-world complexity of fasting behaviors and adherence.

Finally, there is a need to develop ethical frameworks for fasting guidance in minors. Such frameworks should balance respect for cultural and religious practices with the obligation to protect adolescent health and autonomy. Clear criteria for medical exemption, shared decision-making models, and culturally sensitive counseling strategies should be incorporated into future guideline development.

Together, these research priorities provide a roadmap for advancing evidence-based, adolescent-centered approaches to intermittent fasting in diabetes care.

10. Conclusion

Intermittent fasting among adolescents with diabetes represents a clinically complex practice shaped by the intersection of metabolic vulnerability, treatment demands, psychosocial influences, and health system constraints. Evidence synthesized in this review indicates that fasting is associated with measurable increases in the risk of hypoglycemia, hyperglycemia, ketosis, dehydration, and psychological distress, with risk magnitude varying according to diabetes type, treatment regimen, fasting pattern, and sociocultural context. Adolescents with type 1 diabetes and those requiring insulin therapy appear to face the highest risk of acute metabolic complications, particularly during prolonged or unsupervised fasting periods.

Importantly, adolescents differ fundamentally from adults in pubertal physiology, insulin sensitivity, growth requirements, and decision-making capacity. Consequently, reliance on adult-derived evidence while sometimes necessary has clear limitations and reinforces the need for cautious interpretation and individualized clinical judgment. Until robust adolescent-specific data are available, fasting guidance in this population should remain conservative, emphasizing safety thresholds rather than presumed metabolic benefit.

Safe engagement in intermittent fasting, when pursued, requires structured pre-fasting risk assessment, shared decision-making with adolescents and caregivers, tailored treatment and monitoring adaptations, and explicit criteria for terminating the fast. Ethical care must be grounded in pediatric bioethical principles, prioritizing beneficence and non-maleficence while respecting emerging adolescent autonomy and cultural or religious values. Medical safety should take precedence over social expectations, particularly in settings with limited access to diabetes technologies or specialist care.

Finally, there is an urgent need for adolescent-focused clinical trials, longitudinal outcome studies, and consensus-based guidelines that integrate metabolic science, behavioral insights, ethical frameworks, and health system realities. Advancing such evidence will be essential to support clinicians, empower adolescents with diabetes to make informed decisions, and ensure that fasting practices when undertaken do not compromise short- or long-term health.

Article Information

Disclaimer (Artificial Intelligence): The author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.), and text-to-image generators have been used during writing or editing of manuscripts.

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