

Nursing Interventions in Children with Type 1 Diabetes: A Mini-Review of Implications for Renal Health

Jalal Nourmohammadi^{1*} 

¹ Student Research Committee, Faculty of Nursing and Midwifery, Zahedan University of Medical Sciences, Zahedan, Iran.

ARTICLE INFO

Article type

Review article

Article history

Received: 10 May 2026

Accepted: 05 Aug 2026

Keywords

Nursing Interventions

Type 1 diabetes

Child

Renal Health

ABSTRACT

Children with type 1 diabetes are at heightened risk of early renal alterations that may progress to diabetic kidney disease if not adequately addressed. Nurses play a pivotal role in mitigating this risk through comprehensive, developmentally appropriate interventions that extend beyond glycemic control. This mini-review synthesizes current evidence on nursing interventions relevant to renal health in children with type 1 diabetes, with a focus on education, monitoring, lifestyle modification, and family-centered care. The reviewed literature highlights that structured diabetes education, promotion of optimal insulin adherence, and reinforcement of healthy dietary and hydration practices contribute to improved metabolic stability and reduced renal stress. Regular nursing-led screening for early markers of renal involvement, including blood pressure abnormalities and microalbuminuria, facilitates timely referral and intervention. In addition, psychosocial support and empowerment of children and their families enhance self-management behaviors that are essential for long-term renal protection. Despite growing recognition of the nurse's role in preventing diabetes-related renal complications, existing studies remain heterogeneous, and high-quality pediatric-focused evidence is limited. This mini-review underscores the need for integrative, nurse-driven strategies that align metabolic management with early renal preservation and calls for further research to strengthen the evidence base guiding nursing practice in this vulnerable population. Nursing interventions that integrate metabolic management with routine renal surveillance and family-centered support may play a critical role in modifying early kidney risk trajectories in children with type 1 diabetes. Embedding nursing expertise within nephrology-informed pediatric diabetes care pathways could strengthen life-course prevention strategies for diabetic kidney disease.

Please cite this paper as:

Jala Nourmohammadi J. Nursing Interventions in Children with Type 1 Diabetes: A Mini-Review of Implications for Renal Health.

Reviews in Clinical Medicine. 2026;13(3): 145-149. Doi: 10.22038/rcm.2026.95547.1590

Introduction

Type 1 diabetes mellitus (T1DM) is among the most prevalent chronic diseases of childhood and adolescence and is associated with a markedly elevated lifetime risk of diabetic kidney disease (DKD)(1, 2). Although clinically apparent nephropathy is uncommon during pediatric years, growing evidence from pediatric nephrology indicates that renal vulnerability often begins early in the disease course. Adverse metabolic exposure, blood pressure trajectories, and subtle functional or structural renal changes may precede clinically detectable DKD by

years or decades, supporting a life-course model of kidney disease development(3). These early-life processes are increasingly recognized as critical determinants of long-term renal outcomes and support a life-course approach to kidney health(4). Within pediatric diabetes care, nursing practice represents a sustained and influential component of disease management(5, 6). Nurses provide continuous education, monitoring, psychosocial support, and care coordination across developmental stages. Despite this central role, nursing interventions are seldom discussed explicitly within nephrology-focused literature on

***Corresponding author:** Jalal Nourmohammadi, Student Research Committee, Faculty of Nursing and Midwifery, Zahedan University of Medical Sciences, Zahedan, Iran.
Email: jalal_nurse@yahoo.com

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

early kidney risk modification(7). This mini-review addresses this gap by reframing nursing care as an integral element of preventive nephrology in children with T1DM. The aim is to synthesize current evidence on nursing interventions and contextualize their relevance to renal risk accumulation, surveillance, and early prevention strategies.

Scope and Approach

This article is a narrative mini-review designed to provide a focused synthesis relevant to nephrology practice rather than a comprehensive systematic review. Peer-reviewed literature published primarily between 2010 and 2025 was considered. Searches were conducted in major biomedical databases, including PubMed, Scopus, and CINAHL, using combinations of terms related to pediatric T1DM, nursing interventions, metabolic control, blood pressure, renal surveillance, and kidney outcomes. Studies involving children and adolescents with T1DM were prioritized when they examined nursing-led or nursing-integrated interventions associated with outcomes relevant to renal risk pathways, such as glycemic control, blood pressure management, treatment adherence, patient engagement, and screening for albuminuria. Evidence from pediatric nephrology and diabetes research was used to contextualize these outcomes within established mechanisms of kidney injury and DKD progression. Findings from the authors' previously published systematic review on nursing interventions in pediatric T1DM were referenced selectively to inform interpretation and synthesis, without duplication of methods or quantitative analyses. The emphasis of this review is conceptual integration rather than effect estimation.

Nursing Interventions in Pediatric T1DM: A Nephrology-Informed Perspective

Nursing interventions in pediatric T1DM extend well beyond the technical aspects of insulin administration and glucose monitoring(8, 9). Core domains of nursing practice include structured diabetes education, longitudinal metabolic monitoring, psychosocial support, family engagement, and facilitation of routine clinical surveillance(10, 11). Across pediatric age groups, these interventions have been consistently associated with improved glycemic control, enhanced treatment adherence, and more effective self-management behaviors (12-14). From a nephrology

perspective, these outcomes are clinically meaningful because long-term renal risk in T1DM is driven primarily by cumulative metabolic exposure and blood pressure burden rather than isolated glycemic indices. Sustained improvements in glycemic control and adherence, frequently supported by nursing-led education and follow-up, are therefore plausibly linked to modification of renal risk trajectories(15). Importantly, this relationship should be interpreted as indirect and preventive rather than causal, reflecting the current state of evidence. In addition, nurses play a key role in promoting adherence to recommended surveillance practices, including regular blood pressure assessment and screening for albuminuria. By supporting timely identification of early abnormalities and facilitating appropriate referral pathways, nursing care contributes to the early recognition of renal vulnerability within multidisciplinary pediatric diabetes services(16, 17).

Family-Centered Care, Adolescence, and Renal Risk Trajectories

Family involvement is a defining feature of pediatric chronic disease management and is particularly important in conditions requiring continuous self-management such as T1DM(18). Nursing-led family-centered interventions emphasize shared decision-making, caregiver education, and psychosocial support. Such approaches are associated with greater consistency in treatment adherence and improved metabolic stability during childhood(19, 20). Adolescence represents a period of heightened vulnerability, characterized by increasing autonomy, psychosocial challenges, and a higher risk of disengagement from care(21, 22). Nursing interventions targeting self-management skills, continuity of care, and family communication during this transition may help mitigate deterioration in glycemic control. Although renal outcomes are rarely assessed directly in adolescent-focused studies, stabilization of metabolic trajectories during this critical developmental period is likely to have downstream implications for kidney health across the life course (23). A summary of nursing interventions and their potential role in kidney health among children with diabetes is presented in Table 1 (Table1).

Table 1. Summary of Nursing Interventions and Their Potential Contribution to Renal Health in Children with Type 1 Diabetes

Potential impact on renal health	Primary objective	Nursing intervention
Better glycemic control and reduced long-term renal risk	Improve diabetes knowledge and self-management	Structured diabetes education
Reduced chronic hyperglycemia and metabolic stress	Promote consistent insulin administration	Insulin adherence support
Prevention of renal vascular injury	Early detection of hypertension	Blood pressure monitoring

Potential impact on renal health	Primary objective	Nursing intervention
Earlier nephrology referral and intervention	Identify early kidney involvement	Albuminuria screening
Improved adherence and long-term disease management	Strengthen caregiver participation	Family-centered education
Enhanced self-management and continuity of care	Address emotional and behavioral barriers	Psychosocial support
Early recognition of renal risk factors	Ensure regular clinical monitoring	Follow-up and care coordination

Emerging Considerations: Subclinical Renal Changes and Biomarkers

Recent pediatric research suggests that renal involvement in T1DM may begin with subclinical alterations, including early tubular injury and subtle changes in renal hemodynamics, even in the absence of microalbuminuria(24). The growing interest in kidney-specific biomarkers highlights the importance of early risk identification and longitudinal monitoring before clinically overt disease develops(25). As these biomarkers transition from research settings to clinical practice, nursing interventions that support consistent follow-up, patient engagement, and adherence to surveillance protocols may become increasingly relevant(26). Integrating nursing perspectives into nephrology-focused prevention strategies could enhance the effectiveness of early detection and intervention efforts (27).

Evidence Gaps and Future Directions

Despite substantial evidence linking nursing interventions to improved metabolic and psychosocial outcomes in pediatric T1DM, direct associations with kidney-specific endpoints remain limited. Renal outcomes are often secondary or absent in intervention studies, limiting nephrology-specific inference. Future research should integrate longitudinal kidney outcomes including albuminuria trajectories, estimated glomerular filtration rate, and emerging tubular biomarkers into evaluations of nursing-led or nursing-integrated care models. Prospective studies embedded within multidisciplinary kidney prevention programs may help clarify the contribution of nursing care to long-term renal risk modification(3, 7, 28).

Conclusion

From a nephrology perspective, nursing care represents a critical yet underrecognized component of early kidney risk mitigation in children with T1DM. By supporting metabolic stability, treatment adherence, family engagement, and routine renal surveillance, nursing interventions may influence renal risk trajectories long before clinically overt kidney disease develops. Integrating nursing perspectives into life-course nephrology frameworks and strengthening kidney-focused outcomes in future research may offer meaningful opportunities to reduce the long-term burden of diabetic kidney disease.

Implications for Practice

This mini-review underscores the strategic role of nursing practice in the early prevention of renal risk among children with type 1 diabetes. Nursing interventions that integrate metabolic management with routine blood pressure monitoring, renal surveillance, and developmentally appropriate education can contribute to early identification and modification of kidney risk trajectories. Consistent nurse-led engagement with children and families supports treatment adherence and psychosocial stability, particularly during developmental transitions associated with increased vulnerability to poor metabolic control. Embedding nursing expertise within multidisciplinary, nephrology-informed pediatric diabetes care pathways may strengthen life-course approaches to kidney health and enhance early preventive strategies against diabetic kidney disease.

Ethics approval and consent to participate

Informed consent was not applicable for this study because no human participants were directly involved, and no identifiable individual data were collected.

Availability of data and materials

No new data were generated or analyzed in this study. All data supporting the findings of this review are available within the article and its referenced literature.

Competing interests

The author declares that there are no competing interests.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' contributions

Conceptualization: J.N ,Data curation: J.N ,Formal analysis: J.N ,Funding acquisition: no funding, Investigation: J.N , Methodology: J.N , Project administration: J.N, Resources: J.N
Software: J.N , Supervision: J.N, Validation: J.N ,

Visualization: J.N , Writing-original draft: J.N Writing-review & editing: J.N

Acknowledgements

The author would like to thank the researchers whose work contributed to the evidence base synthesized in this review

Ethical approval

Ethical approval was not required for this study, as it is a narrative mini-review based exclusively on previously published literature and did not involve the collection or analysis of primary data from human participants or animals.

Artificial Intelligence (AI) Use Statement

During the preparation of this manuscript, the author used AI solely to assist with English language editing, grammar improvement, and enhancement of readability. The AI tool was not used for literature searching, data extraction, data analysis, interpretation of scientific findings, or generation of scientific conclusions. The author critically reviewed, revised, and approved the final manuscript and accepts full responsibility for its content and accuracy.

References

- Tommerdahl KL, Shapiro ALB, Nehus EJ, Bjornstad P. Early microvascular complications in type 1 and type 2 diabetes: recent developments and updates. *Pediatric nephrology* (Berlin, Germany). 2022;37(1):79-93.[Doi:10.1007/s00467-021-05050-7](https://doi.org/10.1007/s00467-021-05050-7)
- Eshetu K, Regassa LD, Dehresa M, Genete DJPH, Medicine, Therapeutics. Chronic Microvascular Complication of Type 1 Diabetes Mellitus and Its Predictors Among Children with Type 1 Diabetes Mellitus in Ethiopia; A Single Center Experience: Ambi Directional Cohort Study. 2024;201-12.[Doi:10.2147/PHMT.S456541](https://doi.org/10.2147/PHMT.S456541)
- Mamilly L, Mastrandrea LD, Mosquera Vasquez C, Klammer B, Kallash M, Aldughiem A. Evidence of Early Diabetic Nephropathy in Pediatric Type 1 Diabetes. *Frontiers in endocrinology*. 2021;12:669954.[Doi:10.3389/fendo.2021.669954](https://doi.org/10.3389/fendo.2021.669954)
- Kobayashi A, Ohnishi T, Okuda T, Hirano K, Ikenoue T, Yokoo T, et al. Investigating the patterns of renal function variability in early-stage chronic kidney disease by cluster analysis. *BMC nephrology*. 2025;26(1):433.[Doi:10.1186/s12882-025-04344-4](https://doi.org/10.1186/s12882-025-04344-4)
- Liu C, He Y, Venn AJ, Jose MD, Tian J. Childhood modifiable risk factors and later life chronic kidney disease: a systematic review. *BMC nephrology*. 2023;24(1):184.[Doi:10.1186/s12882-023-03232-z](https://doi.org/10.1186/s12882-023-03232-z)
- Lian R, Wang Z-H, FiPH. Association of childhood health with adulthood chronic kidney disease: results from the China Health and Retirement Longitudinal Study. 2025;13:1538744.[Doi:10.3389/fpubh.2025.1538744](https://doi.org/10.3389/fpubh.2025.1538744)
- Ghaljaei F, Lotfi M, Rad MN, Ghaljeh M, Nourmohammadi JJIJoD, Metabolism. Nursing Interventions for Pediatrics with Type 1 Diabetes and Their Families: A Systematic Review. 2025;25(5):395-404.[Doi:10.18502/ijdl.v25i5.20337](https://doi.org/10.18502/ijdl.v25i5.20337)
- Öztaş G, Aydın A, Atak M, Özyazıcıoğlu N, Sağlam H. Relationship among nursing support for parents of adolescents diagnosed with Type 1 Diabetes, parental monitoring of adolescents and the self-efficacy of adolescents with Type 1 Diabetes. *Journal of pediatric nursing*. 2025;80:9-15.[Doi:10.1016/j.pedn.2024.10.040](https://doi.org/10.1016/j.pedn.2024.10.040)
- Tonyushkina KN, March CA, Wolf RM, Benavides VC, Rioles N, Rompicherla S, et al. Team-Based Pediatric Type 1 Diabetes Care in the USA: Current Practices and Sustainability Concerns. 2025.[Doi:10.1159/000548002](https://doi.org/10.1159/000548002)
- Özgüven Öztornacı B. The Effect of Parental Collaboration on Diabetes Self-Efficacy, Quality of Life and HbA1c Level in Adolescents Diagnosed with Type 1 Diabetes. 2024.[Doi:10.4274/jcrpe.galenos.2024.2024-4-7](https://doi.org/10.4274/jcrpe.galenos.2024.2024-4-7)
- Naame E, Pangburn M, Rankine J, Libman I, March CAJDS. Parent Engagement in School Health Decisions for Type 1 Diabetes: Barriers to and Facilitators of Collaboration and Implications for Intervention Design. 2025;ds250004.[Doi:10.2337/ds25-0004](https://doi.org/10.2337/ds25-0004)
- Alzawahreh S, Ozturk C. Improving Self-Efficacy, Quality of Life, and Glycemic Control in Adolescents With Type 1 Diabetes: Randomized Controlled Trial for the Evaluation of the Family-Centered Empowerment Model. *JMIR formative research*. 2024;8:e64463.[Doi:10.2196/64463](https://doi.org/10.2196/64463)
- Jacobson Vann JC, Jain N, Jacob S, Murphy T, Calikoglu AS. Nursing Care Management and Glycemic Control Among Children With Diabetes Enrolled in Medicaid. *Journal for specialists in pediatric nursing : JSPN*. 2025;30(3):e70007.[Doi:10.1111/jspn.70007](https://doi.org/10.1111/jspn.70007)
- Rohan JM, Pendley JS, Delamater A, Dolan L, Reeves G, Drotar D. Patterns of self-management in pediatric type 1 diabetes predict level of glycemic control 2 years later. *Journal of developmental and behavioral pediatrics : JDBP*. 2013;34(3):186-96.[Doi:10.1097/DBP.0b013e318287cb48](https://doi.org/10.1097/DBP.0b013e318287cb48)
- Seyed Ahmadi S, Pivodic A, Svensson AM, Wedel H, Rathsmann B, Nyström T, et al. Risk factors for nephropathy in persons with type 1 diabetes: a population-based study. *Acta diabetologica*. 2022;59(6):761-72.[Doi:10.1007/s00592-022-01863-6](https://doi.org/10.1007/s00592-022-01863-6)
- Li L, Wang S, Huang G, You J. Effect of the nurse-led program on blood glucose control and microalbuminuria development in type 2 diabetic populations. *Medicine*. 2022;101(41):e30693.[Doi:10.1097/MD.00000000000030693](https://doi.org/10.1097/MD.00000000000030693)
- Keong F, Gander J, Wilson D, Durthaler J, Pimentel B, Barzilay JI. Albuminuria Screening in People With Type 2 Diabetes in a Managed Care Organization. *AJPM focus*. 2023;2(4):100133.[Doi:10.1016/j.focus.2023.100133](https://doi.org/10.1016/j.focus.2023.100133)
- Schlarb P, Büttner JM, Tittel SR, Mönkemöller K, Müller-Godeffroy E, Boettcher C, et al. Family structures and parents' occupational models: its impact on children's diabetes. 2024;61(2):235-44.[Doi:10.1007/s00592-023-02187-9](https://doi.org/10.1007/s00592-023-02187-9)
- Mansour M, Parizad N, Hemmati Maslakpak M. Does family-centred education improve treatment adherence, glycosylated haemoglobin and blood glucose level in patients with type 1 diabetes? A randomized clinical trial. *Nursing open*. 2023;10(4):2621-30.[Doi:10.1002/nop2.1522](https://doi.org/10.1002/nop2.1522)
- Rostaminasab S, Nematollahi M, Jahani Y, Mehdipour-Rabori R. The effect of family-centered empowerment model on burden of care in parents and blood glucose level of children with type I diabetes family empowerment on burden of care and HbA1C. *BMC nursing*. 2023;22(1):214.[Doi:10.1186/s12912-023-01375-w](https://doi.org/10.1186/s12912-023-01375-w)
- Rausch JR, Hood KK, Delamater A, Shroff Pendley J, Rohan JM, Reeves G, et al. Changes in treatment adherence and glycemic control during the transition to adolescence in type 1 diabetes. *Diabetes Care*. 2012;35(6):1219-24.[Doi:10.2337/dc11-2163](https://doi.org/10.2337/dc11-2163)
- Laffel LM, Kanapka LG, Beck RW, Bergamo K, Clements MA, Criego A, DeSalvo DJ, Goland R, Hood K, Liljenquist D, Messer LH, Monzavi R, Mouse TJ, Prahalad P, Sherr J, Simmons JH, Wadwa RP, Weinstock RS, Willi SM, Miller KM; CGM Intervention in Teens and Young Adults with T1D (CITY) Study Group; CDE10. Effect of Continuous Glucose Monitoring on Glycemic Control in Adolescents and Young Adults With Type 1 Diabetes: A Randomized Clinical Trial. *JAMA*. 2020 Jun 16;323(23):2388-2396.[Doi:10.1001/jama.2020.6940](https://doi.org/10.1001/jama.2020.6940)
- Santa Cruz-Álvarez P, Ruiz-Trillo CA, Pérez-Morales A, Cortés-Lerena A, Gamero-Dorado C, Garrido-Bueno M. Nurse-led therapeutic patient education program on glycemic control and emotional wellbeing in adolescents with type 1 diabetes mellitus during hospital transition. *Endocrinología, diabetes y nutrición*. 2025;72(1):14-25.[Doi:10.1016/j.endinu.2024.07.008](https://doi.org/10.1016/j.endinu.2024.07.008)
- Matter RM, Sallam DE, Taha SI, Awadallah SM, Khamees R, Salah NY. Transient renal tubular injury among children and adolescents during diabetic ketoacidosis: severity, renal perfusion, and urinary netrin- 1 interplay. *European journal of pediatrics*. 2025;184(6):329.

- [Doi:10.1007/s00431-025-06145-1](https://doi.org/10.1007/s00431-025-06145-1)
25. Gkiourtzis N, Stoimeni A, Michou P, Cheirakis K, Moutafi M, Christakopoulos A, et al. The NGAL as a prognostic biomarker of kidney injury in children and adolescents with type 1 diabetes mellitus: A systematic review and meta-analysis. *Journal of diabetes and its complications*. 2025;39(5):109002.[Doi:10.1016/j.jdiacomp.2025.109002](https://doi.org/10.1016/j.jdiacomp.2025.109002)
 26. Alsahli M, Abd-Alrazaq A, Fathy DM, Abdelmohsen SA, Gushgari OA, Ghazy HK, et al. Effectiveness of Patients' Education and Telenursing Follow-Ups on Self-Care Practices of Patients With Diabetes Mellitus: Cross-Sectional and Quasi-Experimental Study. 2025;8(1): e67339.[Doi:10.2196/67339](https://doi.org/10.2196/67339)
 27. Wong FKY, Chow SKY, Chan TMF, Ijzons. Evaluation of a nurse-led disease management programme for chronic kidney disease: a randomized controlled trial. 2010;47(3):268-78.[Doi:10.1016/j.ijnurstu.2009.07.001](https://doi.org/10.1016/j.ijnurstu.2009.07.001)
 28. Cangelosi G, Mancin S, Morales Palomares S, Pantanetti P, Quinzi E, Debernardi G, et al. Impact of school nurse on managing pediatric type 1 diabetes with technological devices support: a systematic review. 2024;12(8):173.[Doi:10.3390/diseases12080173](https://doi.org/10.3390/diseases12080173)