

Literature Review: Risk Factors for Diabetes in Children

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Article Info	Abstract
Article History Submitted, 2026-05-11 Accepted, 2026-05-20 Published, 2026-06-30 Keywords: Diabetes mellitus, children, obesity, lifestyle	Diabetes mellitus is a non-communicable disease that is increasingly found in children. This condition is not only caused by genetic factors but is also influenced by various risk factors such as obesity, unhealthy diet, and sedentary lifestyle. This study aims to identify the risk factors of diabetes in children based on recent literature. The method used is a literature review of five scientific articles published between 2023 and 2024. The articles were selected based on inclusion criteria, including studies with cross-sectional, mixed-method, and literature review designs that discuss risk factors for diabetes in children. Data were analyzed descriptively by synthesizing the findings of each article. The results show that most studies consistently conclude that genetic factors (family history), obesity, high sugar and fat intake, and lack of physical activity are the main risk factors for diabetes in children. In addition, the increasing prevalence of obesity contributes to the rising incidence of type 2 diabetes in children. In conclusion, the risk factors of diabetes in children are multifactorial, with major contributions from genetic and lifestyle factors; therefore, early prevention through healthy lifestyle and early detection in high-risk groups is essential.

Introduction

Non-communicable diseases (NCDs) are a growing global health problem, including diabetes mellitus, which now affects not only adults but also children. Diabetes mellitus is a metabolic disorder characterized by hyperglycemia due to impaired insulin secretion, insulin action, or both. In recent years, there has been an increase in cases of diabetes in children influenced by lifestyle changes, unhealthy diets, and an increasing prevalence of obesity (Ammatullah, 2024). In Indonesia, diabetes mellitus in children is starting to become a serious concern because the number of cases continues to increase. Research data shows that cases of diabetes in children have been found in various areas, including in Kendari City with a significant number of cases. This condition shows that diabetes in children is no longer a rare case, but has become a health problem that needs to be watched out. Risk factors such as family history, high-sugar food consumption patterns, and obesity are the main triggers for diabetes in children (Handayani & Rusliafa, 2024).

Clinically, diabetes in children consists of two main types, namely type 1 diabetes mellitus which is more common due to autoimmune factors, and type 2 diabetes mellitus which is increasing as the obesity rate in children increases. The increase in cases of type 2 diabetes in children shows a shift in the pattern of the disease that was previously more common in adults. This is closely related to the modern lifestyle that tends to lack physical activity and consume foods high in calories, sugar, and fat (Fitri & Damayanti, 2024). Various studies show that risk factors for diabetes in children are multifactorial. Genetic factors such as family history with diabetes are one of the most dominant factors. In addition, other factors such as obesity, lack of physical activity, unhealthy diet, and other metabolic conditions also contribute to an increased risk of diabetes. In fact, research shows that family history is the most influential factor compared to other factors (Handayani & Rusliafa, 2024; Ulya et al., 2023)

Nevertheless, not all factors show a consistent relationship. Some studies have found that consumption of sugar, salt, and fat does not have a significant relationship directly with the risk of diabetes in school-age children. This shows that the incidence of diabetes is not only influenced by a single factor, but a combination of various factors that interact with each other in the long term (Pulungan et al., 2020). Theoretically, obesity and sedentary lifestyles play an important role in the occurrence of insulin resistance, which is the basis for type 2 diabetes mellitus. In addition, exposure to a diet high in sugar and fat from an early age can also worsen the metabolic condition of children, especially in children who have a genetic predisposition. Therefore, the combination of genetic and environmental factors is the main determinant in the development of diabetes in children (Rohmatulloh et al., 2024)

Based on these findings, further studies are needed on risk factors for diabetes in children. This study aims to describe the risk factors for diabetes in children based on the results of previous research. The results of this study are expected to be the basis for efforts to prevent, detect early, and control risk factors so that the incidence of diabetes in children can be minimized in the future.

Methods

This study is a descriptive literature review that aims to describe the risk factors for diabetes in children based on the results of previous research without intervening on the variables studied. The literature analyzed came from 5 scientific articles that discussed risk factors for diabetes mellitus in children, both related to genetic factors, lifestyle, diet, and accompanying clinical conditions.

The five articles used consisted of research with mixed method, cross sectional, and literature review designs, which were published in the 2023–2024 range. The first article discusses the description of case characteristics and risk factors for diabetes in children at the Kendari City Hospital with a sample of 7 cases. The second article is a scientific review of diabetes in children that highlights the increased incidence of obesity. The third article examines risk factors for type 2 diabetes mellitus with a sample of 98 respondents. The fourth article analyzed the relationship between sugar, salt, and fat consumption and diabetes risk in elementary school-age children with a sample of 84 children. The fifth article is a literature review that discusses risk factors for type 2 diabetes in children to adolescents. The inclusion criteria in this literature review include research articles that discuss diabetes risk factors in children or adolescents, articles that use quantitative research designs and scientific reviews, and articles published in the 2023–2024 range. Meanwhile, the exclusion criteria include articles that do not discuss specific risk factors for diabetes in children, articles without relevant research results, and articles that cannot be accessed completely.

The instrument in this study is in the form of a data extraction sheet which is used to collect information from each article, including the author and year of publication, research design, number of samples, variables studied, and the main results of research related to diabetes risk factors in children. The data obtained is then compiled in the form of a synthesis table to facilitate analysis.

The data collection procedure was carried out by searching for articles through the national scientific journal database, then selection was carried out based on the title, abstract, and content of the article in accordance with the research topic. After that, an in-depth review process was carried out to retrieve data relevant to the research purpose. The ethical aspect in this literature review research is still considered by listing the source of the citation correctly, not plagiarism, and maintaining the authenticity of the information from each article used. All data used comes from publicly accessible scientific publications.

Data processing is carried out through the stages of article identification, article selection based on inclusion and exclusion criteria, data extraction, and then preparation in the form of a table of literature review results. Data analysis was carried out descriptively by comparing the results of the five articles to see the pattern of diabetes risk factors in children. The results of the analysis showed that most of the articles concluded that genetic factors (family history), obesity, unhealthy diet (high in sugar and fat), and sedentary lifestyle were important factors for diabetes in children. In addition, several studies have also shown that the increased prevalence of obesity contributes to an increased incidence of type 2 diabetes in children.

Results and Discussion

From the review of 7 articles included in this literature review, the following information was obtained.

Table 1. Results of Journal Analysis

No	Research	Method	Results
1.	Listy Handayani et al. (2024)	Mixed method (sequential explanatory)	Main risk factors: family history of DM, sugary food/drink consumption, obesity (T2DM)

2.	Yulisnawati Hasanah (2023)	Descriptive (scientific review)	study	Type 1 DM most common; increasing obesity contributes to rise of Type 2 DM
3.	Arnida et al. (2024)	Cross-sectional		Significant association between obesity, physical activity, hypertension, and family history with DM ($p < 0.05$)
4.	Amila et al. (2024)	Cross-sectional		No significant association between dietary intake and Type 2 DM risk
5.	Ayu Tiara Fitri & Putri Damayanti (2024)	Cross-sectional		Risk factors include obesity, sedentary lifestyle, high sugar-fat diet, family history
6.	Sister et al. (2026)	Cross-sectional		No significant association between risk factors and blood glucose levels ($p > 0.05$), but multiple metabolic risks were present
7.	Prihananto (2025)	Cross-sectional analytical		Maternal age ($p=0.002$) and number of children ($p=0.003$) significantly associated with T2DM; maternal age was strongest predictor (OR=4.429)

The results of the studies from the six main articles analyzed indicate that diabetes mellitus in children and adolescents is a complex multifactorial disease influenced by interactions between genetic, metabolic, behavioral, and environmental determinants. Across the reviewed studies, consistent risk factors identified include family history of diabetes mellitus, obesity, unhealthy dietary patterns, sedentary lifestyle, and reduced physical activity. These factors collectively contribute to the increasing incidence of type 2 diabetes mellitus (T2DM) in the pediatric and adolescent population, which was previously dominated by type 1 diabetes mellitus (Hasanah, 2023; Handayani et al., 2024; Fitri & Damayanti, 2024; Arnida et al., 2024; Sister et al., 2026; Prihananto, 2025).

This trend reflects a significant epidemiological transition in childhood diseases. Modern lifestyle changes characterized by increased consumption of high-calorie, high-sugar, and ultra-processed foods, along with decreased physical activity, have contributed to a growing burden of metabolic disorders in children and adolescents. Sedentary behaviors such as prolonged screen time, digital gaming, and reduced outdoor activities have become increasingly common, resulting in decreased energy expenditure and chronic energy imbalance. This condition promotes excessive fat accumulation and the development of obesity, which is a key driver of metabolic dysfunction.

Obesity plays a central role in the pathophysiology of T2DM in children and adolescents. Adipose tissue is not merely an energy storage organ but also an active endocrine organ that secretes various bioactive substances, including pro-inflammatory cytokines such as TNF- α , IL-6, and resistin. These inflammatory mediators interfere with insulin receptor signaling pathways, leading to decreased insulin sensitivity in peripheral tissues. This state, known as insulin resistance, represents the primary mechanism underlying the development of T2DM (Fitri & Damayanti, 2024; Arnida et al., 2024).

The study by Arnida et al. (2024) further supports this mechanism by showing significant associations between obesity, physical activity, hypertension, and family history with diabetes incidence. Similarly, Fitri & Damayanti (2024) reported that obesity, sedentary lifestyle, high-sugar diets, and family history are major contributing risk factors for T2DM in children. These findings reinforce the central role of modifiable lifestyle factors in disease development.

Family history has also been consistently identified as a strong non-modifiable risk factor. Children with parents or close relatives with diabetes mellitus have a higher risk of developing impaired glucose metabolism due to inherited genetic susceptibility affecting insulin secretion, pancreatic beta-cell function, and insulin sensitivity. Handayani et al. (2024) and Arnida et al. (2024) both highlight family history as one of the most dominant risk factors. However, genetic predisposition alone is insufficient to cause disease; it interacts with environmental exposures such as diet and physical activity levels. This gene-environment interaction explains why children with genetic risk are more vulnerable when exposed to obesogenic environments.

Physical inactivity is another consistent risk factor identified in multiple studies. Regular physical activity enhances glucose uptake in skeletal muscles and improves insulin sensitivity. Conversely, low physical activity reduces glucose utilization, resulting in elevated blood glucose levels and increasing the risk of hyperglycemia. Fitri & Damayanti (2024) and Sister et al. (2026) both reported that sedentary lifestyle is highly prevalent among adolescents, indicating a growing public health concern. However, interestingly, Sister et al. (2026) found no statistically significant association between individual risk factors and blood glucose levels, suggesting that metabolic risk may develop gradually and may not be detectable in cross-sectional measurements.

The absence of significant associations in some studies should be interpreted carefully. For instance, Amila et al. (2024) reported no significant relationship between sugar, salt, and fat

consumption and T2DM risk in children. This may be due to methodological limitations such as cross-sectional design, which cannot capture long-term exposure effects, and potential recall bias in dietary reporting. Moreover, diabetes is a chronic condition that develops over time due to cumulative exposure to multiple risk factors, rather than a single short-term dietary pattern (Amila et al., 2024; Ferawati & Hadi Sulisty, 2020).

Similarly, Sister et al. (2026) found no significant relationship between BMI, physical activity, and blood glucose levels in adolescents, despite the presence of multiple metabolic risk factors. However, the study still emphasized that these factors may contribute to early metabolic changes that are not yet clinically apparent. This highlights the importance of early prevention strategies even in the absence of statistically significant findings.

Prihananto (2025) further strengthens the evidence by showing that family-related factors such as maternal age and number of children in the household are significantly associated with T2DM risk in adolescents. The study suggests that family structure and maternal health conditions may indirectly influence dietary patterns, caregiving practices, and lifestyle behaviors in children, thereby contributing to diabetes risk. From a broader public health perspective, these findings highlight that diabetes mellitus in children is not only a medical condition but also a social and environmental issue. Limited access to safe recreational spaces, increased exposure to digital technology, and easy availability of ultra-processed foods contribute to the formation of unhealthy behavioral patterns from an early age. Arnida et al. (2024) and Handayani et al. (2024) emphasize that lifestyle and environmental conditions play a critical role in shaping children's health outcomes.

Theoretically, these findings can be explained through several conceptual frameworks. The insulin resistance theory explains that impaired glucose metabolism results from decreased cellular response to insulin, primarily triggered by obesity and chronic inflammation. The multifactorial disease theory further explains that diabetes arises from the interaction of genetic, behavioral, and environmental factors rather than a single cause. In addition, gene-environment interaction theory highlights that genetic predisposition increases vulnerability when combined with unhealthy lifestyle factors (Susanto et al., 2025).

Furthermore, the epidemiological transition theory explains the shift in disease patterns from infectious diseases to non-communicable diseases, including diabetes mellitus, due to modernization, urbanization, and lifestyle changes. This is reflected in the increasing prevalence of obesity and T2DM among children and adolescents (Rohani et al., 2023). From a health promotion perspective, these findings emphasize the importance of early intervention strategies. Preventive measures such as balanced nutrition education, promotion of physical activity, reduction of sugar intake, and parental education should be prioritized. School-based interventions and family-centered approaches are essential in shaping healthy behaviors from an early age. In addition, early screening for high-risk groups such as obese children and those with a family history of diabetes is crucial for early detection and prevention of disease progression (Fitri & Damayanti, 2024; Arnida et al., 2024).

In conclusion, diabetes mellitus in children and adolescents is the result of complex interactions between genetic predisposition and environmental exposures. The reviewed studies consistently demonstrate that obesity, sedentary lifestyle, unhealthy diet, and family history are the primary risk factors for T2DM. Although some studies report non-significant statistical associations, the overall evidence suggests that cumulative exposure to these risk factors plays a crucial role in disease development. Therefore, comprehensive, multisectoral, and sustainable prevention strategies involving families, schools, and communities are essential to reduce the future burden of diabetes mellitus.

Conclusion

Based on the results of a literature review of five articles, it can be concluded that diabetes in children is a health problem that is influenced by various multifactorial risk factors. The main factors that play the most role are family history (genetic), obesity, unhealthy diet, especially high consumption of sugar and fat, and sedentary lifestyle or lack of physical activity. In addition, the increase in the prevalence of obesity in children also contributes to the increased incidence of type 2 diabetes mellitus at an early age. Although there are variations in results in some studies, in general all articles show that the combination of genetic and lifestyle factors has an important role in the occurrence of diabetes in children. Therefore, prevention efforts are needed from an early age through the implementation of a healthy lifestyle, increased physical activity, and early detection in children with high risk factors to reduce the incidence of diabetes in children.

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References

- Afianti, L. E., Wahyurianto, Y., Puspitadewi, T. R., & Sumiatin, T. (2025). Risk Factors for Diabetes Mellitus (DM) in Adolescents at SMP Negeri 3 Tuban. 4(11).
- Amila, Sembiring, E., & Zendrato, E. O. (2024). Consumption of fat, sugar, and salt with risk factors for type 2 diabetes mellitus in elementary school-age children. *Indonesian Trust Health Journal*, 7(2).
- Arnida, Priyatno, A. D., & Harokan, A. (2024). Risk factors for the occurrence of diabetes mellitus at productive age. *Medical Scholars: Journal of STIKES Al-Ma'arif Baturaja*, 9(2).
- Fitri, A. T., & Damayanti, P. (2024). Type 2 diabetes mellitus in children to adolescents. Faculty of Medicine, University of Lampung.
- Handayani, L., Rusliafa, J., Azim, L. L., & Fin. (2024). Overview of case characteristics and risk factors for diabetes mellitus in children at the Regional General Hospital (RSUD) of Kendari City. *Eventive Journal: Scientific Journal of Public Health Practitioners*, 9(1).
- Hasanah, Y. (2023). Diabetes in children. *Scientific Proceedings of the Anniversary of the Faculty of Medicine, Sriwijaya University*, 57.
- Dwi Ambarwati Nur Ammatullah. (2024). Systematic Literature Review: Analysis of Risk Factors for Type 1 Diabetes Mellitus in Children and Adolescents in Developed Countries in Western Europe. *Vitamins: Journal of General Health Sciences*, 2(4), 152–170. <https://doi.org/10.61132/Vitamin.V2i4.741>
- Ferawati, F., & Hadi Sulisty, A. A. (2020). The Relationship Between the Incidence of Complications and the Quality of Life of Patients with Type 2 Diabetes Mellitus in Prolanis Patients in the Working Area of the Dander Health Center. *Scientific Journal of Nursing Stikes Hang Tuah Surabaya*, 15(2), 269–277. <https://doi.org/10.30643/Jiksht.V15i2.80>
- Fitri, A. T., & Damayanti, P. (N.D.). Type 2 diabetes mellitus in children to adolescents.
- Handayani, L., & Rusliafa, J. (N.D.). Overview of Case Characteristics and Risk Factors for Diabetes Mellitus in Children at the Regional General Hospital (RSUD) of Kendari City. 9(1).
- Lusiani, T., & Qoiriah, A. (2014). Expert system to determine a healthy food menu for people with diabetes mellitus. *S@Cies*, 5(1), 9–23. <https://doi.org/10.31598/Sacies.V5i1.59>
- Pulungan, A. B., Annisa, D., & Imada, S. (2019). Type-1 Diabetes Mellitus in Children: The Situation in Indonesia and Governance. *Pediatrics*, 20(6), 392. <https://doi.org/10.14238/Sp20.6.2019.392-400>
- Rahmawati, D. (2024). Quality of Life of Patients with Diabetes Mellitus and Hypertension in the Chronic Disease Program (Prolanis) in Indonesia: A Narrative Review. *Mandala Pharmacon Indonesia Journal*, 10(1), 116–122. <https://doi.org/10.35311/Jmpi.V10i1.531>
- Rohani Rohani, Sri Handayani, Arpina Fajarnita, & Yusnaini Yusnaini. (2023). Health Education on the Use of Local Food for Diabetic Mellitus Patients in Tanoh Megakhe Village, Badar District, Southeast Aceh Regency. *Sewagati: Indonesian Journal of Community Service*, 2(4), 44–50. <https://doi.org/10.56910/Sewagati.V2i4.1102>
- Rohmatulloh, V. R., Pardjianto, B., & Kinasih, L. S. (2024). The relationship between age and sex to the incidence of type 2 diabetes mellitus based on 4 diagnosis criteria at the Internal Medicine Polyclinic of Karsa Husada Hospital, Batu City. Sec. 8.
- Susanto, Y., Khaerati, K., Widodo, A., & Hardani, M. F. (2025). Education and Early Detection of Tuberculosis, Diabetes, Gout and Hyperlipidemia in Uenuni Village, Palolo District. *To Maega : Journal of Community Service*, 8(1), 1–11. <https://doi.org/10.35914/Tomaega.V8i1.2909>
- Ulya, N., Sibuea, A. Z. E., Purba, S. S., Maharani, A. I., & Herbawani, C. K. (2023). Analysis of Risk Factors for Diabetes in Adolescents in Indonesia. *Tambusai Health Journal*, 4(3), 2332–2341. <https://doi.org/10.31004/Jkt.V4i3.16210>
- Wenny Rahmawati, & Satiti, I. A. D. (2024). The relationship between parental parenting and the incidence of diabetes in school-age children. *Oxytocin : Scientific Journal of Obstetrics*, 11(2), 122–129. <https://doi.org/10.35316/Oksitosin.V11i2.4560>
- Widiastuti, W., Zulkarnaini, A., Mahatma, G., & Anita Darmayanti. (2024). Article Review: The Effect of Food Intake Patterns on the Risk of Diabetes. *Journal Of Public Health Science*, 1(2), 108–125. <https://doi.org/10.59407/Jophs.V1i2.1066>