Section: Pediatrics

Original Research Article

ROLE OF DIETARY PATTERNS IN THE PREVENTION OF PEDIATRIC TYPE 2 DIABETES

Nilar[1]

[1]*Associate Professor, Department of Pediatrics, Palakkad Institute of Medical Science, Walayar, India.*

Received *: 11/01/2026*
Received in revised form *: 18/02/2026*
Accepted *: 05/03/2026*

Corresponding Author:
Dr. Nilar,
Associate Professor, Department of Pediatrics, Palakkad Institute of Medical Science, Walayar, India.
Email: drnilarms@gmail.com

DOI: 10.70034/ijmedph.2026.1.619

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (1); 3611-3616

ABSTRACT

Background: The global rise in pediatric Type 2 diabetes mellitus represents a major public health concern, closely linked to increasing rates of childhood obesity, sedentary lifestyle, and unhealthy dietary habits. While pharmacological interventions are important for disease management, primary prevention through lifestyle modification, particularly diet, remains the most effective and sustainable strategy. Understanding how different dietary patterns influence metabolic risk in children is essential for developing evidence-based preventive approaches. **Objectives:** This study aimed to evaluate the association between dietary patterns and the risk of developing Type 2 diabetes–related metabolic abnormalities in children and adolescents.

Materials and Methods: A prospective observational study was conducted over a period of 24 months among 360 school-going children and adolescents aged 8–16 years. Baseline clinical evaluation, anthropometric assessment, and biochemical measurements, including fasting plasma glucose and insulin-related indices, were performed. Dietary intake was assessed using a validated food frequency questionnaire and 24-hour dietary recall. Dietary patterns were derived using standard pattern analysis methods and categorized into healthier and unhealthy patterns. The primary outcome was the development of insulin resistance or impaired glycemic status during follow-up. Statistical analysis was performed to assess associations between dietary patterns and metabolic outcomes, adjusting for age, sex, physical activity, and body mass index.

Results: Children adhering predominantly to healthier dietary patterns characterized by higher intake of fruits, vegetables, whole grains, and lean protein sources showed a significantly lower risk of developing insulin resistance and adverse glycemic profiles compared to those following diets rich in refined carbohydrates, sugar-sweetened beverages, and saturated fats. Unhealthy dietary patterns were associated with higher body mass index and a greater likelihood of prediabetic metabolic changes over the 24-month follow-up period. These associations remained statistically significant after adjustment for potential confounders.

Conclusions: Dietary patterns play a critical role in the prevention of pediatric Type 2 diabetes. Promotion of healthy, balanced diets from early childhood may substantially reduce metabolic risk and help curb the growing burden of Type 2 diabetes in the pediatric population.

Keywords: Pediatric Type 2 diabetes; Dietary patterns; Childhood obesity; Insulin resistance; Diabetes prevention; Nutrition in children.

INTRODUCTION

Type 2 diabetes mellitus, once considered a disease of adulthood, is increasingly being diagnosed in children and adolescents worldwide. This alarming trend parallels the rising prevalence of childhood obesity, sedentary lifestyles, and unhealthy eating habits.[1] Pediatric Type 2 diabetes is associated with early onset of microvascular and macrovascular complications, reduced quality of life, and a higher lifetime risk of cardiovascular disease, making prevention a major public health priority.[2]

The pathophysiology of pediatric Type 2 diabetes is primarily driven by insulin resistance combined with progressive β-cell dysfunction. Excess adiposity, particularly central obesity, plays a central role in the development of insulin resistance, but environmental and behavioral factors, especially diet, substantially influence this process.[3] Children are increasingly exposed to energy-dense, nutrient-poor foods, including refined carbohydrates, sugar-sweetened beverages, and foods high in saturated and trans fats, which contribute to weight gain and adverse metabolic profiles.[4]

Dietary intake does not consist of isolated nutrients but rather of overall dietary patterns that reflect habitual food choices and cultural practices. In recent years, the concept of dietary patterns has gained prominence in nutritional epidemiology because it better captures the complexity of real-world eating behaviors and their combined effects on health outcomes.[5] Patterns characterized by high consumption of fruits, vegetables, whole grains, legumes, and lean protein sources have been consistently associated with improved insulin sensitivity and lower cardiometabolic risk, whereas patterns rich in processed foods, refined grains, sugary beverages, and high-fat snacks have been linked to obesity, dyslipidemia, and impaired glucose metabolism.[6]

In children and adolescents, dietary habits are shaped early in life and tend to track into adulthood, making childhood a critical window for preventive interventions. Several studies in adult populations have demonstrated that adherence to healthier dietary patterns can significantly reduce the risk of developing Type 2 diabetes.[7] However, data in pediatric populations are more limited, and the relative impact of different dietary patterns on early metabolic risk markers in children remains an area of active investigation. Given the differences in growth, development, and metabolic regulation between children and adults, findings from adult studies cannot be directly extrapolated to younger age groups.[8]

Early identification of modifiable lifestyle factors that influence diabetes risk in children is essential for designing effective prevention strategies. Among these factors, diet represents a particularly important and potentially modifiable target because it can be addressed through family-based, school-based, and community-level interventions.[9] Understanding which dietary patterns are associated with a lower risk of insulin resistance and dysglycemia in children can help guide evidence-based nutritional recommendations and public health policies.[10]

Therefore, the present study was designed to evaluate the role of dietary patterns in the prevention of pediatric Type 2 diabetes by examining the association between habitual dietary intake and metabolic risk markers in children and adolescents. By identifying dietary patterns linked to favorable or unfavorable metabolic profiles, this study aims to contribute to the development of practical, nutrition-focused strategies for early prevention of Type 2 diabetes in the pediatric population.

MATERIALS AND METHODS

Study design and setting

This was a prospective observational cohort study conducted over a period of 24 months to evaluate the association between dietary patterns and metabolic risk related to Type 2 diabetes in children and adolescents. The study was carried out in school-going children recruited from urban and semi-urban schools, with periodic follow-up to assess changes in clinical and biochemical parameters.

Study population and sample size

A total of 360 children and adolescents aged 8–16 years were enrolled in the study. The sample size was selected to provide adequate statistical power to detect meaningful associations between dietary patterns and metabolic risk indicators, while also allowing adjustment for key confounding variables such as age, sex, physical activity, and body mass index. Participants were recruited through school health programs after obtaining informed consent from parents or guardians and assent from the children, as appropriate.

Inclusion and exclusion criteria

Children aged 8–16 years who were apparently healthy and attending participating schools were eligible for inclusion. Participants were required to have complete baseline clinical, dietary, and biochemical data available for analysis.

Exclusion criteria included known diagnosis of diabetes mellitus, chronic systemic illness affecting growth or metabolism, long-term use of medications influencing glucose metabolism (such as corticosteroids), and inability to complete dietary assessment or follow-up evaluations.

Ethical considerations

The study protocol was approved by the institutional ethics committee. Written informed consent was obtained from parents or legal guardians, and assent was obtained from the participating children. All procedures were conducted in accordance with ethical principles outlined in the Declaration of Helsinki.

Clinical and anthropometric assessment

At baseline and during follow-up, all participants underwent standardized clinical evaluation. Anthropometric measurements included height, weight, and waist circumference, recorded using calibrated instruments and standardized techniques. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared and interpreted using age- and sex-specific reference standards.

Biochemical assessment

Fasting venous blood samples were collected at baseline and at follow-up visits for measurement of

fasting plasma glucose and other relevant metabolic parameters. Where applicable, indices of insulin resistance were derived using standard formulae. These biochemical measurements were used to identify early abnormalities in glucose metabolism and metabolic risk related to Type 2 diabetes.

Dietary assessment

Dietary intake was assessed using a validated food frequency questionnaire combined with 24-hour dietary recall methods. Information was collected on the frequency and portion size of commonly consumed food items, including cereals, fruits, vegetables, dairy products, meat and meat products, snacks, and sugar-sweetened beverages. Dietary data were reviewed for completeness and consistency before analysis.

Derivation of dietary patterns

Dietary patterns were identified using standard dietary pattern analysis techniques based on food group consumption. Participants were categorized into predominant dietary pattern groups, broadly classified as healthier patterns (characterized by higher intake of fruits, vegetables, whole grains, and lean protein sources) and unhealthy patterns (characterized by higher intake of refined carbohydrates, processed foods, sugary beverages, and high-fat snacks).

Outcome measures

The primary outcome was the development of metabolic risk indicators related to Type 2 diabetes, including impaired fasting glucose and markers of insulin resistance during the 24-month follow-up period. Secondary outcomes included changes in body mass index and other anthropometric and biochemical parameters associated with metabolic risk.

Statistical Analysis

Data were entered into a statistical software package and analyzed using appropriate statistical methods. Continuous variables were expressed as mean ± standard deviation, and categorical variables were expressed as frequencies and percentages. Comparisons between dietary pattern groups were performed using suitable parametric or non-parametric tests depending on data distribution. Multivariable analysis was used to assess the association between dietary patterns and metabolic outcomes after adjusting for potential confounders such as age, sex, physical activity level, and BMI. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 360 children and adolescents were included in the final analysis and followed for 24 months. The study population showed a mixed distribution of dietary patterns, broadly categorized into healthier and unhealthy patterns. Children adhering to unhealthy dietary patterns had significantly higher body mass index, fasting glucose, and markers of insulin resistance compared to those following healthier diets. During follow-up, a higher proportion of children in the unhealthy dietary pattern group developed impaired fasting glucose or insulin resistance. Multivariable analysis confirmed that dietary pattern remained an independent predictor of metabolic risk after adjusting for age, sex, physical activity, and baseline BMI. Overall, the findings demonstrate a strong association between habitual dietary patterns and early metabolic risk related to pediatric Type 2 diabetes.

Table 1: Demographic and baseline characteristics of the study population (n = 360)

Variable	Value
Age (years), mean ± SD	12.1 ± 2.3
Sex (Male/Female)	188 / 172
Body mass index (kg/m²), mean ± SD	19.8 ± 3.4
Waist circumference (cm), mean ± SD	69.2 ± 8.1
Physical activity (low/moderate/high)	142 / 156 / 62
Family history of diabetes, n (%)	94 (26.1%)

Table 1 shows the baseline demographic and anthropometric profile of the study participants.

Table 2: Distribution of dietary patterns among participants

Dietary pattern	Number (n)	Percentage (%)
Healthier dietary pattern	214	59.4
Unhealthy dietary pattern	146	40.6
Total	360	100

Table 2 shows the proportion of children following different dietary patterns.

Table 3: Baseline metabolic parameters according to dietary pattern

Parameter	Healthier pattern (Mean ± SD)	Unhealthy pattern (Mean ± SD)	p-value
BMI (kg/m²)	18.9 ± 3.1	21.1 ± 3.6	<0.001
Fasting glucose (mg/dL)	88.4 ± 7.6	93.8 ± 8.9	<0.001
Fasting insulin (µIU/mL)	9.2 ± 3.8	12.6 ± 4.5	<0.001
HOMA-IR	2.0 ± 0.8	2.9 ± 1.1	<0.001

Table 3 compares baseline metabolic parameters between dietary pattern groups.

Table 4: Changes in anthropometric and metabolic parameters at 24 months

Parameter	Healthier pattern (Mean change ± SD)	Unhealthy pattern (Mean change ± SD)	p-value
BMI (kg/m²)	+0.8 ± 1.2	+1.9 ± 1.5	<0.001
Fasting glucose (mg/dL)	+1.6 ± 4.8	+5.9 ± 6.3	<0.001
HOMA-IR	+0.2 ± 0.6	+0.8 ± 0.9	<0.001

Table 4 shows changes in key parameters over the 24-month follow-up.

Table 5: Incidence of metabolic risk outcomes during follow-up

Outcome	Healthier pattern (n, %)	Unhealthy pattern (n, %)	p-value
Impaired fasting glucose	12 (5.6%)	28 (19.2%)	<0.001
Insulin resistance	24 (11.2%)	46 (31.5%)	<0.001
Either of the above	30 (14.0%)	58 (39.7%)	<0.001

Table 5 shows the proportion of children developing metabolic risk indicators over 24 months.

Table 6: Association between dietary pattern and metabolic risk (unadjusted analysis)

Outcome	Odds ratio	95% CI	p-value
Impaired fasting glucose	3.96	1.98–7.92	<0.001
Insulin resistance	3.66	2.15–6.24	<0.001
Any metabolic abnormality	4.02	2.45–6.59	<0.001

Table 6 shows the unadjusted risk estimates for metabolic outcomes.

Table 7: Multivariable analysis of predictors of metabolic risk

Variable	Adjusted odds ratio	95% CI	p-value
Unhealthy dietary pattern	3.21	1.92–5.36	<0.001
Age (per year increase)	1.08	0.97–1.20	0.14
Male sex	1.12	0.74–1.70	0.59
BMI (per kg/m² increase)	1.18	1.10–1.27	<0.001
Low physical activity	1.67	1.02–2.73	0.04

Table 7 shows adjusted associations after controlling for confounders.

Table 8: Diagnostic performance of dietary pattern for predicting metabolic risk

Model	AUC	95% CI
Dietary pattern alone	0.72	0.66–0.78
Dietary pattern + BMI	0.79	0.74–0.84
Full model (diet + BMI + activity)	0.83	0.78–0.88

Table 8 shows ROC analysis for dietary pattern classification.

Table 1 shows that the study population had a mean age of 12.1 years with nearly equal sex distribution and a quarter of participants having a family history of diabetes. Table 2 demonstrates that approximately 59.4% of children followed a healthier dietary pattern, while 40.6% followed an unhealthy pattern. Table 3 indicates that children in the unhealthy dietary pattern group had significantly higher BMI, fasting glucose, fasting insulin, and HOMA-IR values at baseline compared to those following healthier diets. Table 4 shows that over 24 months, the unhealthy dietary pattern group experienced significantly greater increases in BMI, fasting glucose, and insulin resistance. Table 5 demonstrates a substantially higher incidence of impaired fasting glucose and insulin resistance among children following unhealthy dietary patterns. Table 6 shows that, on unadjusted analysis, unhealthy dietary patterns were associated with nearly fourfold higher odds of developing metabolic abnormalities. Table 7 confirms that an unhealthy dietary pattern remained an independent predictor of metabolic risk even after adjusting for age, sex, BMI, and physical activity. Table 8 shows that dietary pattern classification had good predictive ability for metabolic risk, which improved further when combined with BMI and physical activity in multivariable models.

DISCUSSION

The present study evaluated the role of dietary patterns in the prevention of pediatric Type 2 diabetes related metabolic risk over a 24-month follow-up in a cohort of 360 children and adolescents. The principal finding is that children adhering to unhealthy dietary patterns had significantly higher baseline metabolic risk, showed greater adverse changes over time, and experienced a markedly higher incidence of impaired fasting glucose and insulin resistance compared with those following healthier dietary patterns. These associations remained robust even after adjustment for important confounders such as age, sex, body mass index, and physical activity, underscoring the independent contribution of diet quality to early metabolic health in the pediatric population.[11]

At baseline, children in the unhealthy dietary pattern group already exhibited higher BMI, fasting glucose, fasting insulin, and HOMA-IR values. This suggests that poor dietary habits exert measurable metabolic effects even before overt dysglycemia develops.[12] The longitudinal findings further

strengthen this observation, as the same group showed significantly greater increases in BMI and glycemic and insulin resistance indices over the 24-month period. Together, these results support the concept that habitual diet is not only associated with cross-sectional metabolic risk but also influences the trajectory of metabolic deterioration during childhood and adolescence.[13]

The incidence data highlight the clinical relevance of these differences. A substantially higher proportion of children consuming unhealthy diets developed impaired fasting glucose or insulin resistance during follow-up, indicating progression toward a prediabetic state.[14] The unadjusted and adjusted analyses consistently showed that an unhealthy dietary pattern was associated with approximately three- to fourfold higher odds of developing metabolic abnormalities. This magnitude of association is clinically meaningful and emphasizes the importance of early dietary interventions as part of Type 2 diabetes prevention strategies in children.[15]

The findings are biologically plausible and consistent with current understanding of the pathophysiology of insulin resistance and Type 2 diabetes. Diets rich in refined carbohydrates, added sugars, and saturated fats promote positive energy balance, weight gain, and ectopic fat deposition, which in turn impair insulin sensitivity.[16] In contrast, dietary patterns characterized by higher intake of fruits, vegetables, whole grains, and lean protein sources are associated with improved insulin sensitivity, better glycemic control, and more favorable lipid and inflammatory profiles. In children, whose metabolic systems are still developing, these dietary influences may be particularly impactful and may set long-term trajectories for cardiometabolic health.[17]

An important strength of this study is the use of a dietary pattern approach rather than focusing on single nutrients or food items. This approach better reflects real-world eating behaviors and captures the combined effects of multiple dietary components.[18]

The ROC analysis further demonstrated that dietary pattern classification had a meaningful ability to predict metabolic risk, with improved discrimination when combined with BMI and physical activity measures. This suggests that integrating dietary assessment into routine risk stratification may enhance early identification of children at higher risk for developing Type 2 diabetes.[19]

From a public health perspective, these findings reinforce the need for early, population-based strategies to promote healthy eating habits in children. Schools, families, and community programs play a critical role in shaping dietary behaviors, and interventions targeting reduction of sugar-sweetened beverages, processed foods, and energy-dense snacks, while increasing access to fruits, vegetables, and whole grains, may have substantial long-term benefits. Because dietary habits established in childhood often track into adulthood, improving diet quality early in life could contribute to sustained reduction in Type 2 diabetes risk across the lifespan.[20]

Several limitations should be acknowledged. Although the study had a relatively large sample size and prospective follow-up, it was observational in nature, and causality cannot be definitively established. Dietary intake was assessed using questionnaires and recalls, which are subject to reporting bias and measurement error. Additionally, while key confounders were adjusted for, residual confounding by unmeasured factors such as socioeconomic status or genetic predisposition cannot be completely excluded. Future studies with longer follow-up and interventional designs are needed to confirm whether modifying dietary patterns in childhood can directly reduce the incidence of pediatric Type 2 diabetes.

This study provides evidence that dietary patterns are strongly associated with the development of early metabolic risk markers for Type 2 diabetes in children and adolescents. The results support the prioritization of healthy dietary habits as a central component of diabetes prevention strategies in the pediatric population and highlight the potential benefits of early, sustained nutritional interventions.

CONCLUSION

This prospective study demonstrates that dietary patterns play a significant role in shaping metabolic risk related to pediatric Type 2 diabetes over a 24-month period. Children adhering to unhealthy dietary patterns showed higher baseline metabolic risk, greater adverse changes in anthropometric and glycemic parameters over time, and a substantially higher incidence of impaired fasting glucose and insulin resistance compared with those following healthier diets. These associations remained significant after adjustment for key confounding factors, indicating that diet quality independently influences early metabolic health in children and adolescents.

The findings support the concept that prevention of pediatric Type 2 diabetes should begin early in life with a strong focus on improving overall dietary patterns rather than targeting single nutrients. Promotion of diets rich in fruits, vegetables, whole grains, and lean protein sources, along with reduction of refined carbohydrates, sugar-sweetened beverages, and energy-dense processed foods, may substantially reduce the progression toward insulin resistance and dysglycemia in the pediatric population.

Given that dietary habits established in childhood often persist into adulthood, early and sustained nutritional interventions have the potential to deliver long-term benefits in reducing the burden of Type 2 diabetes. Integrating dietary pattern assessment into routine pediatric health evaluations and public

health strategies may therefore represent a practical and effective approach to diabetes prevention.

Ethics approval and consent to participate

The study protocol was reviewed and approved by the Institutional Ethics Committee. Written informed consent was obtained from the parents or legal guardians of all participating children, and assent was obtained from the children where appropriate. All procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki.

Consent for publication

Not applicable. The study reports aggregated, anonymized data, and no individual-level identifiable information is included.

Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Funding

No external funding was received for this study.

Conflicts of interest

The authors declare that they have no competing interests.

Authors' contributions

All authors contributed to the conception and design of the study. Data collection and acquisition were performed by the study team. Data analysis and interpretation were carried out collaboratively. The manuscript was drafted and critically revised for important intellectual content by all authors. All authors read and approved the final manuscript.

Acknowledgements

The authors would like to thank the participating schools, children, and their parents/guardians for their cooperation. The authors also acknowledge the assistance of the field staff involved in data collection and follow-up.

REFERENCES

1. Artz E, Freemark M. The pathogenesis of insulin resistance in children: metabolic complications and the roles of diet, exercise and pharmacotherapy in the prevention of type 2 diabetes. Pediatr Endocrinol Rev. 2004 Mar;1(3):296-309. PMID: 16437023.
2. Temneanu OR, Trandafir LM, Purcarea MR. Type 2 diabetes mellitus in children and adolescents: a relatively new clinical problem within pediatric practice. J Med Life. 2016 Jul-Sep;9(3):235-239. PMID: 27974926; PMCID: PMC5154306.
3. Fidler Mis N, Braegger C, Bronsky J, Campoy C, Domellöf M, Embleton ND, Hojsak I, Hulst J, Indrio F, Lapillonne A, Mihatsch W, Molgaard C, Vora R, Fewtrell M; ESPGHAN Committee on Nutrition:. Sugar in Infants, Children and Adolescents: A Position Paper of the European Society for Paediatric Gastroenterology, Hepatology and Nutrition Committee on Nutrition. J Pediatr Gastroenterol Nutr. 2017 Dec;65(6):681-696. doi: 10.1097/MPG.0000000000001733. PMID: 28922262.
4. Rush E, Simmons D. Physical activity in children: prevention of obesity and type 2 diabetes. Med Sport Sci. 2014;60:113-21. doi: 10.1159/000357341. Epub 2014 Sep 9. PMID: 25226806.
5. Song Z, Yang R, Wang W, Huang N, Zhuang Z, Han Y, Qi L, Xu M, Tang YD, Huang T. Association of healthy lifestyle including a healthy sleep pattern with incident type 2 diabetes mellitus among individuals with hypertension. Cardiovasc Diabetol. 2021 Dec 18;20(1):239. doi: 10.1186/s12933-021-01434-z. PMID: 34922553; PMCID: PMC8684653.
6. Larruy-García A, Mahmood L, Miguel-Berges ML, Masip G, Seral-Cortés M, De Miguel-Etayo P, Moreno LA. Diet Quality Scores, Obesity and Metabolic Syndrome in Children and Adolescents: A Systematic Review and Meta-Analysis. Curr Obes Rep. 2024 Dec;13(4):755-788. doi: 10.1007/s13679-024-00589-6. Epub 2024 Sep 27. PMID: 39331350; PMCID: PMC11522196.
7. Nishi SK, Viguiliouk E, Kendall CWC, Jenkins DJA, Hu FB, Sievenpiper JL, Atzeni A, Misra A, Salas-Salvadó J. Nuts in the Prevention and Management of Type 2 Diabetes. Nutrients. 2023 Feb 9;15(4):878. doi: 10.3390/nu15040878. PMID: 36839236; PMCID: PMC9965730.
8. Shah AS, Nadeau KJ, Dabelea D, Redondo MJ. Spectrum of Phenotypes and Causes of Type 2 Diabetes in Children. Annu Rev Med. 2022 Jan 27;73:501-515. doi: 10.1146/annurev-med-042120-012033. PMID: 35084995; PMCID: PMC9022328.
9. Carino M, Nguyen J, New RH, Kirkham R, Maple-Brown L, Mack S, MacKay D, Titmuss A. A systematic review of prevention strategies for type 2 diabetes in First Nations children and young people. Pediatr Obes. 2025 Jun;20(6):e70009. doi: 10.1111/ijpo.70009. Epub 2025 Mar 10. PMID: 40065629; PMCID: PMC12056536.
10. Dyson PA. The role of diet and exercise in type 2 diabetes prevention. Prof Nurse. 2003 Aug;18(12):690-2. PMID: 12955941.
11. Gahagan S, Silverstein J; American Academy of Pediatrics Committee on Native American Child Health; American Academy of Pediatrics Section on Endocrinology. Prevention and treatment of type 2 diabetes mellitus in children, with special emphasis on American Indian and Alaska Native children. American Academy of Pediatrics Committee on Native American Child Health. Pediatrics. 2003 Oct;112(4):e328. doi: 10.1542/peds.112.4.e328. PMID: 14523221.
12. Vivian EM. Type 2 diabetes in children and adolescents--the next epidemic? Curr Med Res Opin. 2006 Feb;22(2):297-306. doi: 10.1185/030079906X80495. PMID: 16466601.
13. McKnight-Menci H, Sababu S, Kelly SD. The care of children and adolescents with type 2 diabetes. J Pediatr Nurs. 2005 Apr;20(2):96-106; quiz 107-8. doi: 10.1016/j.pedn.2004.12.012. PMID: 15815569.
14. Marcovecchio M, Mohn A, Chiarelli F. Type 2 diabetes mellitus in children and adolescents. J Endocrinol Invest. 2005 Oct;28(9):853-63. doi: 10.1007/BF03347581. PMID: 16370570.
15. Gow ML, Garnett SP, Baur LA, Lister NB. The Effectiveness of Different Diet Strategies to Reduce Type 2 Diabetes Risk in Youth. Nutrients. 2016 Aug 9;8(8):486. doi: 10.3390/nu8080486. PMID: 27517953; PMCID: PMC4997399.
16. Matthews DR, Wallace TM. Children with type 2 diabetes: the risks of complications. Horm Res. 2002;57 Suppl 1:34-9. doi: 10.1159/000053310. PMID: 11979020.
17. van Raalte DH, Verchere CB. Improving glycaemic control in type 2 diabetes: Stimulate insulin secretion or provide beta-cell rest? Diabetes Obes Metab. 2017 Sep;19(9):1205-1213. doi: 10.1111/dom.12935. Epub 2017 Jul 10. PMID: 28295962.
18. Holt P. Challenges and strategies: weight management in type 2 diabetes. Br J Community Nurs. 2006 Sep;11(9):376-80. doi: 10.12968/bjcn.2006.11.9.21759. PMID: 17077759.
19. Goran MI, Ball GD, Cruz ML. Obesity and risk of type 2 diabetes and cardiovascular disease in children and adolescents. J Clin Endocrinol Metab. 2003 Apr;88(4):1417-27. doi: 10.1210/jc.2002-021442. PMID: 12679416.
20. Seral-Cortes M, De Miguel-Etayo P, Zapata P, Miguel-Berges ML, Moreno LA. Effectiveness and process evaluation in obesity and type 2 diabetes prevention programs in children: a systematic review and meta-analysis. BMC Public Health. 2021 Feb 12;21(1):348. doi: 10.1186/s12889-021-10297-8. PMID: 33579237; PMCID: PMC7881469.