

Editorial

Juvenile diabetes, its' pervasiveness, and actionplan for deterrent

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Abstract

In Bangladesh, diabetes mellitus is a substantial public health concern, and its prevalence is rising steadily. Many other mechanisms can cause diabetes in childhood; most children develop type 1 diabetes mellitus primarily due to immune system-mediated β cell death, while type 2 diabetes mellitus is characterized by insulin resistance-related β cell failure. The long-term effects of micro and macrovascular illnesses impose a tremendous strain on those frequently affected early in middle age. The increased prevalence of diabetes in children and the excessive morbidity linked to its effects highlight the significance of preventive measures for future generations. It is essential to look into the possibilities for improvement in school-oriented diabetes management interventions. Consistent engagement and communication on diverse theoretical concepts, performing exploratory assessments to guide interventions, and conducting an operational valuation are necessary to enhance these programs. Furthermore, it is required to identify the significant challenge of the general food milieu and its influence on children's diets with more participation from related parties like families, stores, and supermarkets. The fast urbanization of Bangladesh may affect the local population's way of living, there may be a genetic predisposition to diabetes in the country, or both could be responsible for the growth in childhood diabetes mellitus.

Keywords: Juvenile diabetes, Insulin-dependent diabetes, Autoimmunity, Preventive approaches, Incidence of Pediatric Diabetes, Community health.

Bangladesh Journal of Medical Science Vol. 22 No. 02 April'23 Page : 249-255
DOI: <https://doi.org/10.3329/bjms.v22i2.64979>

Diabetes mellitus (DM), one of the non-communicable diseases, is a most important public health concern in Bangladesh. DM causes 5% of all fatalities worldwide annually, and its incidence is constantly rising. In 2010–2011, Bangladesh was recognized as the eighth-most diabetic-populated nation ¹. The increased incidence of diabetes and inadequate glucose control in children is a significant but underreported public health issue. In 2004, it was estimated that children of South Asian descent had a prevalence of type 2 diabetes approximately 13 times higher than that of white children ². Again, doctor-diagnosed DM is over four times more

common in Bangladeshi males than in the general population. It is nearly three times more prevalent in Pakistani and Indian men, according to the Health Survey for England 2004 ³. A genetic predisposition to diabetes may exist in Bangladeshis, the country's rapid urbanization may impact the local population's way of living, or both may be responsible for the rise in childhood diabetes⁴. So, it is high time to discuss the prevalence and prevention of childhood DM to provide the most appropriate healthcare for diabetic children and reduce the risk of consequences that could negatively impact the nation's economic progress.

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Children and teenagers in Bangladesh tend to have a high occurrence of diabetes. The higher-income urban families' kids are at risk for developing obesity, diabetes, and hypertension. This paper explains the causes and plans to prevent diabetes, provide diabetic children with the most effective possible care, and lessen the load of complications.

This paper addresses the possible causes of childhood diabetes, the prevalence of childhood diabetes, and prevention plans. ResearchGate, Science Direct, Google Scholar, PubMed, and Science Direct were used to search online databases for the information. The reference list of related publications was examined to find further works of literature. Searched keywords included Childhood Diabetes, Diabetes Mellitus, Prevalence of Pediatric Diabetes, Juvenile Diabetes, Possible Mechanisms for Childhood Diabetes, and Prevention Strategies for Childhood diabetes. Dissertations printed in other languages and those published before 2000 were ignored. Before being included in this study, the papers' suitability was carefully reviewed. The matching articles were removed carefully. After the independent evaluation and assimilation of the proposed literary works, a follow-up discussion was arranged to address any queries, doubts, inaccuracies, or biases about the particular articles.

Along with the autoimmune destruction of pancreatic β cells, genetic and also environmental factors collectively consequence the development of type 1 Diabetes Mellitus (T1DM). T cell-mediated autoimmune reaction, individuals with T1DM progressively knock down the entire insulin-secreting β cells. Yet active β cells could be found in almost all people, regardless of the duration of illness. Future attempts at rejuvenation could benefit from these residual active β cells⁵. Adults and children likely have the same disease pathogenesis aspects of insulin insensitivity and β cell dysfunction⁶. A decrease in the immediate insulin release was often seen in assessments of children whose parents had type 2 diabetes mellitus (T2DM), implicating β cell dysfunction as the leading cause⁷. T1DM affected approximately 184,100 children and adolescents under 20 years in the South East Asia (SEA) region in 2019. The rise in childhood obesity, which causes T2DM in children and adolescents, is predicted to be a consequential health concern for this zone⁸. A study conducted among 2152 Bangladeshi students aged 10-18 years taken from rural, urban, and suburban

areas found boys had a suggestively higher prevalence of T2DM than girls. In addition, the bulk of impaired fasting glucose (IFG) and T2DM increased with age and income. Besides, urban students showed a significantly increased prevalence of IFG and T2DM (for both $p < 0.001$). Adolescent girls in Bangladesh may be customarily restrained and have limited access to outdoor physical activity; consequently, body mass index (BMI) was substantially greater in girls than in boys⁹.

The incidence of T1DM in children and adolescents has consistently been rising by 3-4% annually, while in some high-incidence nations, this rise seems to be declining or stopping altogether¹⁰. About 2-3% of people are affected globally every year. Children below the age of five were found to become the category with the fastest-rising prevalence of diabetic population in the European Diabetes (EURODIAB) research¹¹. It is alarming that more children and young people are developing T2DM. Micro and macrovascular problems in diabetes beginning in adolescence and early adulthood are known to grow faster and more frequently in T2DM compared to T1DM¹². Bangladesh has recently seen a significant economic and epidemiological change, fast-growing urbanization accompanied by sedentary lifestyles, higher calorie diets, and stressful surroundings, all of which may have influenced the increase in the incidence of DM and the impairment of glycemic control¹³. Research among young children of eastern European countries showed an increased incidence of T1DM, with the highest numbers occurring in the formerly low-incidence populations¹⁴. Patients with diabetes in SEA are more likely to experience consequences for a brief period. Among these problems, vascular impediments, impaired regulation of glucose, and increased risk of cardiovascular diseases cause higher morbidity and mortality rate¹⁵. Neuropathy, retinopathy, and nephropathy are a few examples of the consequences that can be prevented with proper glucose management¹⁶. According to another research, merely 32.4% of thirteen to 18-year-olds in the US had satisfactory glycemic control, as determined by estimated glycated hemoglobin of 7.5% or below¹⁷. The essential aspects of glycemic control therapy, such as continuous delivery of insulin, availability of blood glucose monitoring, and adequate education and training, are still out of reach for many families throughout many Low and middle-income countries contexts, including adolescents who have been diagnosed as diabetic¹⁸.

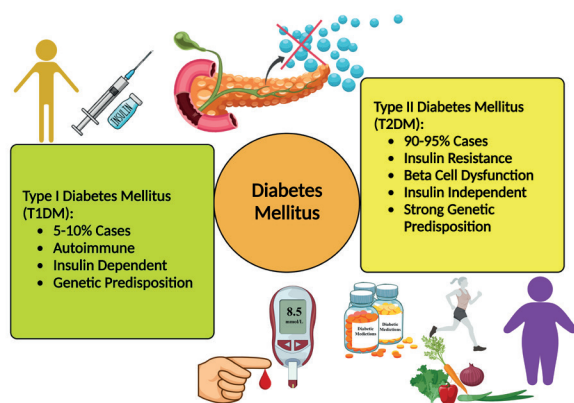


Figure 1: Diagrammatic presentation of Characteristics of T1DM and T2DM. This figure has been developed by utilizing the premium version of Bio Render (<https://biorender.com/>) with License No.: HJ24LAN50T. Image Credit: Susmita Sinha.

Every 1% increase in HbA1c was linked to a 12% increase in heart failure, according to a prospective study conducted in the UK (Figure 1) ¹⁹.

Prevention Strategies

The prevalence of DM is a paramount clinical issue in the majority of Asian nations. To lessen the impact of diabetes on individuals, families, and society in general, primary prevention is crucial ²⁰. Most research on preventing childhood obesity and persistent diseases has concentrated on schools as the central intervention setting. It would seem very logical to use this strategy. Numerous schools have as one of their missions to promote health education and a healthy atmosphere. A plan can be standardized and continued over time. Additionally, school authorities substantially encouraged to implement it ²¹. Previous prevention strategies outcomes showed that diabetes and obesity treatments were unsuccessful. So, it would be more effective if the prevention collaborates with the child, the school, the family, and the community ²². Information should be made accessible so that children, parents, and teachers may acquire knowledge about DM. Ideas can be categorized as (1) to know what DM is, (2) how to prevent diabetes, (3) which food ingestion increases blood glucose level, (4) how is obesity linked with diabetes, (5) choice of food and beverages, (6) lifestyle modification, (7) to know about how much a child should eat, (8) influencing regular physical activity (Figure 2) ²³. To avoid or at least put off the progression of DM in high-risk people, lifestyle

Prevention Plans for Childhood Diabetes

	Knowledge about Diabetes Mellitus
	Avoidance of High Calorie Diets
	Regular Physical Activity
	Eating Foods According to Portion Size
	Proper Weight Management
	Intake of Adequate Amount of Whole Grains & Vegetables

Figure 2: Prevention plans for childhood DM. This figure has been developed by utilizing the premium version of Bio Render (<https://biorender.com/>) with the License No.: UM24LANDN5. Image Credit: Susmita Sinha.

interventions focusing on increased physical activity and healthy dietary practices, as well as utilization of appropriate pharmacological intervention are primary prevention strategies of T2DM ²⁴. Activities offered in schools should include and promote statistically meaningful approach regarding awareness regarding nutrition and exercise. Furthermore, school officials can utilize extra hours of curriculum to promote DM educational awareness campaigns to build adequate cognizance among school children regarding causes and prevention strategies mentioned illness. These programs have shown alterations in food intake patterns and psychological aspects ^{25,26}. Obesity control can come to end or minimize the onset of T2DM ²⁷. Establishing work relations will be vital to sustaining lengthy governmental financial assistance for the initiative, even though long-standing transition strategies are still uncertain. Improved encouragement for kids, such as that provided by diabetic community agencies, will also give diabetic kids and their caregivers the confidence they need to stand up for what's right. Without outside financing, improved consumer awareness will support greater care coordination ²⁸. The Bangladesh government intends to begin offering free insulin to all people with T1DM ²⁹.

Diabetes is a concerning social and medical load in several Asian nations ^{30,31}. In addition to this, many children and adolescents are developing diabetes which is a major health concern ^{32,33}. The way of living of children and adolescents has changed due to modernization, availability of ready-to-eat food, fast

urban expansion, and reduced physical activity³⁴⁻³⁶. Because SEA communities have a immense genetic propensity for metabolic abnormalities like diabetes and CVD, the health impacts are severe³⁷. Present lifestyle factors may enhance the disease's clinical manifestation from a very early age³⁸. The risk of acquiring diabetes, obesity, and hypertension is highest in urban children from higher-income families³⁹⁻⁴¹. The prevalence of IFG and T2DM could be confirmed by additional large-scale research with extra risk variables, such as physical exercise, dietary condition, and psychological distress, that could also help discover the possible risks for non-communicable metabolic illnesses.

Modifying causal factors, including obesity and insulin resistance, can help prevent future diabetes propagation among the community^{42, 43}. Again, preference needs to be given in the healthcare strategy to government initiatives encouraging healthy lifestyles among the community, beginning at the young age⁴⁴⁻⁴⁶. The world today places the most significant importance on patient education, which is the most crucial factor^{47, 48}. The occurrence of diabetes may be confirmed by extensive research, including several lifestyle parameters such as caloric intake, physical activity, and psycho-social distress, which may also help to invent the causes of non-communicable metabolism-related disorders⁴⁹⁻⁵¹. At the same time, the best long-term alternatives are preventing the issue and collaborating with the children, the schools, the parents, and the communities.

Consent for Publication: The author reviewed and approved the final version and has agreed to be accountable for all aspects of the work, including any accuracy or integrity issues.

Disclosure: The author declares that they do not have any financial involvement or affiliations with any organization, association, or entity directly or indirectly with the subject matter or materials presented in this article. This includes honoraria, expert testimony, employment, ownership of stocks or options, patents or grants received or pending, or royalties.

Funding: This study received no funding.

Data Availability: Information is taken from freely available sources for this review paper.

Authorship Contribution: All authors contributed significantly to the work, whether it be in the conception, design, utilization, collection, analysis, and interpretation of data, or in all of these areas. They also participated in the article's drafting, revision, or critical review, gave their final approval for the version that would be published, decided on the journal to which the article would be submitted, and made the responsible decision to be held accountable for all aspects of the work.

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