

## Type 1 diabetes guidelines: Are they enough?

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### ABSTRACT

The discovery of insulin by Banting and Best in 1922 changed the landscape of type 1 diabetes mellitus (T1DM). Guidelines on T1DM should be evidence based and should emphasize comprehensive risk management. Guidelines would improve awareness amongst governments, state health care providers and the general public about the serious long-term implications of poorly managed diabetes and of the essential resources needed for optimal care. T1DM requires lifelong daily medication, regular control as well as access to facilities to manage acute and chronic complications. American Diabetes Association 2014 guidelines recommends annual nephropathy screening for albumin levels; random spot urine sample for albumin-to-creatinine ratio at start of puberty or age  $\geq 10$  years, whichever is earlier, once the child has had diabetes for 5 years. Hypertension should be screened for in T1DM patients by measuring blood pressure at each routine visit. Dyslipidemia in T1DM patients is important and patients should be screened if there is a family history of hypercholesterolemia or a cardiovascular event before the age of 55 years exists or if family history is unknown. Retinopathy is another important complication of diabetes and patients should be subjected to an initial dilated and comprehensive eye examination. Basic diabetes training should be provided for school staff, and they should be assigned with responsibilities for the care of diabetic children. Self-management should be allowed at all school settings for students.

**Key words:** Guidelines, self-management, type 1 diabetes mellitus

### INTRODUCTION

The discovery of insulin by Banting and Best in 1922 changed the landscape of type 1 diabetes mellitus (T1DM). This discovery gave hope of good life expectancy to patients of T1DM. The process of guideline development on T1DM management was initiated after this discovery.

While there is extensive evidence on the optimal management of T1DM, unfortunately, such care is not reaching many people who could benefit from it. Guidelines are one part of a process, which seeks to address these problems. Guidelines would improve awareness among governments, state health care providers and the general public about the serious long-term

implications of poorly managed diabetes and of the essential resources needed for optimal care. These would also assist individual care givers in managing children and adolescents with diabetes in a prompt, safe, consistent, equitable, standardized manner in accordance with the current views of experts in the field. Guidelines should be evidence based, well accepted, clinically relevant, employable in clinical practice, and should emphasize comprehensive risk management.<sup>[1]</sup>

Type 1 diabetes mellitus is the second most common chronic disease in children in India. It accounts for 5–10% of all diagnosed cases of diabetes mellitus<sup>[2]</sup> and has an incidence of 3.0 cases/year/100,000 (IDF atlas 6<sup>th</sup> edition). Of the 18 genomic intervals implicated in the risk of developing T1DM, the major histocompatibility complex region on chromosome 6p21.31 has been the major contributor, estimated to account for 40–50% of the risk.<sup>[3]</sup>

The trend of increasing rates of T1DM in Finland in children <14 years of age has been shown to be associated with a decrease in recommended Vitamin D intake over the last half century. The annual age-related incidence rate

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of T1DM in children  $\leq 14$  years/100,000 population has increased from  $<20$  in 1965 to  $>60$  in 2005.

Type 1 diabetes mellitus requires lifelong daily medication, regular control as well as access to facilities to manage acute and chronic complications. Failure to meet these needs leads to the development of complications with increased morbidity/mortality. The expected life-span for T1DM patients is strongly correlated with the availability of a well-functioning and well-equipped diabetes care organization. The mortality has increased 4–7-fold in the T1DM population over their matched nondiabetic counterparts.

The challenges of diabetes care include low patient awareness, significant psychosocial impact, having poor blood glucose control, irregular/missed insulin doses, patient noncompliance, and concerns about hypoglycemia.

The recommended HbA1c target for children  $<18$  years of age is  $<7.5\%$  and for adults is  $<7.0\%$ . However, targets can be made less stringent for the elderly population; viz., for a healthy geriatric  $<7.5\%$ , for those with one or more co-morbidities  $<8.0\%$ , and in those with poor health  $<8.5\%$ . A different school of thought, however, suggest HbA1c levels for children  $<6$  years of age as  $<.0\%$ , 6–12 years of age as  $\leq 7.5\%$ , and for adolescents as  $\leq 7.0\%$ .<sup>[14]</sup>

Chronic complications associated with T1DM in children are retinopathy, nephropathy, and neuropathy (rarely reported in prepubertal children). These might occur after the onset of puberty or after 5–10 years of diabetes. It is recommended that those with expertise in diabetes management should conduct the assessments.

American Diabetes Association (ADA) 2014 guidelines recommends annual nephropathy screening for albumin levels; random spot urine sample for albumin-to-creatinine (ACR) ratio at start of puberty or age  $\geq 10$  years, whichever is earlier, once the child has had diabetes for 5 years. The treatment could be ACE inhibitors when ACR is abnormal with two different specimens from two different days over a 6-month period.

Hypertension should be screened for in T1DM patients by measuring blood pressure at each routine visit. Initial treatment of high-normal blood pressure (systolic blood pressure or diastolic blood pressure consistently above the 90<sup>th</sup> percentile for age, sex, and height) should include dietary intervention and exercise, aimed at weight control along with increased physical activity, if appropriate. If target blood pressure is not reached with 3–6 months

of lifestyle intervention, the physician should consider pharmacologic treatment. The goal of treatment should be to attain blood pressure consistently  $<130/80$  mmHg or below the 90<sup>th</sup> percentile for age, sex, and height, whichever is lower.<sup>[15]</sup>

Dyslipidemia in T1DM patients is an important issue, and patients should be screened if there is a family history of hypercholesterolemia or a cardiovascular event before the age of 55 years exists or if family history is unknown. In children  $>2$  years of age, the physician should consider obtaining a fasting lipid profile soon after diagnosis (once glucose control has been established). Initial therapy should be aimed to optimize and maintain glucose control. Statin therapy is justified in patients  $>10$  years of age. The goal should be to achieve low density lipoprotein cholesterol  $<100$  mg/dL.<sup>[15]</sup> Over the past 30 years, the prevalence of coronary artery disease (CAD) has increased 300%, from 2% to 6% in rural areas and from 4% to 12% in urban India.<sup>[16]</sup>

By 2015, the number of Indians with CAD is projected to reach 6.2 crores, of which 2.3 crores will be  $<40$  years of age, and 1.05 crores will be  $<30$  years. In India, CAD is projected to claim 29 lakh lives annually that include 9.2 lakhs, who are  $<40$  years and 4.2 lakhs who are  $<30$  years resulting in a projected cumulative GDP loss of 8500 crores INR. CAD claims only 4.2 lakh lives annually in the US; of these one-half of deaths occur in patients above 85 years of age. India has an exploding burden of premature CAD that underscores the need for immediate action.<sup>[17]</sup>

Retinopathy is another important complication of diabetes and patients should be subjected to an initial dilated and comprehensive eye examination. Patients in whom puberty has set in or are 10 years of age or older (whichever is earlier) should be screened for retinopathy once he/she has had diabetes for 3–5 years. After initial examination, patients should be recommended to undergo annual routine follow-up and less frequent examinations may be acceptable on advice of an eye care professional.

The position statement of ADA (2014) suggests different procedures for care of children in different age groups. Infants (birth–18 months) should be provided with warmth and comfort measures after injections and finger pricks. They should be monitored for hypoglycemia. Toddlers (3–5 years) should be given reassurance that their body is intact and should be provided with toys and band-aids after procedures. They should be provided with positive reinforcement for cooperation and can be

involved in choosing injection and finger prick sites. They should be trained about identifying any hypoglycemic signs and symptoms. Children in the age group 6–12 years should be evaluated for skill level and taught about self-care skills. They should be trained about their roles and responsibilities along with the communication process with peers and school staff about diabetes. In the next stage, the adolescents (12–18 years) should be transitioned into personal care planning with adequate explanation given regarding their roles and responsibilities and the implications of living with diabetes. They should be counseled to handle social situations, driving, alcohol and drugs, dating, sex, and pre-conception, when living with diabetes. They should also be counseled about how, when and with who to discuss about diabetes; and advice about college and career planning given.<sup>[5]</sup>

According to a recent guideline on insulin dosage, on day 1 (throughout the night), the child should be given regular insulin every 2<sup>nd</sup> h until blood glucose is <11 mmol/L or (198 mg/dL), and then every 4<sup>th</sup> h. The dose for a child <5 years should be 0.1 U/kg, for a child >5 years dose should be 0.2 U/kg, and if hourly monitoring of blood glucose cannot be provided, he/she should be given half of the above doses. On day 2 (from morning/breakfast), the dose should be 0.5–0.75 U/kg/day, and distribution of insulin must be adjusted daily according to blood glucose levels. The morning (and 3 am) blood glucose is used for adjusting the bedtime basal dose, pre-meal levels to adjust the day time basal insulin, and the 2-h postprandial blood glucose is used to tailor the meal bolus doses.

During the partial remission phase, the total daily insulin dose is often <0.5 IU/kg/day and pre-pubertal children (outside the partial remission phase) usually require 0.7–1.0 IU/kg/day. During puberty the requirements may rise substantially above 1 U/kg/day and even up to 2 U/kg/day.<sup>[8]</sup>

Basic diabetes training should be provided for school staff, and they should be assigned with responsibilities for care of diabetic children. Self-management should be allowed at all school settings for students (to their age-appropriate capacity). If the child is sick, he/she must always be continued with insulin therapy and provided with usual doses if the child is able to eat food. The child should be provided with an extra dose of short acting insulin if blood glucose is >300 mg/dL or there is more than trace ketones in the urine. The usual barriers in achieving desired blood glucose control include socioeconomic factors, psychological factors, inadequate education, developmental factors, and fear of hypoglycemia.

According to an earlier published paper, in 1999, no T1DM child survived till his/her 14<sup>th</sup> birthday and suffered from a myriad of diabetic complications including infections, cardiovascular risk factor, CAD, cardiovascular disease, hypoglycemia, diabetic ketoacidosis, and malignancy. The author replicated the study and published 10-year data in 2009, reporting an enormous increase in life expectancy of type 2 diabetes mellitus (T2DM) patients while that of T1DM patients remained minimal.<sup>[9]</sup> Most of the T1DM patients die before their 40<sup>th</sup> birthday, no female T1DM patient has lived beyond her 50<sup>th</sup> birthday, and the significant morbidity and mortality in diabetic patients is because of infections and renal failure. There had been a huge difference in quality of care in diabetics, but the majority of it had been in T2DM and not in T1DM patients.<sup>[10]</sup>

In many parts of Africa, the life expectancy is reduced to a single year for a person who requires insulin to survive.

## SUMMARY

Guidelines are present, but do not necessarily translate to better patient care. The primary importance should be patient as well as health-care provider education, and newer insulins delivered by smarter devices can contribute to improved patient care.

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