NATIONAL HEALTH MISSION
राष्ट्रीय स्वास्थ्य मिशन

स्वास्थ्य एवं परिवार कल्याण मंत्रालय
MINISTRY OF HEALTH AND FAMILY WELFARE
सत्यमेव जयते

RBSK
RASHTRIYA BAL SWASTHYA KARYAKRAM
राष्ट्रीय बाल स्वास्थ्य कार्यक्रम
FROM SURVIVAL TO HEALTHY SURVIVAL

GUIDANCE DOCUMENT

FOR

DIABETES MELLITUS IN CHILDREN

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सत्यमेव जयते

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स्वास्थ्य एवं परिवार कल्याण
व रसायन एवं उर्वरक
भारत सरकार
Minister
Health & Family Welfare
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Government of India

MESSAGE

Over the past decade, India's progress in health sector reflects the sustained and coordinated efforts of the Government, public health system and communities across the country. Recognising that improvements in early-life health outcomes are fundamental to long-term social and economic development, strong emphasis on health of women, newborn and children has remained central to National health priorities.

Over the years, policy orientation has increasingly shifted towards a continuum-of-care framework that prioritises prevention, early detection and comprehensive management of childhood conditions. Within this framework, childhood Non-Communicable Diseases (NCDs), particularly diabetes mellitus, are emerging as an important public health challenge requiring a structured and system-level response.

By integrating childhood diabetes into health system, India has taken a policy shift toward a life-course approach for chronic disease management in children. This facilitates early detection through community-level screening, timely referral to appropriate health facilities and continuity of care through a coordinated service delivery system.

Aligned with strategies for tackling NCDs, release of guidance document for screening and management of diabetes mellitus in children under Rashtriya Bal Swasthya Karyakram will help in reducing complications and promotes equitable access to essential health services, thereby reinforcing a comprehensive and sustainable approach to child health across the life course.

(Jagat Prakash Nadda)

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NATIONAL HEALTH MISSION
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सत्यमेव जयते

राज्य मंत्री
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भारत सरकार

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MINISTER OF STATE
HEALTH & FAMILY WELFARE
AND CHEMICALS & FERTILISERS
GOVERNMENT OF INDIA

MESSAGE

Strengthening the health system and improving service delivery remain central to India's public health agenda. Over the past decade, sustained efforts have been directed towards expanding and upgrading health infrastructure, including the establishment of Maternal and Child Health (MCH) Wings, Special Newborn Care Units (SNCUs), and Newborn Care Units (NBCCs and NBSUs). These interventions have significantly enhanced the capacity of the public health system to provide quality care across the continuum—from pregnancy and childbirth to neonatal and early childhood care.

As the health system continues to evolve, the focus is steadily shifting beyond survival to ensuring that every child is able to achieve optimal growth and development. Child health outcomes must therefore be viewed not only in terms of survival, but in enabling every child to reach their full physical, cognitive, and developmental potential.

The Rashtriya Bal Swasthya Karyakram (RBSK) has emerged as an important initiative for the early detection and timely management of selected health conditions in children. Over time, the programme has progressively strengthened its outreach mechanisms, screening processes, and referral linkages, thereby improving access to essential care and facilitating appropriate follow-up and treatment through the public health system.

In response to the changing epidemiological profile and emerging health needs, the inclusion of diabetes mellitus in children under RBSK represents a significant step forward. Early identification and comprehensive management of both Type 1 and Type 2 Diabetes Mellitus are essential to prevent acute and long-term complications, ensuring sustained care through an integrated, life-course approach.

This guidance document provides a structured and standardised framework for RBSK teams, in convergence with NCD services, to undertake screening, diagnosis, referral, and management of childhood diabetes. Its implementation is expected to strengthen service delivery at all levels of care and contribute to improved health and developmental outcomes for children across the country.

(Anupriya Patel)

April 24, 2026
New Delhi.

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सत्यमेव जयते

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स्वास्थ्य एवं परिवार कल्याण मंत्रालय
Government of India
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Ministry of Health and Family Welfare

Message

Strengthening Maternal and Child Health (MCH) services remains a central pillar of the National Health Mission (NHM), reflecting the Government of India's commitment to improving health outcomes for the mothers, newborns, children, and adolescents. Over time, strategic investments in systemic reforms and targeted interventions have improved various parameters of children's growth and development. These gains have been recognized globally for their scale, inclusiveness, and measurable impact.

A major contributor to this progress is the strengthening of comprehensive primary health care, ensuring last-mile delivery of preventive, promotive, and basic curative services. Emphasis on strong service delivery system, community engagement, and strong frontline systems has enabled early detection, timely intervention with continuity of care. This integrated approach has enhanced service delivery and accountability across facilities and community levels.

Within this framework, the Rashtriya Bal Swasthya Karyakram (RBSK) serves as a flagship initiative for early identification and intervention among children from birth to 18 years. It focuses on screening for the "4 Ds" Defects at birth, Diseases, Deficiencies, and Developmental delays through mobile health teams and facility-based services at District Early Intervention Centres (DEICs). The program ensures referral, free treatment and follow-up through DEICs, supporting a lifecycle approach to child health and improving developmental outcomes, particularly for vulnerable populations.

The introduction of childhood Diabetes Mellitus in the NHM framework under RBSK 2.0 guidelines marks a significant step forward in strengthening paediatric care. As we strengthen our response to childhood Diabetes Mellitus, its structured screening and standardized management pathways are integrated within the established RBSK framework. This will ensure early identification of children and adolescents at risk and their continued support through the health care delivery system.

This guidance document on diabetes mellitus in children and adolescents provides an evidence-informed, program-aligned framework for early identification, referral, continuous management and follow-up. It builds on existing NHM and RBSK systems to strengthen care pathways, improve service delivery and ensure equitable access, better outcomes, and long-term well-being. With these guidelines, I am hopeful that all the caregivers and stakeholders will be benefited in the diabetes management of the children in the country.

Punya Salila

(**Punya Salila Srivastava**)

#StopObesity

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MESSAGE

Strengthening Maternal and Child Health (MCH) services under the National Health Mission (NHM) continues to be a key strategic priority to ensure equitable, accessible, and quality healthcare for all children and adolescents across the country. The Rashtriya Bal Swasthya Karyakram (RBSK) remains a cornerstone intervention under NHM for early identification, screening and management of health conditions in children, thereby reinforcing our commitment to preventive, promotive, and comprehensive child health services.

In view of the increasing burden of non-communicable diseases, particularly Diabetes Mellitus among children and adolescents, there is an urgent need to further strengthen early detection and continuum of care mechanisms. The convergence of RBSK with the National Programme for Prevention and Control of Non-Communicable Diseases (NP-NCD) provides a robust and structured framework for this purpose. Under this integrated approach, RBSK Mobile Health Teams will play a critical role in early screening and identification of suspected cases, while NCD clinics at District Hospital and Medical Colleges will ensure confirmatory diagnosis, standardized management, counselling and follow-up to prevent long-term complications.

This integrated strategy must be supported through sustained health system strengthening at both facility and community levels under NHM. This includes capacity building of frontline health workers, strengthening referral linkages, ensuring availability of essential diagnostics and medicines (provision of glucometers, lancets & insulin), and enhancing data-driven monitoring mechanisms. Digital tools and reporting systems should be optimally leveraged to ensure real-time monitoring and effective program implementation.

I urge all States and UTs to prioritize and operationalize this with a strong commitment. Our collective efforts must be directed towards ensuring early diagnosis, timely treatment, and lifelong support for children and adolescents living with Diabetes Mellitus, thereby enabling them to lead healthy, productive, and fulfilling lives in alignment with national health goals under NHM.

Dated: 27th April, 2026

(Aradhana Patnaik)

#StopObesity

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PREFACE

India remains committed to strengthen the health and well-being of children and adolescents through an integrated package of preventive, promotive, and curative services. Diabetes mellitus in this age group has emerged as an important public health concern, necessitating a structured programmatic response. In view of the evolving epidemiological profile, including the need for timely identification of Type 1 diabetes and the increasing prevalence of Type 2 diabetes among adolescents associated with overweight, physical inactivity, and unhealthy dietary practices, this document outlines a systematic approach focused on early detection, timely referral, and continuity of care.

An operational framework for Programme Managers, Medical Officers, Non-Communicable Disease (NCD) clinic staff, Rashtriya Bal Swasthya Karyakram (RBSK) teams and NCD counsellors is being provided to strengthen the identification, referral, management, and counselling of children with diabetes. It promotes a coordinated and integrated service delivery approach, with convergence between RBSK and the National Programme for Prevention and Control of Non-Communicable Diseases (NP-NCD).

Under this framework, RBSK Mobile Health Teams will conduct systematic, symptom-based screening for diabetes during school health visits using a standardized checklist. Where indicated, point-of-care capillary blood glucose testing should be undertaken to support early identification. Children suspected of having diabetes must be referred without delay through established referral pathways to designated NCD clinics for confirmatory diagnosis and initiation of appropriate management in line with national treatment protocols. The guidance also emphasizes counselling at key stages—including diagnosis, treatment initiation, and follow-up to enhance adherence, improve caregiver awareness, and support long-term disease management.

I am hopeful that with these guidelines, early detection and management of diabetes mellitus in children and adolescents will be strengthened for ensuring timely access to care and contributing to improved health outcomes and quality of life.

मीरा श्रीवास्तव

(Meera Srivastava)

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ACKNOWLEDGMENT

The development of Guidance Document for Diabetes Mellitus in Children under RBSK (Rashtriya Bal Swasthya Karyakram) marks a significant step in strengthening the public health response to childhood diabetes. With the rising burden of both Type 1 and Type 2 diabetes in younger populations, this document presents a structured, evidence-based framework integrating preventive, promotive, and curative approaches, aligned with national public health priorities.

The operational framework reflects a well-coordinated convergence between RBSK and the National Programme for Prevention and Control of Non-Communicable Diseases (NP-NCD). It clearly defines roles and responsibilities across levels of care from RBSK Mobile Health Teams undertaking systematic screening and early identification, to NCD clinics ensuring diagnosis, treatment initiation, and long-term follow-up.

I would like to express my sincere gratitude to the Secretary (Health & Family Welfare), AS & MD (NHM) and Joint Secretary (RCH) for their guidance, encouragement and strategic direction throughout the development of this document. Their leadership has played a pivotal role in shaping a cohesive and forward-looking framework. I also extend my appreciation to the NP-NCD Division at National Health Mission and the Directorate of Health Services for their valuable technical inputs and continued collaborative support.

I express my sincere thanks to the technical experts and contributors whose insights have strengthened the document and ensured its practical relevance. I acknowledge the support of WJCF in finalizing the layout and design, which has enhanced its overall presentation and usability. I also extend my appreciation to the Child Health and RBSK team for their dedicated efforts and timely coordination in completing this work within the stipulated timeframe.

As we move forward, I reaffirm our commitment to providing full operational support for the effective implementation of these guidelines across States and UTs for better quality of life for children living with diabetes in India.

(Dr. Shobhna Gupta)

List of Abbreviations

4Ds	Defects at birth, Deficiencies, Diseases, Developmental delays
4Ts	Toilet, Thirsty, Tired, Thinner (warning signs of diabetes)
AAM	Ayushman Arogya Mandir
ABHA	Ayushman Bharat Health Account
AcAc	Acetoacetate
ACE	Angiotensin-Converting Enzyme
ANM	Auxiliary Nurse Midwife
API	Application Programming Interface
ASHA	Accredited Social Health Activist
AYUSH	Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homeopathy
BG	Blood Glucose
BMI	Body Mass Index
BOHB	Beta-hydroxybutyrate
BP	Blood Pressure
CBAC	Community-Based Assessment Checklist
CBG	Capillary Blood Glucose
CHC	Community Health Centre
CHO	Community Health Officer
CNS	Central Nervous System
CVD	Cardiovascular Disease
DEIC	District Early Intervention Centre
DEO	Data Entry Operator
DH	District Hospital
DKA	Diabetic Ketoacidosis

DM	Diabetes Mellitus
DSME	Diabetes Self-Management Education
DTR	Deep Tendon Reflexes
DVDMS	Drugs and Vaccine Distribution Management System
ECG	Electrocardiogram
FBG	Fasting Blood Glucose
FOH	Fear of Hypoglycaemia
GCS	Glasgow Coma Scale
GDM	Gestational Diabetes Mellitus
GI	Glycemic Index
GL	Glycemic Load
HbA1c	Glycosylated Haemoglobin
HDL	High-Density Lipoprotein
HHS	Hyperosmolar Hyperglycaemic State
HMIS	Health Management Information System
HPLC	High Performance Liquid Chromatography
HWA	Health and Wellness Ambassador
ICR	Insulin-to-Carbohydrate Ratio
ICU	Intensive Care Unit
IEC	Information, Education and Communication
IFG	Impaired Fasting Glucose
IGT	Impaired Glucose Tolerance
IPD	In-patient Department
IRMA	Intraretinal Microvascular Abnormalities
ISPAD	International Society for Pediatric and Adolescent Diabetes

ISF	Insulin Sensitivity Factor
IU	International Units
IV	Intravenous
LDL	Low-Density Lipoprotein
LJM	Limited Joint Mobility
MHT	Mobile Health Team
MO	Medical Officer
MoHFW	Ministry of Health & Family Welfare
MUFA	Monounsaturated Fatty Acid
NCD	Non-Communicable Disease
NHM	National Health Mission
NLEM	National List of Essential Medicines
NP-NCD	National Programme for Prevention and Control of Non-Communicable Diseases
NPDR	Non-Proliferative Diabetic Retinopathy
OHA	Oral Hypoglycemic Agent
OPD	Out-patient Department
ORS	Oral Rehydration Solution
PCOS	Polycystic Ovarian Syndrome
PDR	Proliferative Diabetic Retinopathy
PHC	Primary Health Centre
PLT1D	Person / People Living with Type 1 Diabetes
PLT2D	Person/People Living with Type 2 Diabetes
PIP	Programme Implementation Plan
PPBG	Post-Prandial Blood Glucose

PTM	Parent Teacher Meeting
PUFA	Polyunsaturated Fatty Acid
RBG	Random Blood Glucose
RBS	Random Blood Sugar
RBSK	Rashtriya Bal Swasthya Karyakram
RKSK	Rashtriya Kishor Swasthya Karyakram
SC	Subcutaneous
SMBG	Self-Monitoring of Blood Glucose
T1DM	Type 1 Diabetes Mellitus
T2DM	Type 2 Diabetes Mellitus
TDD	Total Daily Dose
TSH	Thyroid Stimulating Hormone
UTI	Urinary Tract Infection
VBG	Venous Blood Gas

Introduction

Healthy children are the foundation upon which a nation builds its future success, stability and development. Intervening early in a child's life to identify and address health conditions can prevent avoidable morbidity and mortality, support healthy cognitive and physical development, and contribute to a productive adulthood. To ensure that the health needs of the children are prioritised, Government of India launched the Rashtriya Bal Swasthya Karyakram (RBSK) in 2013 under the National Health Mission as a flagship initiative to provide comprehensive child health screening and early intervention services for children from birth to 18 years of age.

The programme is built around a structured screening framework targeting the 4Ds: Defects at birth, Deficiencies, Diseases, and Developmental delays. Services are delivered through two complementary channels: facility-based newborn screening and community-level outreach conducted by Mobile Health Teams (MHTs) at Anganwadi Centres and government schools. Children identified with health conditions are linked to public health facilities for free-of-cost treatment and follow-up care through District Early Intervention Centres (DEICs). These components establish a continuum of care with the aim that no child is left behind.

India's child health trajectory over the past three decades reflects the impact of these sustained investments. As per UN report, between 1990 and 2024, the country recorded a 79% reduction in under-five mortality and a 70% reduction in neonatal mortality, outpacing the global averages of 61% and 54% respectively.

Epidemiological shift

Non-communicable diseases (NCDs) such as obesity, hypertension and diabetes are increasingly being recognised as a significant health concern among children and adolescents in India and globally. Early onset of these conditions not only affects immediate health and well-being but also predisposes individuals to other chronic conditions and complications in adulthood. Detecting and managing NCDs during childhood offers an opportunity to prevent long-term complications and promote healthy growth and development.

Need for early detection and management of Diabetes Mellitus in children and adolescents

Childhood diabetes, regardless of type, is a lifelong condition that demands continuous medical care, education, and psychosocial support. When identified late,

the disease often manifests with serious complications, including life-threatening metabolic emergencies, growth failure, and early onset of complications. Conversely, when detected and managed early, children can achieve appropriate growth, development, and life expectancy.

Type 1 Diabetes Mellitus (T1DM) is amongst the most common endocrine conditions in children. In T1DM, the body loses its ability to produce insulin, thus, requires lifelong insulin therapy. The condition often occurs in childhood, with a peak onset between the age of 6 to 14 years. Timely detection and early initiation of treatment, coupled with regular follow-up and education, empowers children and caregivers to manage the condition effectively and prevent long-term disability.

Type 2 Diabetes Mellitus (T2DM), once considered a disease of adulthood, is increasingly being reported in younger age groups, driven by rising rates of childhood obesity, sedentary lifestyles, and unhealthy dietary patterns. In T2DM, the body becomes resistant to insulin, and its capacity to produce insulin gradually declines. Timely intervention in childhood can prevent or delay the development of T2DM.

Expanding the scope of RBSK to include Diabetes Mellitus among children and adolescents

The RBSK aims to identify health conditions early in life, including NCDs, and link affected children to timely care and management. After over a decade of strengthening care for childhood conditions, the scope of RBSK is now being expanded to meet the growing child health needs in India by including T1DM and T2DM under its mandate.

Children and adolescents till 18 years of age will be routinely screened for signs and symptoms of diabetes by the MHTs under RBSK. Any person screening positive will be referred to the Non-Communicable Diseases (NCD) clinic set up at District Hospitals under the National Programme for Prevention and Control of Non-Communicable Diseases (NP-NCD). These clinics will carry out confirmatory diagnosis for diabetes and in case of a positive diagnosis, provide comprehensive management and care including treatment initiation; provision of essential drugs, insulin and commodities for self-monitoring of blood glucose; follow-up care; screening for complications; and age-appropriate education and counselling. Implementation of this current public health programme is estimated to significantly improve quality of life and long-term survival.

Dedicated public health programmes for T1DM specifically have found space in a select few high-income nations, such as the United Kingdom and the Scandinavian countries. Among nations with large populations, India stands poised to be a pioneer

— one of the first to formalise guidance on T1DM and embed it within its public health mandate.

Objectives of this document

This document is envisioned to serve as a guide for technical staff of RBSK MHTs and NCD clinics, as well as programme managers across different levels, to strengthen care for DM among children and adolescents. It aims to:

- Orient clinicians at the NCD clinic and other healthcare providers with the symptoms, diagnosis and treatment protocols for T1DM and T2DM among children and adolescents.
- Provide an overview of the operational framework for diagnosis and management of DM among children and adolescents, including service delivery mechanisms, human resources, supplies and logistics, and monitoring framework of the programme.
- Lay down a structured care pathway for children and adolescents living with T1DM and T2DM during treatment initiation and follow-up visits.
- Be a referral document for addressing all issues and concerns related to childhood diabetes amongst all stakeholders.

Chapter 1

Overview of Diabetes Mellitus in Children

Learning objectives

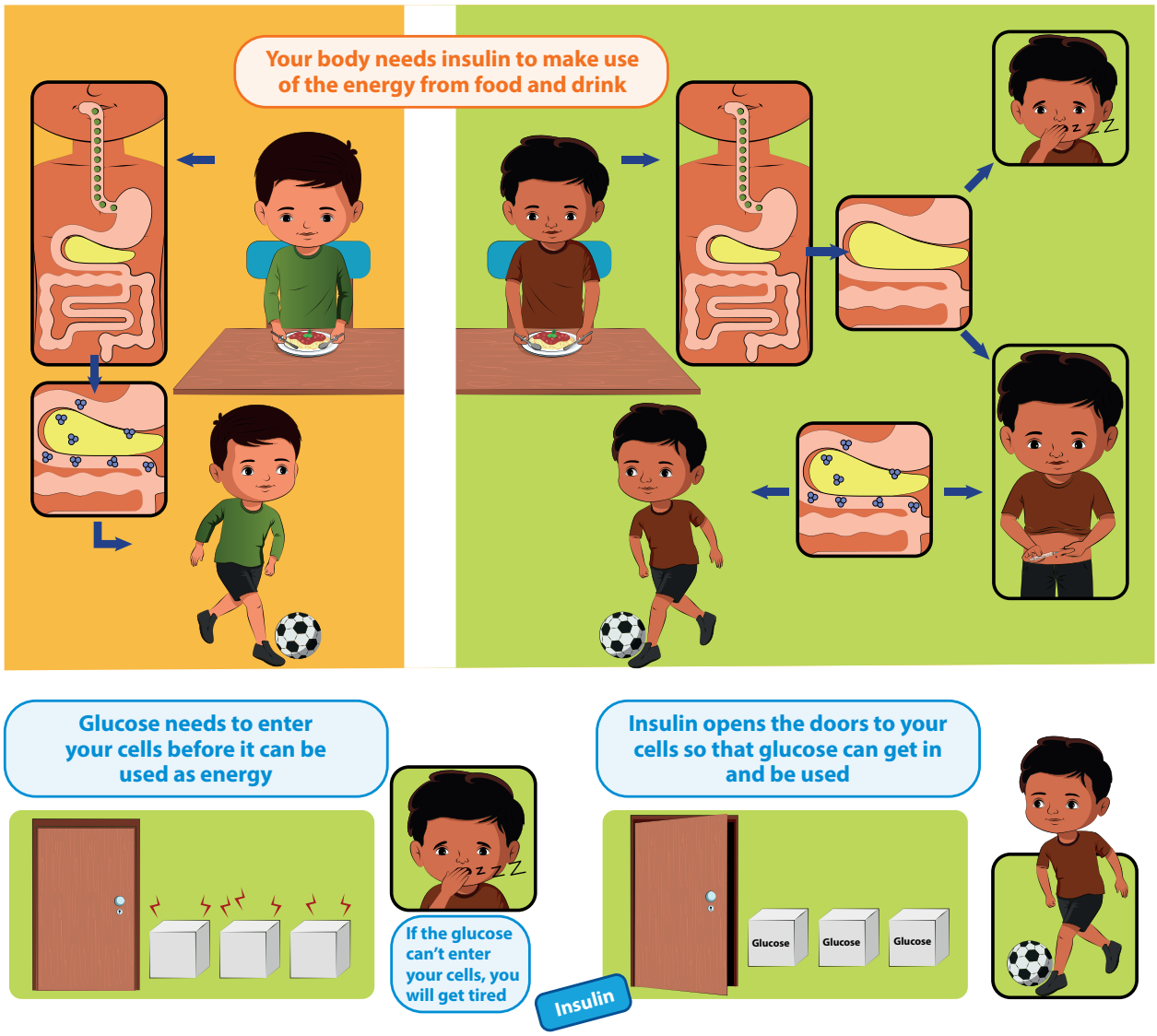
1. Explain the role of insulin in the body and describe how changes in insulin production or action lead to diabetes.
2. Distinguish between Type 1 and Type 2 Diabetes Mellitus in children in terms of cause, presentation, and management requirements.
3. Recognise the key warning signs (4Ts) of diabetes in children that should prompt further testing and referral.

Diabetes Mellitus (DM) is a condition characterised by high blood glucose levels, or hyperglycemia. The two predominant forms of DM observed in children and adolescent age group are Type 1 Diabetes Mellitus (T1DM) and Type 2 Diabetes Mellitus (T2DM). Although both conditions share hyperglycemia as a common feature, they differ in their etiology, pathophysiology, clinical presentation, and management requirements.

Role of insulin in the body

Insulin is a hormone produced by the pancreas that is responsible for uptake of glucose from the blood into the body cells. Insulin acts as a key which opens the door of the cells for glucose to enter and to enable cells to utilise this glucose for production of energy. Defects in insulin production, insulin action, or both, result in accumulation of glucose in the blood, leading to diabetes.

Figure 1: Role of insulin in the body



Type 1 Diabetes Mellitus (T1DM)

T1DM is an autoimmune condition in which the body's immune system targets and destroys the insulin-producing beta cells in the pancreas. Absolute deficiency of insulin leads to impaired glucose uptake into cells, causing chronic hyperglycemia. Thus, exogenous insulin replacement is essential for survival in T1DM. T1DM is one of the most common endocrine conditions in children, with onset often occurring between the ages of 6 and 14.

Risk factors for T1DM

- Family history of T1DM
- Certain viral infections (e.g., German measles, coxsackie, mumps) that can trigger an autoimmune response
- Presence of other autoimmune conditions

Clinical presentation

Children with T1DM commonly present with the classical symptoms of polyuria (frequent urination), polydipsia (excessive thirst), and tiredness or fatigue, and unexplained weight loss. These may be remembered as **4Ts:**

- **Toilet:** Frequent urination (polyuria), or resumption of bedwetting
- **Thirsty:** Excessive thirst (polydipsia)
- **Tired:** Unexplained fatigue and lethargy
- **Thinner:** Unexplained or sudden weight loss

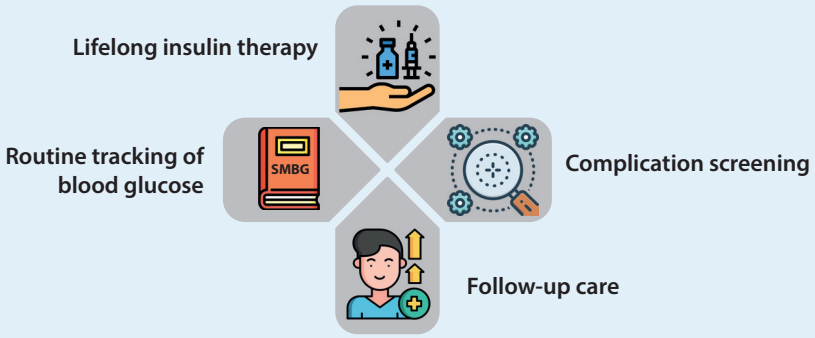
Majority of T1DM cases present with symptoms of acute complications (Diabetic Ketoacidosis), including vomiting, dehydration, acute abdominal pain, rapid and deep breathing with a fruity-smelling breath, and confusion or decreased consciousness.

Figure 2: Common signs and symptoms of T1DM (4Ts)

Diagnostic criteria for T1DM: Any one of the following:

- Fasting blood glucose ≥ 126 mg/dL
- Two-hour post-prandial blood glucose ≥ 200 mg/dL
- Random Blood Glucose ≥ 200 mg/dL along with signs/symptoms of hyperglycemia
- Glycosylated hemoglobin (HbA1c) ≥ 6.5%

Treatment and management



Type 2 Diabetes Mellitus (T2DM)

While T1DM is more common in childhood, epidemiological trends indicate that the prevalence of T2DM is rising in children and adolescents, largely driven by increasing rates of obesity and sedentary lifestyles. T2DM is characterised by insulin resistance, where the body's cells do not respond effectively to insulin, often combined with a gradual decline in insulin production over time. Insulin resistance in peripheral tissues leads to hyperglycemia, which may remain asymptomatic for extended periods.

Pre-diabetes in children and adolescents

Pre-diabetes represents a stage where blood glucose levels are higher than normal but not yet in the diabetes range. Identifying pre-diabetes early offers a critical opportunity to prevent or delay the onset of T2DM and associated complications. Although pre-diabetes is less common in young children, it is increasingly seen in adolescents, especially those with obesity, unhealthy dietary habits, or family history of diabetes.

Definition of pre-diabetes:

A child or adolescent is considered to have pre-diabetes when laboratory values fall within the following ranges (as per any of the following criteria):

- **Impaired Fasting Glucose (IFG):** Fasting blood glucose 100–125 mg/dL
- **Impaired Glucose Tolerance (IGT):** 2-hr post-glucose value 140–199 mg/dL
- **Elevated HbA1c (borderline range):** 5.7–6.4%

Diagnosis must be made only at a health facility (NCD clinic), not at school or community levels.

Risk factors for T2DM and pre-diabetes in children and adolescents

- Obesity or being overweight
- Sedentary lifestyle including lack of physical activity
- Unhealthy diet: High intake of processed foods, sugary drinks, and fats, and low intake of whole foods, fruits and vegetables
- Family history of T2DM
- Maternal history of gestational diabetes during pregnancy
- Presence of conditions such as Polycystic Ovarian Syndrome (PCOS), hypertension, or fatty liver disease

Diagnosis of T2DM will be mostly risk based and, in some instances, on the basis of the osmotic symptoms (4Ts).

Signs and symptoms of T2DM and pre-diabetes

Children with T2DM/pre-diabetes are often likely to be asymptomatic. However, the following may be noted:

- Increased tiredness
- Excessive hunger
- Gradual weight gain
- Difficulty concentrating
- Increased thirst or urination (late sign—consider testing urgently)

Clinical presentation of T2DM

The symptoms of T2DM can be similar to T1DM, including increased thirst (polydipsia), frequent urination (polyuria), and unexplained weight loss. However, T2DM often has a more insidious onset, and children may be asymptomatic at the time of diagnosis. Many cases are diagnosed during routine screening or when metabolic complications such as hypertension, fatty liver, or PCOS prompt investigation.

Diagnostic criteria for T2DM: More than 1 criterion or any criterion more than once:

- Fasting blood glucose ≥ 126 mg/dL
- Two-hour post-prandial blood glucose ≥ 200 mg/dL or during an oral glucose tolerance test
- Random Blood Glucose (RBG) ≥ 200 mg/dL along with signs/symptoms
- Glycosylated hemoglobin (HbA1c) ≥ 6.5%

Lifestyle modification for T2DM and pre-diabetes

Under the integrated RBSK–NP-NCD framework, management of T2DM/pre-diabetes in children and adolescents focuses on early identification, lifestyle modification, and structured follow-up to prevent progression to diabetes.

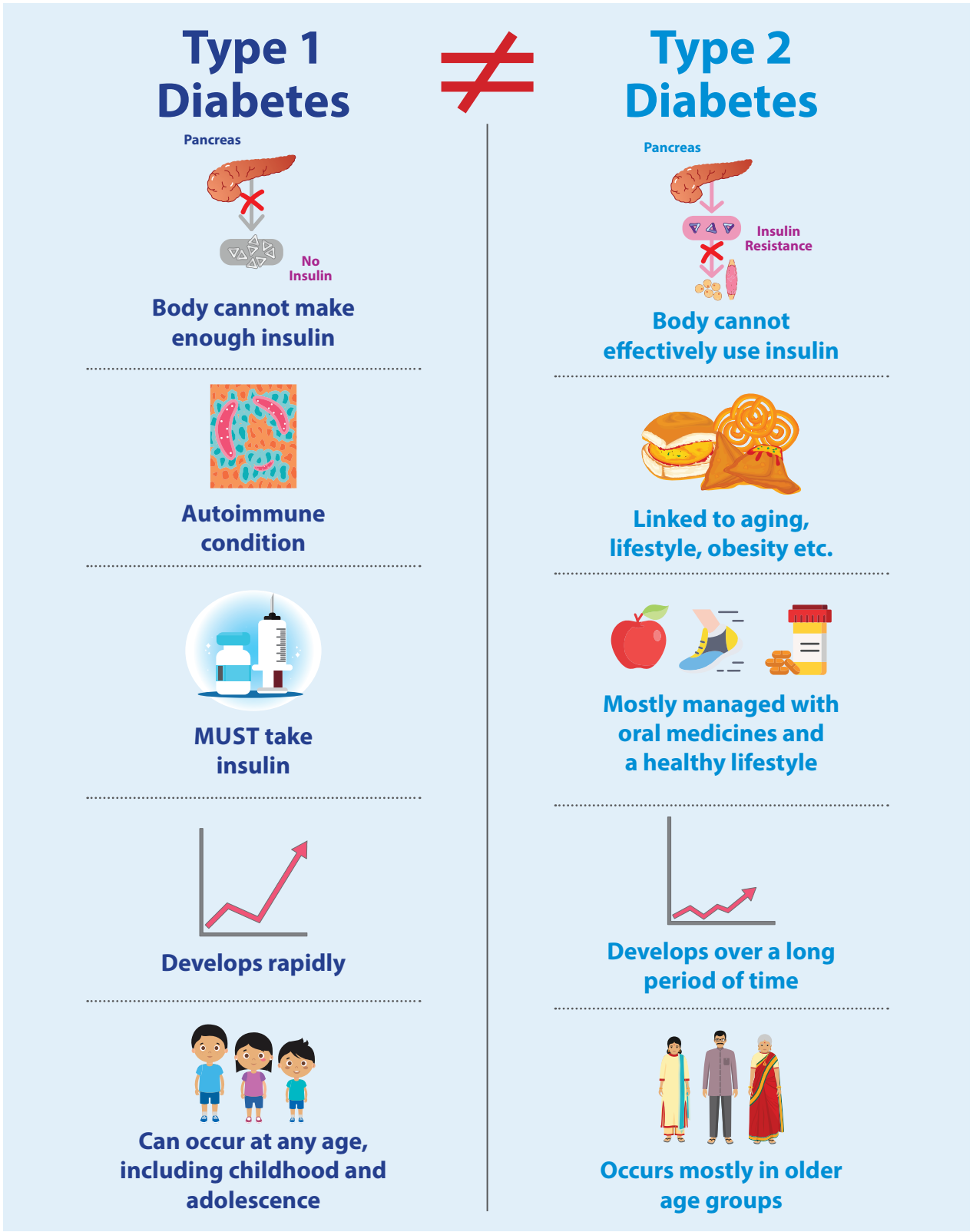
- Lifestyle modification (healthy diet, increased physical activity) remains the primary intervention; pharmacological treatment is not routinely indicated.
- School Health Programme supports daily physical activity, healthy eating practices, and a non-stigmatising school environment.
- ASHAs and MHTs reinforce behaviour change at household and community levels and track follow-up visits.
- Periodic monitoring at NP-NCD facilities (every 6 to 12 months) ensures early detection of progression to diabetes.

Key differences between T1DM and T2DM

Table 1: Comparison of T1DM and T2DM

Feature	Type 1 Diabetes Mellitus (T1DM)	Type 2 Diabetes Mellitus (T2DM)
Etiology	Autoimmune beta-cell destruction leading to absolute insulin deficiency	Insulin resistance + relative insulin deficiency
Age of onset	Usually 6-14 years of age but may occur at any age	Typically associated with adults but onset among adolescents is rising; associated with obesity
Insulin requirement	Immediate and lifelong	Often initially managed with lifestyle changes and/or oral medications, may require insulin later
Onset	Acute, symptomatic	Gradual, often asymptomatic
Associated risk factors	Family history of T1DM, autoimmune disorders, certain viral infections	Obesity, sedentary lifestyle, family history of T2DM, maternal gestational diabetes
Complications at presentation	Majority of cases are diagnosed at Diabetic Ketoacidosis (DKA) stage	Acute complications usually absent at diagnosis; chronic complications may be present at the time of diagnosis due to chronic asymptomatic condition

Figure 3: Differences between T1DM and T2DM



These guidelines expand the purview of RBSK to screening for diabetes (both T1DM and T2DM) and referral of cases screened positive to the NCD clinics at the district hospital (DH). Management and follow-up care for T1DM and T2DM will be anchored by the NCD clinic at DH. Refer to Chapter 4 for more details on T1DM and T2DM management.

Chapter
2

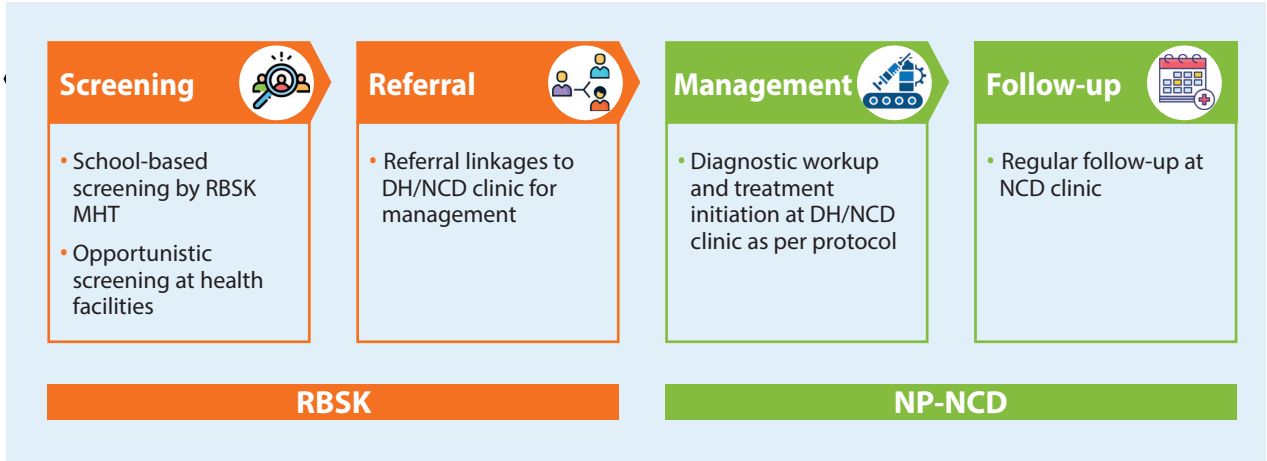
Integrated RBSK – NP-NCD Framework for Early Detection and Management of Diabetes in Children

Learning objectives

1. Describe how the RBSK and NP-NCD programmes are integrated to enable timely detection and management of diabetes in children.
2. Identify the roles and responsibilities of RBSK Mobile Health Teams (MHT) and NCD clinics within this integrated framework.
3. Explain the referral and linkage pathway from community-level screening to confirmatory diagnosis and treatment at the DH NCD clinic.

To ensure early detection of DM in children and its proper management, it is imperative that the RBSK programme works in collaboration with the National Programme for Prevention and Control of Non-Communicable Diseases (NP-NCD). An integrated service delivery framework will leverage the strengths of both the programmes, facilitate efficient use of resources, enable ongoing follow-up and management of confirmed cases, and ensure seamless transition from pediatric to adult care in the future through the NCD clinics.

Figure 4: Integrated RBSK- NP-NCD framework for early detection and management of diabetes in children



RBSK will conduct frontline screening and early identification of T1DM, T2DM, and other metabolic diseases across school settings through MHTs consisting of two AYUSH doctors, one Auxiliary Nurse Midwife (ANM)/Staff Nurse, and one Pharmacist. Activities will be planned in a tiered structure to ensure continuity of care and seamless linkage with NP-NCD.

Screening activities

- Screening of children through MHTs at government/ government-aided schools and Anganwadi centres, according to standard screening criteria (refer to Chapter 3), including:
  a) Symptom-based screening (osmotic symptoms: polyuria, polydipsia, weight loss, fatigue, recurrent infections) for T1DM
  b) Targeted risk-based screening for T2DM
  c) Taking family history of T1DM, autoimmune disorders
  d) Opportunistic screening for symptomatic children during routine school visits
- Use of standardised RBSK screening format updated to include T1DM symptoms
- RBG testing for children with symptoms or red flags

Facility-based clinical assessment at DH level

- Children screened positive by MHTs will be referred to the NCD clinic at the DH for:
  a) Confirmatory blood glucose (BG) testing
  b) Clinical evaluation by trained pediatrician/medical officer

Referral and linkage to NCD clinics at DH level

- Diagnosis confirmation
- Initiation of treatment/ insulin therapy
- Provision of insulin, insulin syringes, blood glucose meters, blood glucose test strips, lancing devices, and lancets
- Education and counselling of patients and their caregivers
- Enrollment/registration on the NCD portal for follow-up monitoring - (API integration between NCD and RBSK portals for seamless data exchange)

Note: Children and adolescents with a pre-existing diagnosis of T1DM or T2DM should similarly be enrolled at the DH NCD clinic to receive care and follow up as outlined in these guidelines

Follow-up and continuity of care

- NCD clinic at DH will ensure the following:
  a) Adherence to treatment
  b) Early detection of complications
  c) Psychosocial support

Table 2: Detailed structure of activities under RBSK

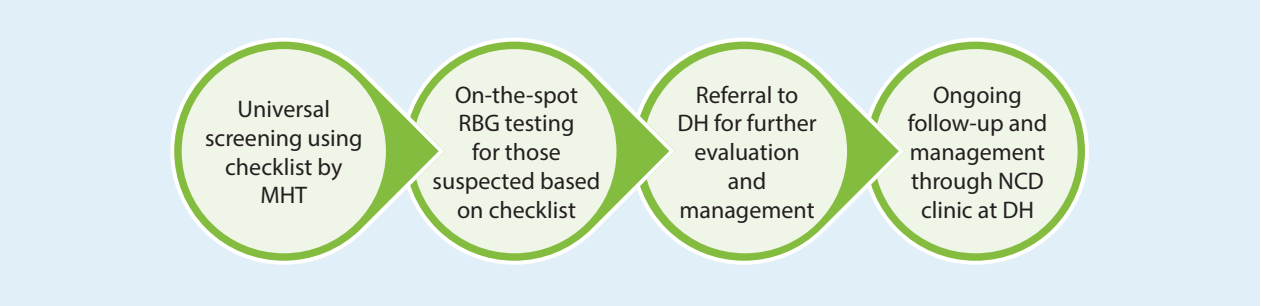
Level	Key Activities	Responsibility
Screening (MHTs)	Symptom checklist, identification of symptoms, opportunistic screening, RBG testing (symptomatic), referral linkage	MHTs
Assessment (NCD clinic at DH)	Clinical evaluation, confirmatory glucose testing	MD Pediatrics, MD Medicine, MO, Lab Technician
Management (NCD clinic at DH)	Registration, diagnosis confirmation, insulin initiation, education and counselling, maintenance of enrollment and follow up records on the NCD portal	Clinician (MD Pediatrics, MD Medicine, MO), Staff Nurse, NCD Counsellor, Nutritionist, Clinical Psychologist, Data Entry Operator (DEO)
Follow-up school/ community	Quarterly school follow-up, tele-follow up	School Health and Wellness Ambassador and NCD clinic staff (telephonic follow up).
Monitoring and reporting	Registration and follow-up	NCD portal, RBSK web portal (API integration for seamless data exchange)

Key implementation strategies

1. Strengthening RBSK for screening and early detection of diabetes

A systematic approach is envisioned under RBSK for early detection and effective management of diabetes in school-age children. MHTs under RBSK will be instrumental in conducting universal screening for DM in children and adolescents under the age of 18 through a screening format. This will be followed by on-the-spot blood glucose testing using glucometer for those individuals suspected to have diabetes based on the screening format. This will enable early detection and referral of suspected cases for further evaluation and management at district healthcare facilities. Detailed screening protocol for T1DM and T2DM under RBSK is provided in Chapter 4.

Figure 5: Framework for early detection and management of diabetes in children



The following steps should be undertaken to ensure that the RBSK MHTs are equipped for this role:

- Adequate training and capacity building of MHT on T1DM symptoms, risk factors for T2DM, RBG testing using blood glucometer, and referral protocols
- Ensure all MHTs are provisioned with functional equipment to carry out screening activities (Refer to Annexure 2)
- Relevant IEC materials should be made available to facilitate awareness generation

2. Strengthening of NCD clinics at DH for management of DM in children

Under NP-NCD, dedicated NCD clinics have been operationalised in DHs. It is imperative that the existing NCD clinics are strengthened to cater to DM in children as well. This will be done by:

- One or two days per week (based on the load) should be earmarked at the NCD clinic for the treatment and management of DM in children. However, if a child with T1DM or T2DM presents to the DH on a non-designated day or when the pediatrician is unavailable, the NCD clinic team should ensure that necessary care is provided without delay.
- The pediatrics division of the DH should depute a designated pediatrician to the NCD clinic on the earmarked day(s) for pediatric diabetes care. This pediatrician will serve as the nodal clinician for DM among children and adolescents at the facility and will be trained and capacitated to provide care in accordance with these guidelines.
- Training and capacity building of various cadres of existing staff (doctors, staff nurses, pharmacist, data entry operators, counsellors) according to relevant roles.
- Ensuring availability of relevant equipment such as child-size blood pressure (BP) cuff, stethoscope, stadiometer, appropriate reference charts (e.g., BP-for-age, BMI-for-age). Refer to Annexure 2 for a list of equipment that should be made available at NCD clinics for delivering adequate follow-up care.
- Provisioning and supply of requisite drugs and commodities (e.g., insulins and self-monitoring of blood glucose (SMBG) commodities) from the NCD clinic itself (instead of the common hospital pharmacy).
- Ensuring availability of age- and stage-appropriate education and counselling materials.

In districts where a medical college is present, the diabetes clinic may be established there, given the availability of specialist expertise and infrastructure. In other districts, the NCD clinic at the DH serves as the primary facility for diagnosis, treatment initiation, and ongoing follow-up care. In instances where the clinical situation demands a higher level of expertise, such as development of chronic complications requiring multidisciplinary care (such as diabetic retinopathy, nephropathy, or cardiovascular involvement), acute emergencies requiring tertiary-level hospitalization, or uncertainty about type of diabetes, the PLT1D should be promptly referred to the nearest medical college or tertiary care facility. Once the acute need has been addressed and the condition stabilised, the PLT1D should be referred back to the DH NCD clinic for continuity of routine follow-up care.

Endocrinologists, diabetologists, internists, and pediatricians with specialised training in diabetes care at medical colleges should be actively engaged to provide mentoring, handholding, and periodic clinical guidance to doctors managing T1DM at the DH NCD clinics. It must be noted that the primary role of these specialists is not to manage individual cases directly, but to build the clinical capacity and confidence of district-level teams, thereby strengthening the overall quality of pediatric diabetes care delivered at the district level.

3. Strengthening of the NCD portal and integration with the RBSK portal for reporting, monitoring, and evaluation

The NCD portal to track and maintain separate, ongoing records for children diagnosed with T1DM and T2DM. Covering both patient information and stock management. API integration between the NCD and RBSK portals would enable seamless, bidirectional data sharing, allowing both programmes to access and maintain health records across the continuum of care.

4. Maintain uninterrupted drugs and logistics supply at NCD clinics

Children and adolescents diagnosed with diabetes need to have access to uninterrupted supply of drugs and commodities for management of the condition. This is especially critical for T1DM which has a distinct requirement of commodities to be provided to the diagnosed case on an ongoing basis for proper management. Insulins and other consumables will be dispensed to each person diagnosed with diabetes by the designated staff at the NCD clinic. Package of drugs and commodities that should be provided to people diagnosed with T1DM on a monthly basis is provided in Chapter 4, Table 4.

Dispensing should be undertaken directly through the NCD clinic at the DH, rather than through the main hospital pharmacy. The dispensing guidelines under NP-NCD must be adhered to while dispensing supplies at the clinic. Insulin vials should be stored in the dedicated insulin refrigerator provisioned for the clinic and kept securely within the clinic premises. This should be mandatory to ensure proper stock maintenance and accountability.

Drug and Vaccine Distribution Management System (DVDMS) should be utilized to monitor availability of stock at the state and facility level. Ideally, at least three months of required stock of drugs and commodities should be maintained at the DH NCD clinic.

Please refer to Chapter 13 for roles and responsibilities at each level of service delivery.

Chapter 3

Screening Protocol for Diabetes in Children under RBSK

Learning objectives

1. Learn about the screening format for RBSK MHTs to identify children at risk of diabetes during school and community screening visits.
2. Demonstrate the correct procedure for on-the-spot Random Blood Sugar testing using a glucometer, including safety and hygiene protocols.
3. Interpret Random Blood Glucose (RBG) test results and determine appropriate next steps, including timely referral for children who screen positive.

Screening for diabetes under RBSK is targeted at children and adolescents. These children will be screened during routine visits by RBSK MHTs, with the help of the screening checklist for diabetes in children. Children who are suspected to have diabetes as per the screening format will be tested for RBG on-the-spot by the RBSK MHTs. Those with high RBG will be referred to the NCD clinics at the DH for management and evaluation as per the referral criteria.

The existing primary healthcare structures will be leveraged for health promotion and awareness generation activities.

Sensitisation programs will be conducted by RBSK to raise awareness regarding the signs and symptoms (osmotic symptoms) of T1DM – the 4Ts namely, toilet (frequent urination), thirsty (excessive thirst), tired (unexplained fatigue), and thinner (unexplained weight loss), as well as risk factors of T2DM.

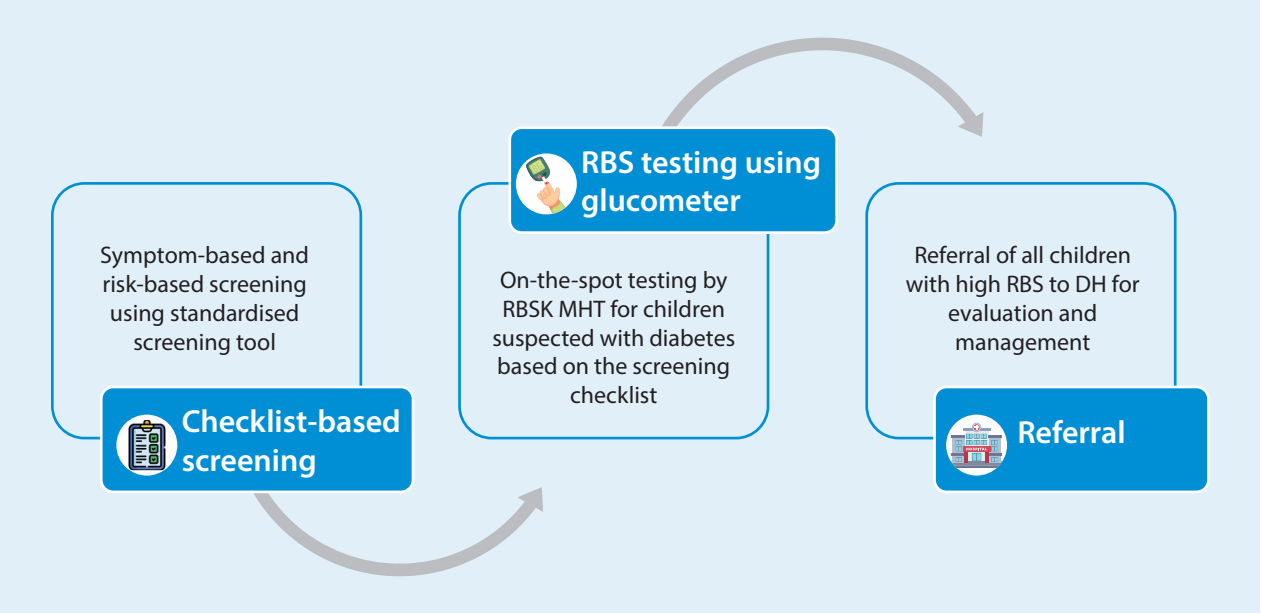
All healthcare professionals including grassroots-level health workers like ASHAs and ANMs may be trained to immediately refer any child showing these 4Ts symptoms and RBG level above 200 mg/dL to the NCD clinic at their respective District Hospitals for urgent treatment initiation. It is essential to do this in a time-bound manner to save lives.

Additionally, all healthcare providers (HCPs) in PHCs and above, and School Health and Wellness Ambassadors may be trained regarding sick day rules (refer to Chapter 8) and hypoglycemia management (refer to Chapter 8). In case of any child exhibiting symptoms of either of these two acute events, HCPs should immediately refer the child to their respective DH NCD clinic. Emergency ambulance services, such as through 112 helpline or any equivalent mechanism available in the state, should be mobilised as needed to facilitate timely patient transfer.

HCPs who encounter a child with a pre-existing diagnosis of T1DM or T2DM should refer them to the DH NCD clinic for management and follow-up care. Refer to Annexure 8 for more details.

Checklist-based Screening

Figure 6: Screening approach for early detection of diabetes in children under RBSK



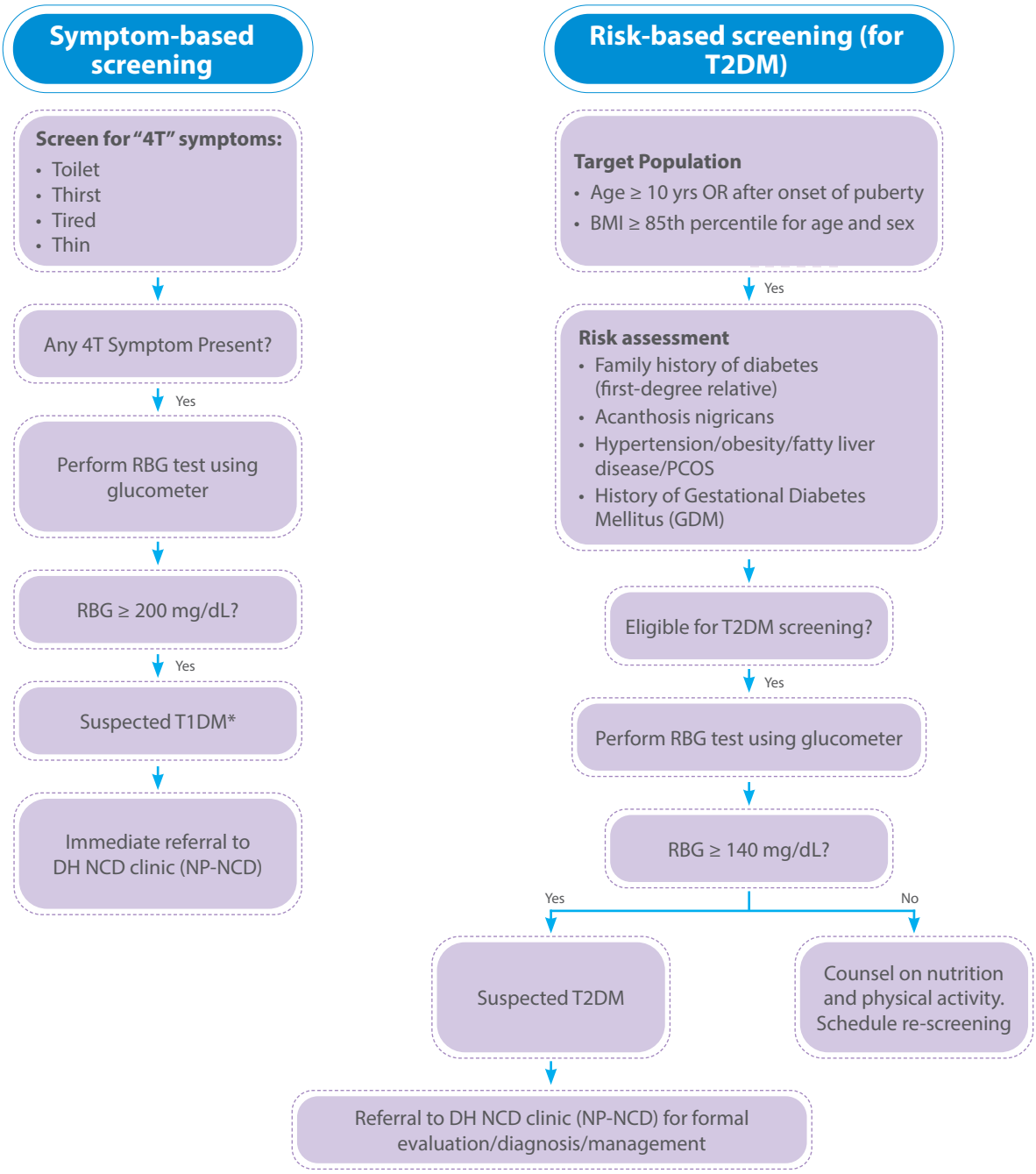
The screening format is based on a combination of symptom-based and risk-based screening approach. Symptom-based screening focuses on identifying children with the classical symptoms of diabetes followed by BG level testing for those who have symptoms. Risk-based screening focuses on identifying children and adolescents who have obesity and/or presence of metabolic risk factors predisposing them for T2DM (which is often asymptomatic at diagnosis), followed by BG testing and evaluation for those with risk factors.

Target age group

- **Symptom-based screening:** will be done for children and adolescents up to 18 years
- **Risk-based screening** will be focused on adolescents aged 10 to 18 years

The figure below depicts the screening and referral pathway for DM in children and adolescents under RBSK with linkage to DH NCD clinics under NP-NCD. The MHTs will conduct the screening in school/Anganwadi settings and refer any cases that screen positive to the NCD clinic at the DH. Children identified through risk-based screening may be referred to the NCD clinic at a CHC or Sub-District Hospital for confirmatory diagnosis. Children who do not screen positive should be re-screened every three years or earlier based on clinical judgement. For children identified with prediabetes, annual re-screening is recommended.

Figure 7: Screening and referral pathway for diabetes in children and adolescents under RBSK with linkage to NCD clinics



School/Anganwadi/Community-based screening by RBSK MHT or at any other health facility (CHC/PHC/AAM)

*If any osmotic symptoms present, presume this as T1DM (until further evaluation) and refer to DH, counselling the caregivers of the child to seek necessary care as soon as possible.

Children identified through risk-based screening may be referred to the NCD clinic at a CHC or Sub-District Hospital for confirmatory diagnosis.

Children who do not screen positive should be re-screened every three years or earlier based on clinical judgement. For children identified with pre-diabetes, annual re-screening is recommended.

Screening tool for MHTs for early detection of diabetes in children

Section A: Preliminary particulars- identifying details and anthropometry as per the existing RBSK screening format-cum-referral card for children (from birth till 18 years of age).

Figure 8: Image of RBSK screening tool

PRELIMINARY PARTICULARS				
District/Block:	**Mobile Health Team ID**		**Name of School**	**School ID/DISE code**
Name of Child:		***Age of Child (in months/ years)**	**Gender (M/F)** ☐ M ☐ F	**Class/Section**
RBSK ID				**ABHA/BAL ABHA/PEN ID**
Name of Father/Guardian	Name of Mother	Contact Number	Name of Teacher	Contact number
Weight (in Kg):	**Height/Length (in cm):**	**Body Mass Index: Calculate (Weight in kg/Height² (in m²)**	**BMI Classification - Tick as appropriate** (N: No referral / U: Underweight / O: Obese	
			N ☐ U <-3SD ☐ O >+2SD ☐	

Section B: Symptom-based screening checklist for diabetes - This section should be administered to all children from birth till 18 years of age.

Section B. Symptom-based screening format This section should be administered to all children from birth till 18 years of age If response to ANY of the questions is YES, ***check random blood glucose using glucometer***		
B	In the last 3 months, have you experienced any of the following:	Response
B 1	Frequent urination (more than what was usual for you)?	☐ Yes ☐ No
B 2	Bedwetting (frequency >2/week in last 3 months)?	☐ Yes ☐ No
B 3	Felt very thirsty, more than what would be usually expected for the season?	☐ Yes ☐ No
B 4	Felt that you have lost weight or failed to gain weight? (Prompt: Can have recall of weight/ loosening of clothes.)	☐ Yes ☐ No
B 5	Felt tired or fatigued more than usual? (Prompt- Decreased activity at school or home)	☐ Yes ☐ No

Section C: Risk-based screening checklist for T2DM - This section should only be filled for adolescents aged 10 years and above and those who were classified as Obese (BMI > +2SD) in **Section A**. Obese individuals with presence of one or more metabolic risk factors should be evaluated for diabetes.

Section C. Risk-based screening format **This section should be administered to adolescents aged >= 10 years who have BMI > +2 SD** If response to ANY of the questions is YES, ***check random blood glucose using glucometer***		
C 1	Ask for the following history	Response
C 1.1	Does anyone in your family (parents/ siblings) have Type 2 Diabetes?	☐ Yes ☐ No ☐ Don't know
C 1.2	*Ask only to females:* Have you been diagnosed with Polycystic Ovarian Syndrome (PCOS) or have experienced complaints of irregular periods, increased body hair and acneiform eruptions?	☐ Yes ☐ No ☐ Don't know
C 2	**Look for signs of insulin resistance during general examination**	
C 2.1	Evidence of acanthosis nigricans - darkening and thickening of skin, typically on the back of the neck and in armpits	☐ Yes ☐ No

Section D: On-the-spot testing - This section is used to record the RBG value using glucometer testing. This should only be filled for individuals suspected to have diabetes, i.e., if responses to ANY of the items in Section B or C of the tool is marked as "Yes".

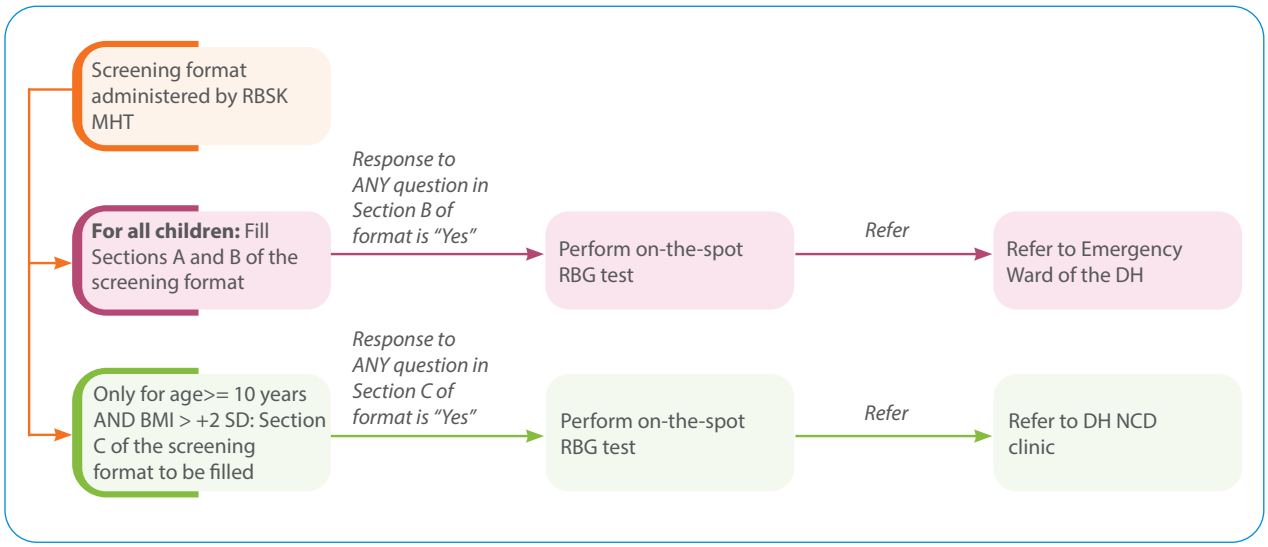
Section D. On-the-spot RBG testing RBG testing should be performed only if responses to ANY of the questions in Section B and C is YES, ***If RBG >= 200 mg/dL, immediately REFER the child to the DH without any delay***		
D	Random blood sugar (mg/dL)	

On-the-spot RBG testing by MHTs

To enable early detection of diabetes among children, RBSK MHTs will perform on-the-spot RBG testing for children who screen positive using the formats above. Workflow for testing and referral is illustrated below. MHTs under RBSK will be equipped with glucometer, test strips and other supplies for on-the-spot RBG testing.

Workflow for diabetes screening, on-the-spot testing and referral by RBSK MHT

Figure 9: Workflow for diabetes screening, on-the-spot testing and referral by RBSK MHT



Blood glucose measurement technique using a glucometer

Switch on the glucometer and insert a compatible test strip

Sterilize the finger using an alcohol swab. Wait for the alcohol to dry completely before pricking

Prick the sterilized finger using a fresh lancet/ needle. **Always prick the finger on the side and not on the pulp. Do not over-squeeze the finger to draw the blood**

Touch the edge of the test strip to the drop of blood to let the strip absorb the blood

After a few seconds, the glucometer will display the BG level on its screen

Safety and hygiene protocols

Strict hygiene and safety practices must be observed while RBG testing.

- **Hand hygiene:** Disposable gloves should be used for each test, and hand hygiene must be maintained by hand washing or use of alcohol-based hand rub before and after testing
- **Infection prevention:** A fresh lancet should be used for each test
- **Safe disposal of waste:** Biomedical waste management guidelines must be followed at all times. Used lancets/ sharps must be disposed of in puncture-proof containers. Used test strips and cotton/gauze should be disposed in yellow bags. Ensure that disposal bags or sharps container are not filled beyond ¾ capacity.

Figure 10: Image of a sharps container

NEVER reuse lancets on multiple children. Ensure that the prick site is sterilised using alcohol swab before performing the test.

Chapter 4

Overview of Diagnosis and Management of Children with Diabetes at NCD Clinic

Learning objectives

1. Describe the confirmatory diagnosis process for diabetes at the DH NCD clinic and explain when to treat a child as T1DM until confirmed.
2. Outline the key components of T1DM and T2DM management at the DH NCD clinic, including initial hospitalisation, insulin initiation, and lifestyle counselling.
3. Explain the importance of seamless continuity of care from childhood into adulthood and the role of NCD and RBSK portals linked via API in supporting this transition.

Confirmatory diagnosis

All children screened positive for diabetes by the MHT as per the aforementioned screening protocols should be referred to the DH NCD clinic for evaluation and confirmatory diagnosis by a pediatrician. Diagnosis should be established by the pediatrician based on clinical findings and BG levels. Where definitive diagnosis is not clinically possible, C-peptide levels may be tested where available. **If there is doubt about the subtype of diabetes (T2DM or other subtypes), it is better to treat as T1DM until further evaluation as this is life-saving.** Management of T1DM and T2DM in children and adolescents will be done on a weekly designated day(s) at the NCD clinic which will be earmarked for pediatric diabetes. Children and adolescents with a pre-existing diagnosis of T1DM or T2DM should also be enrolled at the DH NCD clinic.

Overview of management of T1DM at DH NCD clinic

All children diagnosed with T1DM must be treated with insulin at NCD clinic at DH level. The aim is to replace insulin as physiologically as possible so that BG levels are within the target range avoiding hypoglycemia and hyperglycemia. Management of T1DM is comprehensive and lifelong, thereby preventing acute and chronic complications.

Principles of T1DM management in children:

All children diagnosed with T1DM require lifelong insulin therapy. Comprehensive management includes:

- **Insulin therapy:** Using a basal-bolus regimen with multiple daily injections to mimic the body's natural insulin production
- **Self-Monitoring of Blood Glucose (SMBG):** Regular BG checks (at least 3-4 times a day) to guide insulin dosing, diet, and physical activity
- **Nutrition management:** A balanced diet and understanding carbohydrate counting to match insulin doses with food intake
- **Physical activity:** Regular exercise is encouraged, with adjustments to insulin and food as needed
- **Education and support:** Continuous education for the child and family on all aspects of diabetes care, including managing hypoglycemia and sick days
- **Psychosocial support:** Addressing the emotional and psychological challenges of living with a chronic condition

Remember!

When communicating a T1DM diagnosis:

- Clearly explain and reassure the family that it is an autoimmune condition that can affect anyone, regardless of lifestyle
- Avoid giving false messages about needing insulin for only a few days. Clearly inform the family that the child's body has stopped producing insulin, necessitating the lifelong use of exogenous insulin.
- **Do not stop insulin under any circumstances.** Remember it is the only proven life-saving treatment for T1DM. Avoid any other forms of treatment.

Treatment for a newly diagnosed child should preferably be initiated in an inpatient setting at the DH (refer to Figure 11 and 13 below). The initial hospital stay is crucial and is used to:

- **Stabilize the child's condition,** including managing DKA if present
- **Provide psychological support** to help them cope with the diagnosis
- **Initiate a basal-bolus insulin regimen,** calculating the initial total daily dose (TDD) of insulin and dividing it between long-acting (basal) and rapid/short-acting (bolus) insulin
- **Educate and train the family** on essential skills, including insulin injection technique, site rotation, and proper storage, how to perform SMBG and maintain a logbook, recognizing and treating hypoglycemia, basic nutritional guidance
- **Conduct a comprehensive diagnostic workup** to screen for associated autoimmune conditions (like thyroid disease and celiac disease) and long-term complications

Upon discharge, the child should be registered at the NCD clinic in the DH, and a continuous supply of essential commodities, including different types of insulin, syringes, glucometer, test strips, and lancets, must be ensured.

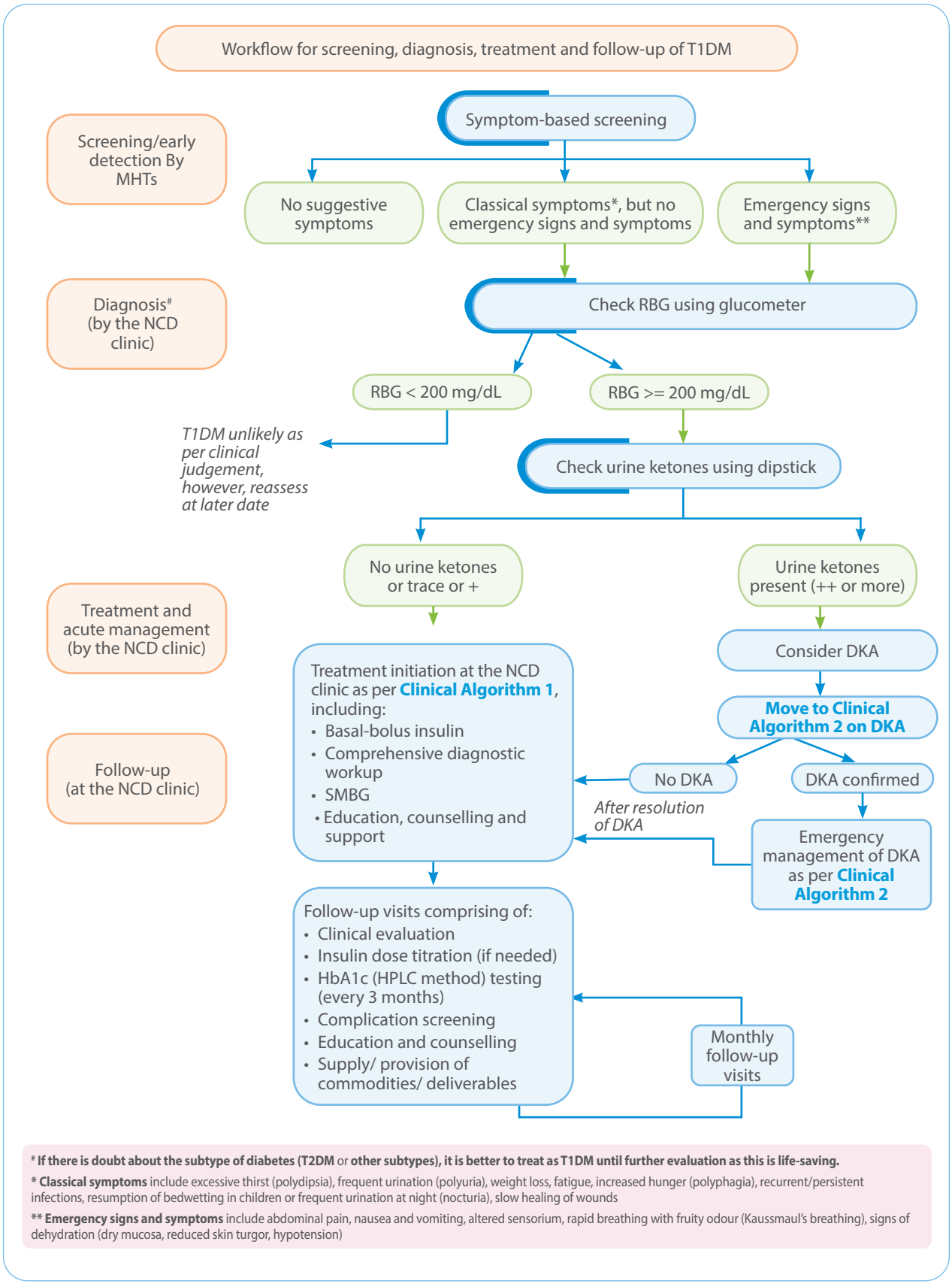
Referral to medical college or other healthcare facilities

There are several reasons why a PLT1D may need to be referred to another doctor or healthcare facility:

- **Hospitalization and specialized care needs:** If the PLT1D requires hospitalization in a tertiary care setting for diabetes-related complications or acute illness, or if they require specialized treatment or management beyond the scope of their current doctor's expertise, they may be referred to nearby hospital or AIIMS or diabetes specialist
- **Complex health issues:** If the individual develops complications related to diabetes that require multidisciplinary care, such as diabetic retinopathy, nephropathy, or cardiovascular issues, they may be referred to specialists in those areas
- **Geographical considerations:** If the individual relocates to a new area, they may require a referral to a DH or medical college closer to their new location

For follow up care, referral linkages to be established and medical colleges to be identified for hub and scope model. Once the acute need has been addressed and the condition stabilised, the PLT1D should be referred back to the DH NCD clinic for continuity of routine follow-up care.

Figure 11: Workflow for screening, diagnosis, treatment and follow-up of T1DM



 # If there is doubt about the subtype of diabetes (T2DM or other subtypes), it is better to treat as T1DM until further evaluation as this is life-saving.

*** Classical symptoms** include excessive thirst (polydipsia), frequent urination (polyuria), weight loss, fatigue, increased hunger (polyphagia), recurrent/persistent infections, resumption of bedwetting in children or frequent urination at night (nocturia), slow healing of wounds

**** Emergency signs and symptoms** include abdominal pain, nausea and vomiting, altered sensorium, rapid breathing with fruity odour (Kaussmaul's breathing), signs of dehydration (dry mucosa, reduced skin turgor, hypotension)

***For clinical algorithm 1, refer to Figure 13 (Chapter 4) and for clinical algorithm 2, refer to Figure 26 (Chapter 8)**

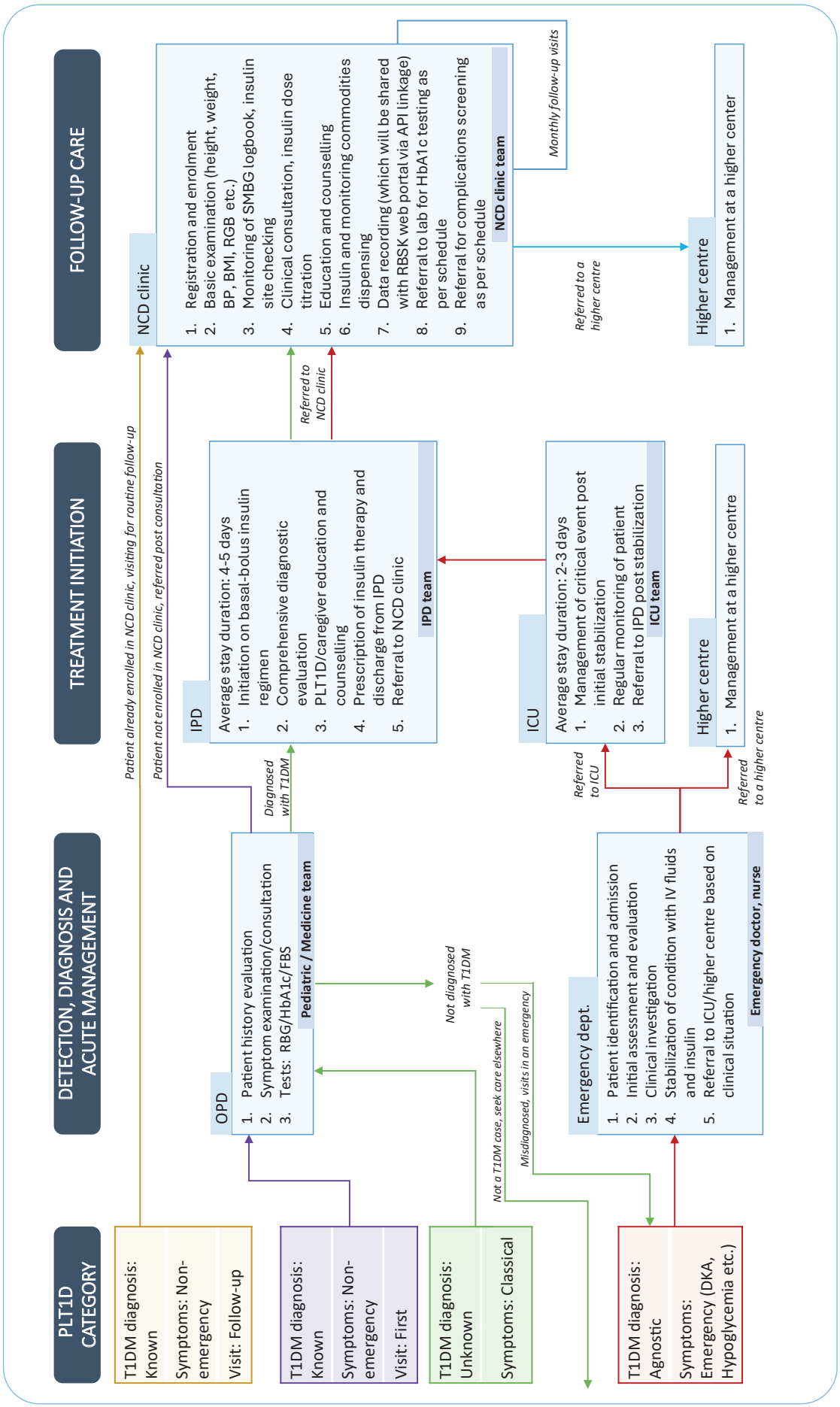


Figure 12: Indicative journey of a child with T1DM within a DH

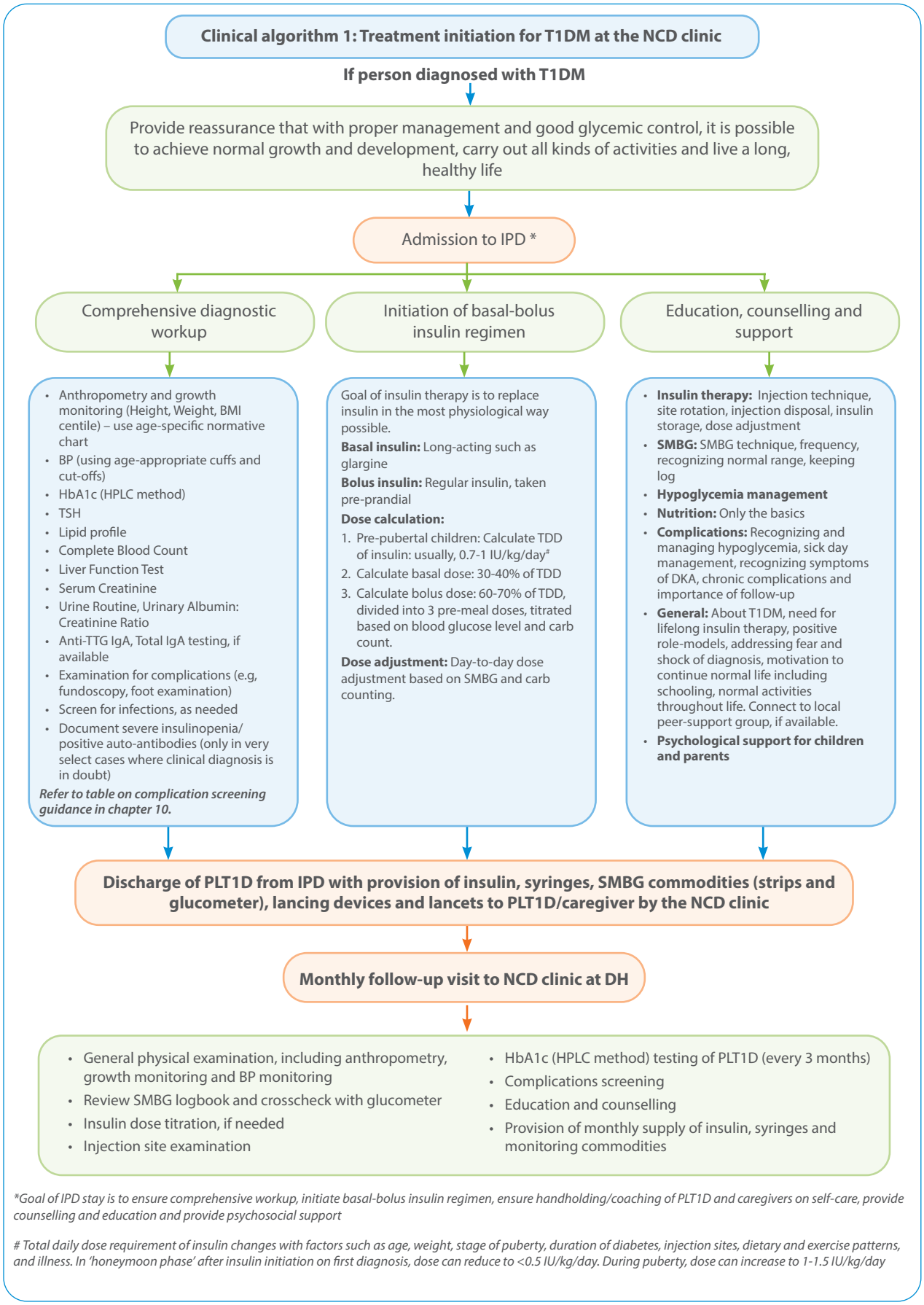
Human resources of NCD clinic

Identified named existing staff (doctors, staff nurses, pharmacist, data entry operator, NCD counsellors, nutritionists, clinical psychologists) must be rigorously trained and mentored according to relevant roles and responsibilities. In addition to MD Medicine, existing pediatrician of the health facility may be deputed to attend NCD clinic once a week for optimal management of childhood cases.

Care continuum

All children and adolescents with T1DM need continuation of care beyond 18 years of age and should be linked to the adult NP-NCD programme to ensure proper follow-up. Extending the scope of routine adult NCD clinics to include children and adolescents would further strengthen this continuum. Screening, diagnosis and management of T1DM must be provided irrespective of age, including children below 6 years. ASHAs should screen all children under 18 years using the modified Community-Based Assessment Checklist CBAC form and urgently refer suspected cases to the DH NCD clinic. The ABHA-linked personal health record, maintained on the NCD portal and shared with RBSK portal via API for cases till 18 years, is an important channel to maintain a care continuum across the transition from pediatric to adult care. A seamless care continuum is life-saving.

Figure 13: Clinical algorithm 1 for treatment initiation for T1DM at the NCD clinic



**Goal of IPD stay is to ensure comprehensive workup, initiate basal-bolus insulin regimen, ensure handholding/coaching of PLT1D and caregivers on self-care, provide counselling and education and provide psychosocial support*

 # Total daily dose requirement of insulin changes with factors such as age, weight, stage of puberty, duration of diabetes, injection sites, dietary and exercise patterns, and illness. In 'honeymoon phase' after insulin initiation on first diagnosis, dose can reduce to <0.5 IU/kg/day. During puberty, dose can increase to 1-1.5 IU/kg/day

Overview of management of T2DM at DH

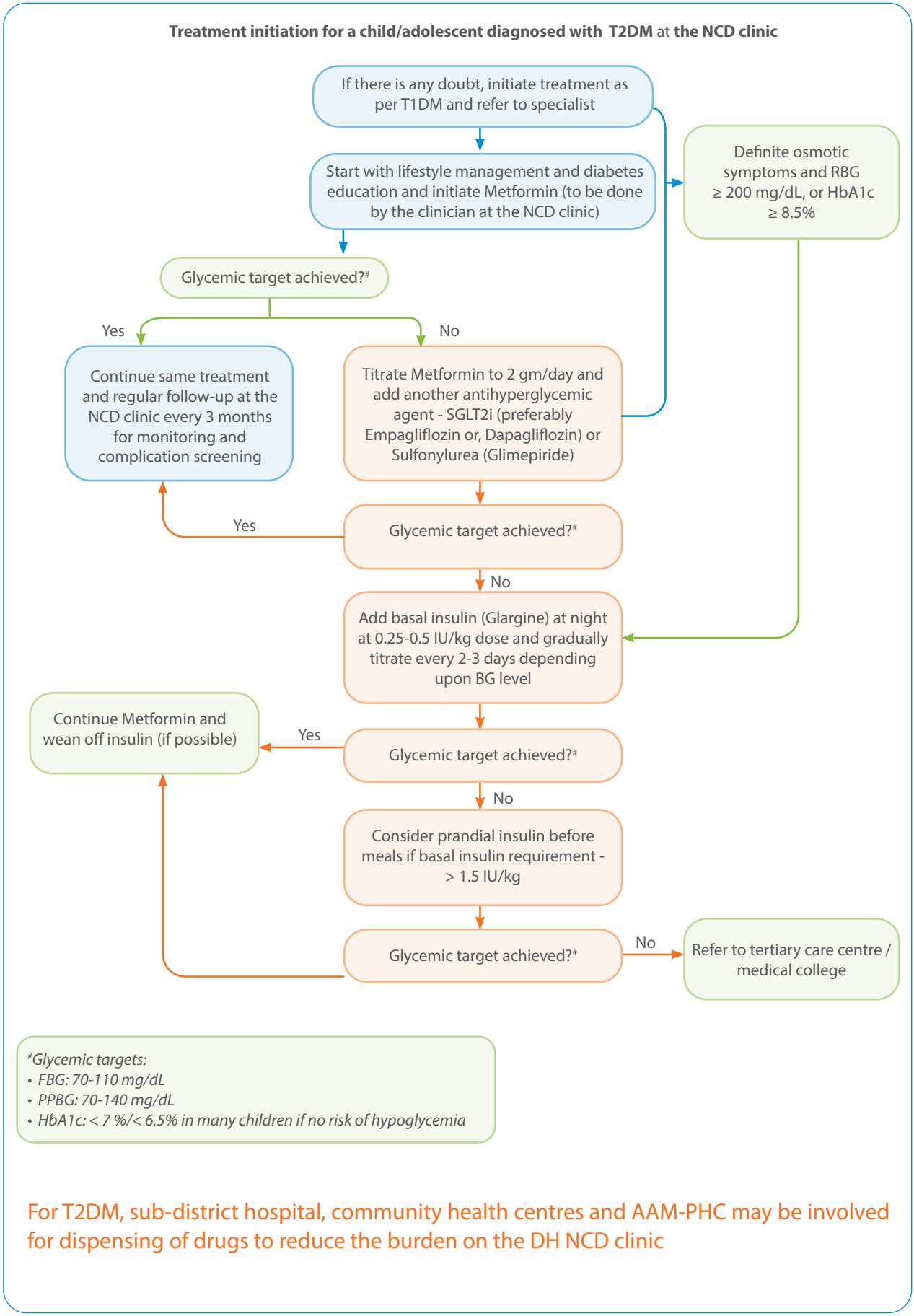
Treatment of T2DM centres on lifestyle modification and oral hypoglycemic agents (OHAs). People with T2DM need to be educated regarding importance of healthy lifestyle including role of diet and exercise in managing blood sugars and reducing complications.

Table 3: Guidance for lifestyle modification for T2DM

Physical activity	Diet	Lifestyle changes
• At least 60 min per day of moderate to vigorous physical activity. • Strength/resistance exercises 20 min a day for 3 times a week	• Promote meals at fixed time without distractions • Decrease intake of junk foods – ultra-processed foods, foods high in fat and calories • No intake of sugary carbonated drinks and juices • Prefer whole grains with low glycemic index • Minimize exposure to alcohol and tobacco	• Encourage adequate sleep of 8-11 hours a night

Metformin is the first line drug for T2DM. If glycemic control is not adequate with Metformin, additional OHAs such as sulfonylurea or SGLT-2 inhibitors may be added. In some cases, insulin may need to be added to achieve glycemic control.

Figure 14: Treatment initiation protocol for T2DM



For T2DM, sub-district hospital, community health centres and AAM-PHC may be involved for dispensing of drugs to reduce the burden on the DH NCD clinic

Follow-up protocol

All children with T1DM should be routinely followed up in the NCD clinics at the DH on a monthly basis to ensure glycemic control and prevention of complications. In case of T2DM, once condition is stabilized, follow up may be done every 3-6 months. All children with diabetes will be overseen at the NCD clinic on the weekly designated day(s). Each follow-up visit should comprise:

- Review of glycemic control and dose adjustment if needed. For T1DM, this includes titration of insulin doses as appropriate based on daily SMBG values. For T2DM, this includes addition/ modification of therapy, based on reported and target HbA1c levels
- Structured and age-appropriate diabetes education and counselling, to enable self-management of diabetes
- Screening of microvascular and macrovascular complications through anthropometric examination and laboratory investigations (Refer to the next section for complication screening guidance)
- Dispensing of drugs and supplies for management. For T1DM, this includes dispensing of supplies for self-monitoring of blood glucose as well as supplies for insulin administration (Detailed below)

Appropriate treatment and management will lead to prevention of further morbidity and mortality.

Package of insulin and take-home commodities for T1DM

The following package of drugs and commodities to be provided to PLT1D on a monthly basis through the DH NCD Clinic during follow-up visits:

Table 4: Package of insulin and take-home commodities for T1DM

Drugs/Commodities	Unit	Number to be dispensed per month	Availability in NLEM
Insulin Glargine (rDNA 100 IU/mL)	3 mL vial	To be dispensed according to dosage	Yes
Regular/Soluble Insulin Inj. I.P. 40 IU/mL	10 mL vial	To be dispensed according to dosage	Yes
40 IU Insulin syringe (for short-acting insulin)	Syringe	30 per month	No
100 IU Insulin syringe (for long-acting insulin)	Syringe	10 per month	No
Glucometer*	Device	One device per year	No

Drugs/Commodities	Unit	Number to be dispensed per month	Availability in NLEM
Glucose test strips	Box of 50 strips	2 Boxes i.e., 100 strips per month	No
Lancing pen/device	Device	One device per year	No
Lancets	Box of 25 lancets	1 box (25 lancets) per month	No

*One glucometer to be supplied per 50 strips

Dispensing to be done at the NCD clinic at DH itself and not the main pharmacy of the hospital. Insulin vials/cartridges to be stored in the insulin fridge provisioned for this dedicated clinic and kept under lock and key in the clinic itself. This to be mandatory to ensure proper stock maintenance and accountability.

Financial guidance for states

While submitting their proposals for the annual NHM Programme Implementation Plan (PIP), states may propose activities under the appropriate budget heads and FMR codes.

Capacity building of MHTs, Pediatricians, Medical Officers, Staff Nurses, and other medical personnel posted in NCD clinics may be budgeted under RBSK-RCH 3.21. For diagnostics, states may budget under HSS 7.1.181 (Free Diagnostics Services Initiative) for procurement of glucometers, strips, and lancets for use by MHTs during field screening; equipment and supplies for confirmatory and follow-up laboratory investigations at health facilities; as well as glucometers, strips, lancets, and other consumables for PLT1D/PLT2D to take home for SMBG. Procurement and supply of insulin for children diagnosed with T1DM may be budgeted under HSS 7.180 (Free Drugs and Services Initiative).

All of the above are to be part of the Drugs and Vaccine Distribution Management System Portal (DVDMS), and the RBSK programme shall recommend the activities proposed by states for implementation of these initiatives.

Chapter 5

Treatment Initiation for Type 1 Diabetes Mellitus at District Hospitals

Learning objectives

1. Explain why insulin therapy is non-negotiable and lifelong for all children diagnosed with T1DM.
2. Describe the basal-bolus insulin regimen, including the types of insulin used, dose calculation, and administration technique.
3. Outline the discharge protocol for a newly diagnosed person with T1DM, including minimum education, supplies to be dispensed, and follow-up plan.

All individuals diagnosed with T1DM require insulin as soon as they are diagnosed and continuously thereafter throughout life. There is currently no alternative to insulin therapy — it is not optional or temporary. Therefore, initiating and maintaining insulin therapy is essential from the time of diagnosis and must continue lifelong.

At the time of diagnosis, a comprehensive set of initial assessments is critical to establish the clinical baseline, detect any complications or comorbidities early, and tailor the management plan to the individual's needs.

Initial examination

- **DKA evaluation:** All PLT1D should be evaluated for the possibility of DKA at diagnosis with clinical features, urine/serum ketone testing and a blood gas if clinically indicated
- **Tests for differential diagnosis:** Testing for autoimmune antibodies is not mandatory for all cases but might be helpful where differential diagnosis for T2DM and monogenic diabetes are considered
- **Lab investigations:** All PLT1D should be screened for:
  a) Anthropometry and growth monitoring (height, weight, BMI centile), using age-specific normative charts (refer to Annexure 7)
  b) Blood pressure (using age-appropriate cuffs and cut-offs)
  c) HbA1c (HPLC method)
  d) TSH (should be deferred in very sick PLT1D with DKA till recovery)

e) Complete Blood Count

f) Liver Function Test

g) Serum Creatinine

h) Urine Routine

i) Anti-TTG IgA, Total IgA testing, if available

j) Examination for complications (example, fundoscopy, foot examination)

k) Screen for infections, as needed

Insulin therapy

Insulin is a hormone produced by the beta cells of the Islet of Langerhans in the pancreas that plays a crucial role in regulating BG levels. It facilitates the uptake of glucose into cells, where it can be used for energy or stored for future use. Insulin is essential for maintaining normal BG levels and enabling cells to function properly. A background level of insulin is continuously released by the pancreas to maintain stable BG levels throughout the day, even when not eating. It helps to control BG levels between meals and overnight. In addition, spikes of insulin are released in response to rise in BG levels, for example during meals.

T1DM is an autoimmune condition where the pancreatic beta cells are gradually destroyed, thereby resulting in an absolute deficiency of insulin and the inability of the body to regulate BG. Insulin replacement therapy is essential for survival in T1DM.

Types of insulin

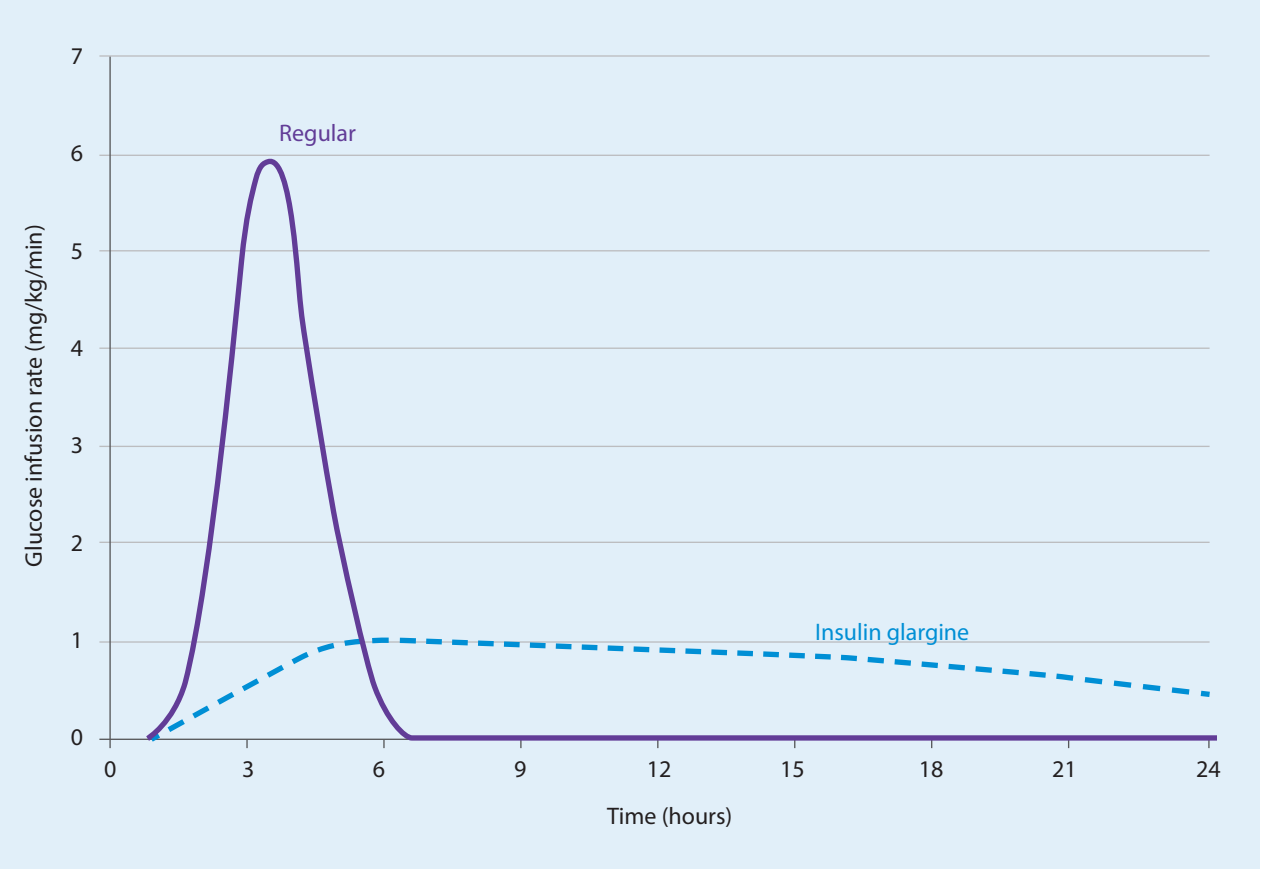
Insulins are classified based on their action profiles into several categories: rapid-acting, short-acting, long-acting, and ultra-long-acting. Understanding the different types of insulin and their action profiles helps in tailoring diabetes treatment plans to meet individual PLT1D's needs, ensuring optimal BG control.

- **Short-acting insulins:** These insulins are used around mealtimes but have a slightly slower onset and longer duration compared to rapid-acting insulins. For example, Regular insulin
- **Long-acting insulins:** These insulins provide a steady level of insulin throughout the day and night, often used in combination with rapid or short-acting insulins. Examples include Glargine and Detemir

Table 5: Activity profiles of different types of insulin

Type	Examples	Onset	Peak	Duration	Remarks
Short-acting	Regular insulin	½ - 1 hour	2-4 hours	6-8 hours	
Long-acting	Glargine insulin (U-100)	1-2 hours	Minimal/No peak	Up to 24 hours	Has reduced risk of nocturnal hypoglycemia

Figure 15: Action profiles of different types of insulin



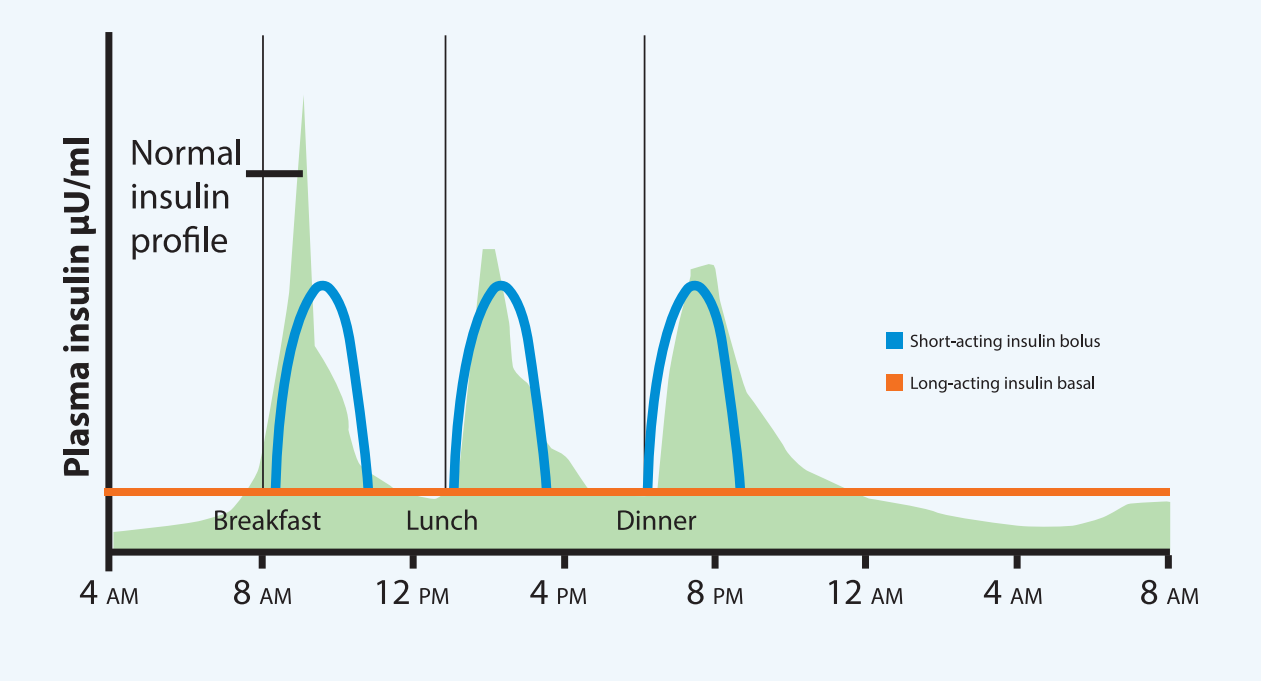
Insulin regimen

Insulin replacement therapy should aim to mimic the physiological insulin secretion. The common insulin regimens include premix, split mix and basal-bolus regimens. Of these, **the basal-bolus regimen is the only recommended regimen** as it most closely resembles the physiological secretion pattern and provides better glycemic control and flexibility in the management of T1DM.

Basal-bolus regimen aims to mimic the body's natural insulin production more closely than older (premix and split mix) methods. It involves the use of two types of insulin:

- **Basal insulin (long-acting):** Provides a steady level of insulin throughout the day, helping to keep BG levels stable between meals and overnight. This mimics the body's background insulin production. The basal dose typically includes one daily injection of long-acting insulin such as glargine (U-100).
- **Bolus insulin (short-acting):** This type of insulin is taken at mealtimes to manage the rise in BG that occurs after eating. Bolus insulin provides additional insulin needed to cover the glucose produced by the intake of carbohydrates during meals. Bolus doses comprise of short-acting insulin such as regular insulin, injected multiple times a day.

Figure 16: Action profiles of basal and bolus insulins compared with physiological insulin secretion



Insulin dosing

Dose adjustment of basal and bolus components of insulin therapy is an ongoing process. The optimal dose should result in glycemic control without causing hypoglycemia. Dose changes with factors such as age, weight, stage of puberty, duration of diabetes, injection sites, food and exercise pattern, illness episodes, etc.

- In the management of DKA, a starting dose of 0.1 unit/kg/hour of short-acting insulin given as an intravenous infusion should be appropriate in majority of cases.
- After the PLT1D recovers from DKA, the insulin requirement for the first few days may be as high as 2-2.5 units/kg/day (may go as high as 3 units/kg/day in some cases), because of elevated levels of stress hormones, increased appetite and need to restore depleted tissue stores of protein and glycogen. (The management of DKA is discussed in detail in Chapter 8).
- As the PLT1D enters the honeymoon phase, the dose comes down to 0.5 units/kg/day or lower; some may require virtually no insulin. However, it is preferable to continue with a very small dose once or twice a day. The honeymoon phase lasts for 3-12 months, rarely up to 24 months.
- With the onset of the intensification phase (this may happen gradually, or it may be abrupt if precipitated by an infection); the requirement rises to 0.7-1.0 units/kg/day in prepubertal children and 1.0-1.5 units/kg/day in pubertal children (on account of the anti-insulin effects of growth hormone and sex steroids) and adults.

During hospital admission, PLT1D and/or their caregivers should be educated on the need for insulin, importance of basal-bolus regimen, delivery devices, injection technique and site rotation.

Table 6: Dose requirements of PLT1D across phases of T1DM

Phase	Dose requirement
DKA Management	0.1 IU/kg/hour
Partial remission / honeymoon phase	=< 0.5 IU/kg/day
Pre-pubertal children	0.7 – 1.0 IU/kg/day
Puberty and above	1.0 – 1.5 IU/kg/day

Dose distribution

Approximately 30-40% of the total daily dose (TDD) is given as basal insulin (Glargine), injected once a day. The remaining 60-70% of the TDD is divided into three or four pre-meal bolus doses (Regular insulin), taken about 30 minutes before the meal.

- **Basal dose (Glargine):** 30% TDD
- **Bolus dose (Regular insulin):** 70% of TDD divided into three pre-meal bolus doses

Example:

How to calculate the insulin dose for a 10-year-old PLT1D weighing 20 kgs:

1. Start with a TDD requirement of 0.7 IU/kg/day,
   TDD = 0.7×20=14 units per day
2. Divide the TDD into basal and bolus doses in the ratio 30:70
   Basal dose = 0.3×14 ≅ 4 units
   Bolus dose = 0.7×14 ≅ 10 units
3. Divide the bolus dose into 3 equal doses to be given before each meal

Table 7: Illustrative dosing schedule for a 10-year-old child with T1DM weighing 20 kg

Time of the day	Before breakfast	Before lunch	Before dinner	Bedtime
Dose type	Bolus	Bolus	Bolus	Basal
Insulin	Regular	Regular	Regular	Glargine
Units to be taken	3 IU	4 IU	3 IU	4 IU

Dose adjustments

Insulin dose adjustment is an ongoing process. A thorough evaluation of the SMBG logbook is crucial to evaluate the need for insulin dose adjustment (refer to Chapter 6 for more details on the SMBG logbook). The total insulin dose requirement can be adjusted to align with the requirements on the days where all SMBG readings were within range. Dose distribution of basal

and bolus doses can be done based on pattern of SMBG readings. For example, if the post-meal BG is in the target range but the following pre-meal BG is high then the basal insulin should be increased.

Ratios such as **Insulin Sensitivity Factor (ISF)** and **Insulin-to-Carbohydrate Ratio (ICR)** can be used to adjust insulin doses in addition to carb-counting. These ratios help PLT1D and their caregivers to titrate bolus insulin doses based on food intake and current blood glucose levels.

Insulin Sensitivity Factor (ISF)

- In case of regular insulin, $ISF = \frac{1500}{\text{Total Daily Dose}}$
- In case of rapid-acting insulin (such as Aspart, Fiasp), $ISF = \frac{1800}{\text{Total Daily Dose}}$

Insulin-to-Carbohydrate Ratio (ICR)

$$ICR = \frac{500}{\text{Total Daily Dose}}$$

*Refer to Chapter 7 for more details on ISF and ICR.

Insulin administration

Insulin can be administered using syringes.

Insulin syringes*: U-100 syringes should be used with U-100 vials (100 units of insulin/mL) and U-40 syringes with U-40 vials (40 units of insulin/mL). The attached needles are 6 or 8 mm long. Regular insulin is usually available in 40 IU/mL strength, while insulin glargine is usually available as 100 IU/mL. The PLT1D should be instructed to check the strength of the insulin vial before use.

Insulin pen: These are either reusable or disposable. Pens typically have 0.5- or 1-unit increments. Pen needles are 4, 5 or 6 mm long. They are easy to carry, convenient and easier to use.

*In the T1DM public health programme, supported by NHM, syringes will be provided for insulin administration as seen below:

Syringe 100 IU
(orange cap)

Syringe 40 IU
(red cap)

Insulin injection technique

Insulin is injected subcutaneously in the anterior abdominal wall (leaving out 2 inches from all sides of the navel) or in the anterolateral thigh. The deltoid region is not ideal for children.

Proper insulin injection technique is crucial for effective diabetes management and minimizing discomfort and complications. **Rotation of injection sites to prevent lipohypertrophy is of utmost importance**. Proper technique and site rotation help ensure that insulin is absorbed consistently and effectively, reducing the risk of blood sugar fluctuations and injection-related complications. Care providers and healthcare professionals should regularly assess PLT1D/ caregiver's injection technique and skills to ensure proper insulin delivery.

Steps for administering an insulin injection

1

Gather supplies:

- Insulin (vial)
- Syringe
- Alcohol swab
- Sharps container for needle disposal

2

Wash hands:

Use soap and water to ensure cleanliness and reduce infection risk

3

Prepare the insulin:

- For vials and syringes:
  - Roll the vial gently between the hands to mix it well
  - Clean the rubber stopper with an alcohol swab
  - Draw air into the syringe equal to the insulin dose
  - Insert the needle into the vial, push the air in, then draw the insulin dose into the syringe
  - Check for air bubbles and remove them by flicking the syringe and pushing the air out

4

Choose an injection site:

- Common sites include the abdomen, thighs, buttocks, and upper arms
- Rotate injection sites within the same region to avoid lipohypertrophy (lumps or indentations in the skin)

5

Clean the injection site:

Use an alcohol swab to clean the skin and allow it to dry

6

Inject the insulin using a syringe:

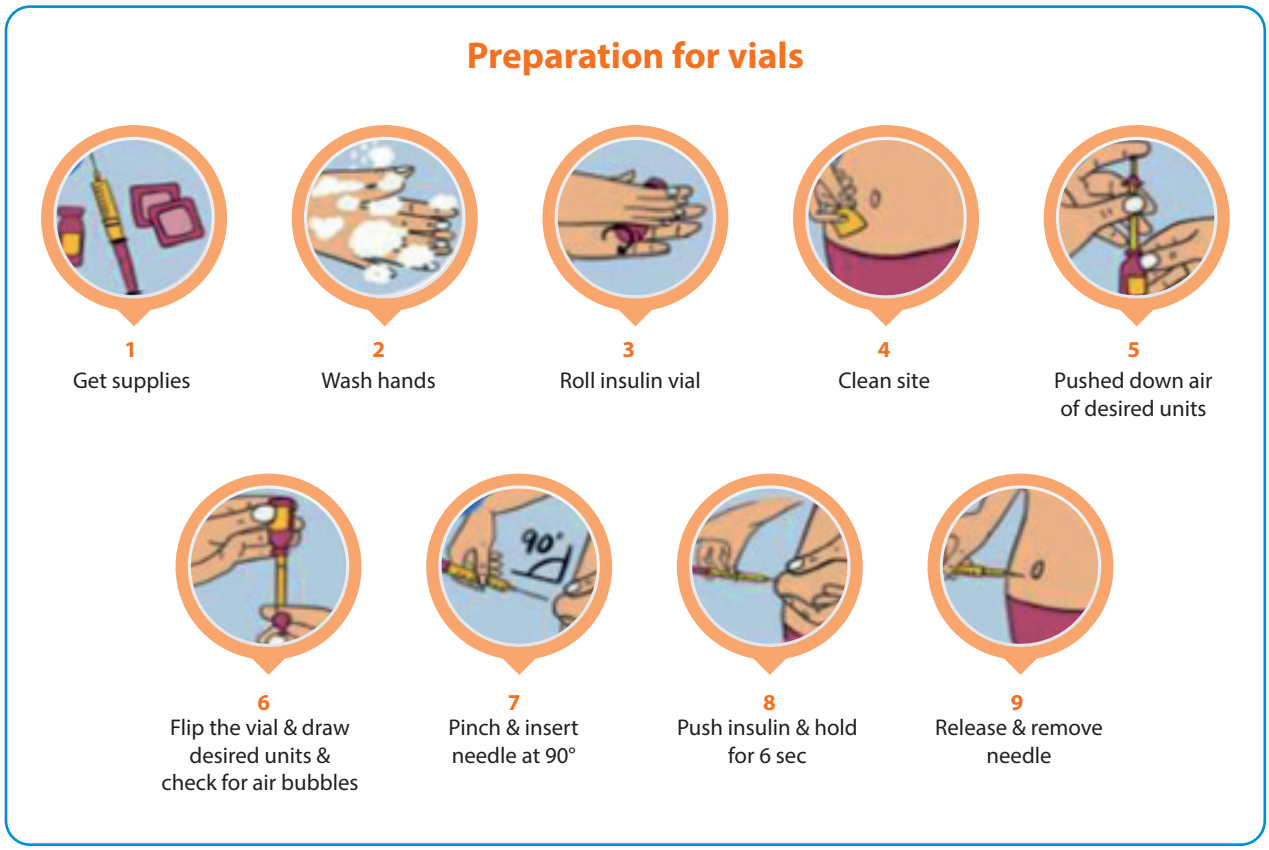
- Ensure that the insulin syringe matches the insulin concentration being used. 40 IU syringes (red cap) and 100 IU syringes (orange cap) have different markings and cannot be interchanged.
- Pinch a fold of skin to avoid injecting into muscle
- Insert the needle at a 90-degree angle (or 45-degree angle if you are very thin)
- Push the plunger to inject the insulin slowly and steadily
- Wait a few seconds before removing the needle to ensure all insulin is delivered

7

Dispose of needles safely:

- Place used needles in a sharps container to prevent injury and contamination
- Proper disposal of lancets and sharps must be taught to all PLT1D and their families

Figure 17: Insulin administration technique using syringe and vial



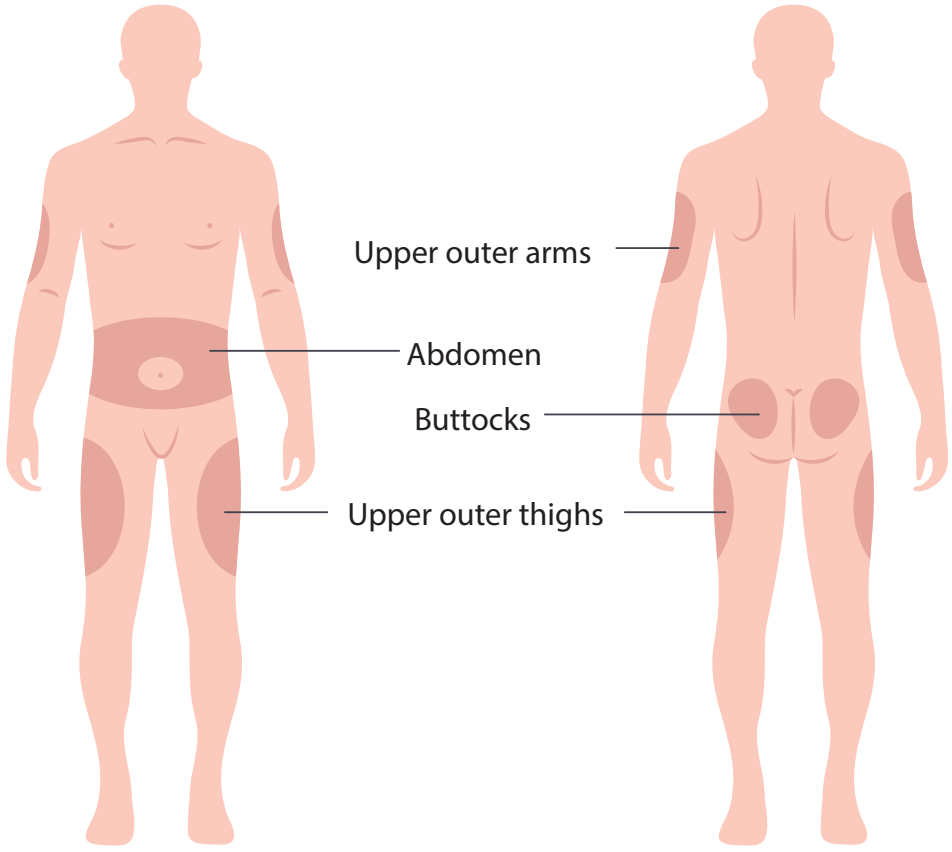
Insulin injection sites and site rotation

Insulin is a growth hormone and will cause abnormal growth and scarring (lipohypertrophy) if continuously injected in the same location. This impacts absorption if the site is continuously used, making site rotation an essential component of insulin therapy. It involves systematically changing injection sites to preserve healthy tissue, ensure consistent insulin absorption, and prevent local complications.

Insulin sites

As shown in the image, there are four safe areas for insulin injections: the side of the thighs, the back of the upper arms, the abdomen (belly) and the upper outer buttocks.

Figure 18: Insulin injection sites



- **Upper outer arms :** use the outer back area of the upper arm where there is fatty tissue
- **Abdomen:** except for a 2-inch circle around the navel
- **Buttocks:** upper and outer part of the buttocks
- **Upper outer thighs:** avoid administering too close to the bony area above the knee

The stomach has the fastest rate of absorption, followed by the arms, thighs, and buttocks.

Rotating sites

PLT1D should be encouraged to inject consistently within the same area (abdomen, thigh, buttocks, arm) at a particular time of the day, but must avoid injecting repeatedly into the same spot to prevent lipohypertrophy. For instance, if the pre-breakfast dose is being injected in the abdomen, it should not be given in thigh or buttocks.

PLT1Ds/caregivers can use the following method for rotating sites:

- Divide the selected injection area (for example: the abdomen) into four large sections
- Select one section and split it into four smaller sections
- Rotate clockwise through these four small sections for a week
- In the following week, select the next large section clockwise from the previous week and divide it into four smaller sections
- Repeat the rotation between the small sections and large sections each following week

Within the given area, not more than 2-3 doses should be injected in a month at the same spot. To achieve this, 10-15 spots must be marked in each area (e.g., using a plastic sheet) in such a way that there is two fingers width between any two spots.

Evaluation of sites

Inspect injection sites during each visit, both visually and by palpation to aid in the detection of lipohypertrophy. If lipohypertrophy is present, show PLT1D/caregiver the lesion and instruct not to inject into it until it heals completely. Clinicians should teach PLT1D/caregivers what to feel and look for and engage them/caregivers in surveying injection sites.

Insulin storage

Insulin should be stored at 4–8°C in the refrigerator.

Insulin should never be frozen or kept under direct sunlight.

Insulin may be stored in clay pots using the double pot method in hot climates if the refrigerator is not available.

If fridge is not available:

- Insulin may be stored in clay pots using the double pot method in hot climates
- Add wet sand between two pots and water on the clay lid for keeping the insulin cool
- Put the insulin in a plastic bag after tying a rubber band, stored in the double clay pot

Figure 19: Insulin storage technique (double pot method)

Source: *Dr Archana Sarda, "Clay pot", in ISPAD Clinical Practice Consensus Guidelines 2022, International Society for Pediatric and Adolescent Diabetes. (accessed 16 April 2026).*

Setting for initiation on insulin regimen

Diagnosis for T1DM can be either done in the OPD or in the emergency room, in case of DKA. In both cases, initiation on insulin regimen should take place in the in-patient ward or intensive care unit. Initial in-hospital management of T1DM offers several advantages, including the opportunity to provide intensive education and counselling to the PLT1D and their family, along with supervised administration of insulin (refer to Chapter 9 for more details on diabetes education and counselling). Additionally, it allows the family, time to accept the diagnosis and recover from the initial shock.

For PLT1D who are currently on an insulin regimen other than basal-bolus, the transition to basal-bolus regimen can be done in the OPD. The detailed protocol and step-by-step process for transitioning PLT1D to basal-bolus therapy are outlined in the beginning of this chapter.

Discharge protocol:

Before discharging a PLT1D from the hospital, the following must be completed:

- Resolution of DKA, CBG < 250 mg/dL
- Clinical: absence of vomiting, no pain abdomen, urine output > 0.5 mL/kg/hr
- Biochemical: venous pH >= 7.3, bicarbonate >= 18 mmol/L, ketones < 0.6 mmol/L
- PLT1D and/or caregivers have received education and counselling on basic survival skills

Given that T1DM diagnosis might be overwhelming for the PLT1D and their family, it is essential to provide diabetes education in a step-by-step manner that is easy to absorb. In the first month, the focus should be to provide guidance on the essential survival skills for diabetes management as detailed below:

Advice for PLT1D and their caregivers at the time of discharge:

- Insulin administration as per the clinical advice
- BG monitoring as per recommended protocol
- Maintaining a logbook for recording BG levels
- Counselling on management of emergencies like hypoglycemia, sick day management
- Basic principles of healthy eating
- Next date for follow up visit, emphasizing the importance of adherence

In the case of children and adolescents, the primary caregiver should be identified for education and counselling as it is common that several family members accompany the child at the time of diagnosis and initial management.

Discharge only once PLT1D and/or caregivers are confident in administering insulin and checking BG levels. **For this, they should practice insulin administration, measuring BG levels using a glucometer and recording the values in the SMBG logbook in the IPD.**

The following supplies should be dispensed before discharging the PLT1D:

- Insulin syringes - both 40 IU and 100 IU.
- Insulin vials– both short and long acting (Regular insulin and Glargine insulin)
- Glucometer, strips, lancing devices, lancets and SMBG logbook for BG monitoring
- Contact information of the managing doctor to be contacted in case of emergency
- PLT1D should be redirected to NCD clinic for enrollment, and the date for next visit should be provided

***For dispensing drugs and commodities, standard operating procedures laid down under the Operational Guidelines of NP-NCD should be followed.**

Chapter 6

Blood Glucose Monitoring in Type 1 Diabetes Mellitus

Learning objectives

1. Explain the importance of regular SMBG in achieving glycemic control and preventing complications.
2. Describe the recommended frequency and timing of SMBG, including a rotating schedule that is feasible in resource-limited settings.
3. Explain the purpose of HbA1c testing, its frequency, and target values for children with T1DM.

SMBG refers to testing and recording of BG levels by a PLT1D and/or caregiver, at home or in hospital, at different times of the day. The BG levels obtained help PLT1D and clinicians to make appropriate adjustments in lifestyle (diet and physical exercise) and medications.

SMBG is a key factor that predicts glycemic control in PLT1D. Good glycemic control reduces the risk of long-term complications such as retinopathy, nephropathy and neuropathy and macrovascular complications. Frequent SMBG has been shown to improve glycemic control, and to reduce the absolute frequency of severe hypoglycemic episodes in PLT1D. It is important to remember that frequent SMBG translates into improved glycemic control only when these values are used systematically (by PLT1D/caregivers and doctors) for making decisions on insulin dose adjustments, and/or meal/snack timing and content.

Importance of regular BG monitoring

- Each BG reading provides vital information regarding the glycemic status in response to insulin received, food consumed, and the exercise done by the PLT1D
- It aids in ascertaining immediate and daily insulin requirements
- It guides adjustment in insulin dose, food pattern and exercise
- It facilitates timely management of hypoglycemia and hyperglycemia. This is particularly useful in PLT1D with hypoglycemia unawareness

Frequency and timing of BG monitoring

Ideally, SMBG should be performed 4 to 6 times daily:

- 4 times per day- before each meal and at bedtime
- 12:00 Midnight – 3:00 AM once in 1-2 weeks
- Postprandial samples (1.5 - 2 hours after food) to be done whenever necessary
- Additional tests:
  a) When hypoglycemia or hyperglycemia is suspected
  b) Before and after physical activity (walking, exercise, gardening etc.)
  c) During illness
  d) Before driving a vehicle
  e) Whenever the person is concerned about their diabetes

Even in resource limited settings, SMBG should be performed at least 3-4 times per day

At least 3 to 4 BG tests daily are required for a reasonable assessment. Occasionally additional BG testing may be required 2 hours after meals and during late night. Ideally, testing 2 hours after breakfast and lunch should be encouraged daily or as often as possible.

Since 8 to 10 tests may not be practical due to affordability, compliance, or school support, a rotating schedule of 3 to 4 tests per day can help cover all time points across the week.

Figure 20: Sample SMBG rotation schedule

DAY	BREAKFAST		LUNCH		DINNER		BEDTIME	Between 2 AM to 3 AM
	Pre-meal	2h post-meal	Pre-meal	2h post-meal	Pre-meal	2h post-meal		
Monday	✓	✓					✓	
Tuesday			✓	✓			✓	
Wednesday	✓				✓	✓		✓
Thursday	✓	✓					✓	
Friday			✓	✓			✓	
Saturday	✓				✓	✓		✓
Sunday	✓	✓					✓	

Target Values of SMBG

As per the ISPAD guidelines, the blood glucose levels for a PLT1D should fall within the following target ranges:

Table 8: Recommended BG target ranges for PLT1D

Time of Monitoring	Target Range (mg/dL)
Fasting or pre-prandial	90-145
Post-prandial (2 hours after food)	90-180
Bedtime	120-180
Nocturnal	80-162
HbA1c	<7.5%*

*HbA1c goals may be individualised, with the aim of achieving values as close to the recommended range as possible.

Interpreting BG values at different times of the day

Each high pre-meal BG value indicates how much additional insulin is to be taken on that occasion; high (or low) post-meal values help us alter future insulin doses:

Pre-breakfast BG

- It is the most important of all measurements and reflects the glycemic control at night. Pre breakfast BG is closely related to the basal dose given at night
- In case of a high pre-breakfast BG -> Look at 2-3 AM value for dose adjustments
  - High pre-breakfast BG and high 2-3 AM BG -> increase basal insulin that covers the night hours
  - High pre-breakfast BG and low 2-3 AM BG -> either the basal insulin needs to be reduced or an additional bedtime snack of low glycemic index (GI) is required

Pre-lunch and pre-dinner BG

- Pre-lunch and pre-dinner BG levels are controlled by morning and pre-lunch doses of regular insulin respectively. This value is also affected by the dose of basal insulin like Glargine. Further, this value will be affected by the evening outdoor activities. The timing and amount of evening snacks (usually taken by children after returning from school) also affects this value.
- If the pre-lunch BG levels are high, dose of Glargine is increased by 10-15% or better still, a regular or rapid insulin dose with school snack is encouraged.
- If pre-dinner BG levels are high, the noon dose of short acting insulin/bolus insulin is increased by 10-15% or a small dose of short-acting insulin can be encouraged with evening snack especially in adolescents.

Post-meal BG

- Used for adjusting the dose of the preceding pre-meal bolus insulin
- High post-meal BG -> Increase pre-meal bolus insulin of the preceding meal (e.g. if post-breakfast BG is high, increase the pre-breakfast bolus insulin)

Bedtime BG

- Bedtime testing is important to know the effect of regular insulin given before dinner. This value is also important in PLT1Ds who develop nocturnal hypoglycemia.
- If bedtime BG levels are high, night dose of fast acting insulin is increased by 10-15%. Similarly, reduction in insulin dose can be made if the corresponding BG levels are below the target range.
- If bedtime BG values are low (< 80 mg/dL), extra snacking should be done to prevent hypoglycemia at night and ideally late-night testing should be done again.

Table 9: Recommended insulin dose adjustment based on different SMBG readings

Scenario	SMBG Pattern								Insulin Dose Adjustment	Next Follow-up Visit
	Breakfast		Lunch		Dinner		Bed time	2–3 AM		
	Pre	Post	Pre	Post	Pre	Post				
All BGLs are within target range	↔	↔	↔	↔	↔	↔	↔	↔	No adjustment required, continue with the same insulin dose	After 1 month
Repeated pattern of hyperglycemia without ketosis	↑	↑	↑	↑	↑	↑	↑	↑	Increase TDD by 0.1 IU/kg/day. Recalculate the dose requirements and divide into long-acting and short-acting insulin	After 2 weeks; titrate doses until blood glucose levels are in range for at least 1 week
High pre-breakfast BGL with high 2–3 AM BGL	↑	↔	↔	↔	↔	↔	↔	↑	Increase basal dose by 10%	
High pre-breakfast BGL with low 2–3 AM BG	↑	↔	↔	↔	↔	↔	↔	↓	Decrease basal dose by 10% OR add a bed-time snack of low GI such as ½ a glass milk	
High pre-lunch BGL	↔	↔	↑	↔	↔	↔	↔	↔	Increase morning bolus dose by 10%	
High pre-dinner BGL	↔	↔	↔	↔	↑	↔	↔	↔	Increase afternoon bolus dose by 10%	
High post-meal BGL (includes post breakfast, lunch and dinner BGLs)	↔	↑	↔	↔	↔	↑	↔	↔	Increase respective pre-meal bolus dose by 10% (e.g., if high post-dinner BGLs, increase pre-dinner bolus by 10%)	
Low bedtime BGL (<80 mg/dL)	↔	↔	↔	↔	↔	↔	↓	↔	Add a bedtime snack to prevent hypoglycemia at night; late night testing should be done	

Maintaining logbooks

Insulin doses cannot be adjusted based on a single blood glucose test reading, which necessitates the need for creating and maintaining an SMBG logbook to record BG levels. The pattern of BG levels is more important than individual values. The PLT1D should be given an SMBG logbook and taught how to enter SMBG values at the specified times, following the SMBG rotation pattern explained above.

Figure 21: SMBG logbook cover

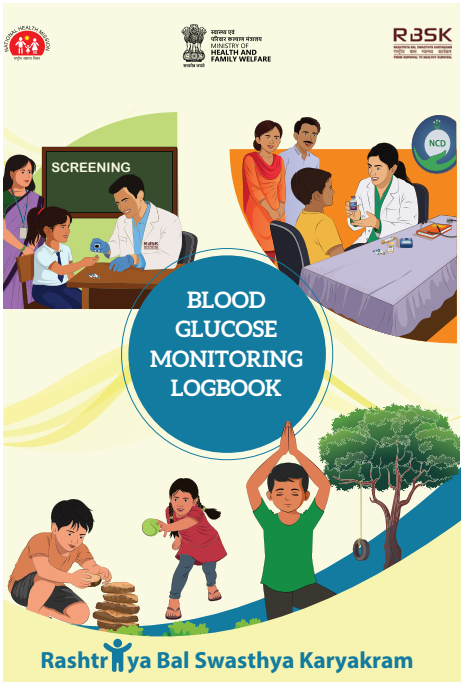


Figure 22: Format for SMBG logbook

Personal information

Name	
Date of Birth	
Gender	☐ Male ☐ Female ☐ Other
Address	
Guardian's Name	
Relation	☐ Mother ☐ Father ☐ Guardian
Contact Number	
ASHA ID / Aadhaar Number	
Date of Diagnosis	

Investigation log

S.No.	Date	Height	Weight	BMI	BP	Random Blood Sugar	HbA1c (should be done every 3 months)	Fundus Examination	Foot Examination
1									
2									
3									

Main logbook sheet

Month **Year**

Blood Glucose Monitoring and Insulin Logbook

S. No.	Date	Blood Glucose Level							
		Before breakfast	2 hours after breakfast	Before lunch	2 hours after lunch	Before dinner	2 hours after dinner	Before bedtime	Between 2 AM to 3 AM
1									
2									

Prescribed dose sheet

	Regular / Rapid-acting Insulin			Glargine / Detemir Insulin
	Before breakfast	Before lunch	Before dinner	Before going to bed
Dose (in units)				
Time				

Insulin Dose Given (in units)				Remarks
Before breakfast	Before lunch	Before dinner	Before bedtime	

Designed SMBG logbook

Interpretation of SMBG based on handwritten logbook records is dependent on PLT1D's record-keeping intensity and organization, and these records can vary dramatically in terms of helpfulness in making management decisions. It is imperative that PLT1D and/or their caregivers are given adequate education and counselling about when to monitor, how to monitor and record their SMBG results. The following should be documented while monitoring BG levels:

- BG reading
- Timing of the test
- Amount of insulin administered
- Time of the last meal, along with the amount and type of food / drink consumed
- Activity done by the PLT1D

Review of SMBG logbook

Below is a guide on how to conduct a manual review of SMBG logbooks maintained by the PLT1D:

- Review at least 1-2 weeks of SMBG results
- Review consistency and timing of SMBG
- Identify and circle worrisome hypoglycemic events
    a) Ask whether the PLT1D required assistance of another individual (i.e. serious events) or were manageable by themselves by carbohydrate treatment
    b) Also, check if the event can be explained through a missed meal, overtreatment of hyperglycemia or unexpected cause
- Assess the overall SMBG average and variability throughout the day. Compare this to the previous review and HbA1c values
- Assess time-specific BG averages
    a) Visually glance down the logbook columns to identify time specific averages along with the highest and lowest values to identify problem areas
    b) Review PLT1D's schedule, as shift workers and those with irregular schedules may not align with the logbook's timeframes
- If the BG levels are always outside the target limits, in the absence of exercise or abnormal diets to explain this variation, insulin dose should be changed
- SMBG logbook readings should be crosschecked with glucometer readings (PLT1D should be advised to carry both their logbook and glucometer for every monthly visit to the NCD clinic)
- Some tips about SMBG values are given below:
    a) If the SMBG values are consistently high, the PLT1D requires more insulin

b) If the values are consistently low, insulin doses should be reduced

c) If the readings are erratic (high sometimes and low sometimes) their insulin dose, method of storage and administration, food intake or their activity may be inconsistent and need a detailed evaluation or counselling

Using glucometer and test strips

Refer to Chapter 3 section B.

Using lancets or pricking device

Refer to Annexure 1.

Reducing pain with SMBG testing

Pain with SMBG may be reduced by:

- Rotating fingers
- Using side of fingers rather than the central fat pad
- Using lancet with depth gauge and adjusting it to a minimal setting which gives an adequate blood drop
- Using alternate sites for testing including palm of the hand, the forearm and the thigh

HbA1c testing (HPLC method)

The HbA1c test is used to measure the amount of glycosylated haemoglobin in the blood. The test is an index of a PLT1D's average BG level over the past 2-3 months and is the most widely accepted outcome measure for evaluating glycemic control in individuals with diabetes. Measuring HbA1c is not a replacement for SMBG as the latter provides more real time feedback of glycemic status and can identify hypoglycemia or hyperglycemia at any given time. In contrast to SMBG, HbA1c provides the average glucose level over the past 2-3 months.

Frequency of monitoring

Measurement of HbA1c (HPLC method) every 3 months prior to the clinic visit should be conducted to evaluate the adequacy of insulin therapy. Results should be discussed with the PLT1D and caregivers and documented in the medical records.

Target HbA1c values

HbA1c value needs to be interpreted in the context of SMBG readings and clinical findings. HbA1c along with SMBG helps to determine the requirement for insulin adjustment. The aim is to keep the HbA1c as close to normal as possible without high glycemic variability. Targets for HbA1c are to be given with careful attention to avoid severe hypoglycemia.

The general goal is to keep the HbA1c in all PLT1Ds < 7.5%. Physicians should be aware of the potential interferences like hemoglobinopathies, which may affect HbA1c values. HbA1c values that are inconsistent with the clinical presentation should be investigated further.

Chapter 7

Diet, Nutrition and Exercise

Learning objectives

1. Describe the key nutritional principles for children with T1DM, including macronutrient distribution and the relevance of carbohydrate counting and GI.
2. Explain how physical activity affects BG levels in PLT1D and describe appropriate precautions and carbohydrate adjustments around exercise.
3. Counsel children and caregivers on practical dietary and lifestyle modifications relevant to the Indian context.

This chapter aims to introduce key concepts on diet, nutrition and exercise to pediatricians and physicians. These are summary recommendations intended as general guidance. Clinicians should tailor diet and nutrition plans based on PLT1D's dietary habits, age, food availability, cultural practices, and glycemic control.

Diet and nutrition

Structured dietary guidance and lifestyle modification play an essential role in achieving better glycemic response. Understanding the effect of healthy and well-balanced diet with adequate inclusion of macro and micro nutrients and physical activity on glycemia is essential for optimal management of T1DM and reducing long-term morbidity

Aims of nutritional management

- Maintain glycemia in the normal to the near-normal range with minimal/no hypoglycemia
- Maintain optimal blood pressure, weight, and lipid levels
- Ensure adequate nutrition to facilitate healthy body weight as well as standard growth and development in children and adolescents
- Prevent the development or progression of diabetes-related microvascular and macrovascular complications
- Address individual nutrition needs, incorporating personal, social, and cultural preferences
- Improve overall health through appropriate food choices by emphasizing carbohydrate counting (CC), low GI foods, portion and serving size to achieve a satisfactory glycemic control

- Develop a nutrient-dense meal plan according to the individual food preferences, integrated with patient's insulin regimen

Nutritional recommendations for PLT1D

Nutrient distribution and diet plan for each PLT1D should be individualised, considering their socio-cultural environment, food habits, preferences, and work schedule to facilitate proper compliance. The energy requirement for PLT1D is similar to the general population.

The following macronutrient targets should guide meal planning for PLT1D, taking into account individual needs and preferences:

- Carbohydrate: 50-55% (e.g., rice, roti, dal, poha, idli, upma)
- Sucrose: < 10% (e.g., limit added sugar in chai, mithai, packaged juices, and sweetened beverages)
- Fat: 25-35%
    a) **Saturated fat + trans fatty acids:** < 10% (e.g., limit vanaspati, dalda, fried snacks like samosa, pakora, and commercially baked goods)
    b) **Trans fatty acid: < 1%** (e.g., avoid partially hydrogenated oils commonly found in packaged biscuits, namkeen, and street food)
    c) **Polyunsaturated fat:** < 10% (e.g., sunflower oil, soybean oil, flaxseeds, walnuts)
    d) **Monounsaturated fat:** 10-20% (e.g., groundnut oil, mustard oil, almonds, groundnuts, sesame seeds)
- Protein: 15-20% (e.g., dal, rajma, chana, paneer, eggs, fish, chicken, soya)

Carbohydrate management:

Carbohydrates are considered as the main source of energy for body functions; with each gram providing 4.1 kcal of energy. Severe carbohydrate restriction can result in hypoglycemia. A minimum of 130 g of carbs/d is recommended to include in the diet as an energy source for brain. Emphasis should be put upon complex carbohydrate such as whole grains, pulses, vegetables, milk and milk products etc and dietary fibre. So, amount and kind of carbohydrate the PLT1D are consuming should be taken into consideration.

Protein management:

Protein is a macronutrient that serves as an essential structural and functional component of body maintaining muscle, bone, immune system, tissue repair, hormone production etc. Protein requirements may vary from person to person based on their physical activity level and physiological conditions. On average an individual needs 0.8-1.0 g of protein/kg BW/d. Adequate high quality protein intake is crucial for the young individual with T1DM for proper growth and development. Protein does not elevate the BG level as do carbs and contribute a smaller number of calories than fat i.e., 4.1 kcal. Some common rich sources of protein include- lean meat, fish, cheese, curd, egg, soyabean, legumes, nuts etc.

Fat management:

Fat is concentrated, energy dense macronutrient and rich source of fatty acids and fat-soluble vitamin. It provides maximum amount of energy with about 9 kcal. Though the type and quantity of fat inclusion in the diet significantly impacts the cardiovascular health of the PLT1Das diabetes and CVD are closely associated with each other. Fat slows down the absorption of carbohydrates, reducing the immediate BG spike after a meal. However, it can cause a delayed rise in BG several hours later. Fat content in the diet should be around 25-30% of total calories. Healthier fat choice is utmost important as excessive fat intake contributes to obesity. There are different kinds of fats present such as Saturated fat (SFs), Monounsaturated fat (MUFA) and Polyunsaturated fat (PUFA). It should be in ratio of 1:1.5:1 in the diet.

Fiber management:

Fiber is indigestible nutrient and does not provide any calories. High fiber diet is found to be beneficial for digestive health, weight loss and prevention of constipation. Soluble fiber has greatest hypoglycemic effect. About 20-30 gm of soluble fiber is recommended for individual with T1DM. Usually, the fiber intake recommended in children is 14 g/1000 kcals or, it can be calculated with a substitute formula, in children who are >2 years old, it is calculated as age in years of individual + 5 = grams of fiber/day), up to 25–30 g/day, which is mainly suggested for adults. It increases satiety by delaying gastric emptying and slow down glucose absorption. People are encouraged to eat whole grains, fruits (with low GI), vegetables, legumes.

Net Carbohydrate = Total Carbohydrate – Dietary Fiber

A detailed dietary history should be taken at the time of enrolment to assess current eating patterns and guide the development of an appropriate diet plan. Key areas to assess include:

- Pre-existing family dietary habits, traditions, and beliefs
- The PLT1D's usual food intake including energy, carbohydrate amount and distribution, fat intake, quality of food choices and mealtimes or patterns of food intake
- The PLT1D's daily activities including the impact of nursery/school/ work, physical activity, and exercise schedules
- Advice should be given at diagnosis based on the assessment and an individualized plan provided by the diabetes team

Importance of carbohydrate counting

Carbohydrates are the primary macronutrient that has an effect on the postprandial glycemic response. The amount of carbohydrate and premeal bolus insulin is one of the most crucial factors influencing postprandial glycemic control; it forms the basis of diabetes education program.

Meal-time routines and dietary quality are important for optimal glycemic outcomes. Matching insulin dose to carbohydrate intake allows greater flexibility in carbohydrate intake and mealtimes and supports improvement in glycemic control and quality of life.

Carbohydrate counting in home and nutrition facts label

Tracking the amount of carbs consumed by people with T1DM at home is essential to manage their daily meals and stable BG levels. Since the home-cooked foods are healthier and nutritious, also the usage of additives and preservatives are comparatively less so it would be easier to know the common ingredients used in the cooking. For the above purpose to be fulfilled, the weighment of ingredients and estimation of carbohydrate are important to match food intake with required insulin dose. People are advised to keep a diary to track the carbohydrate intake in each meal. In addition, with this, nutrition facts label on packaged food items are very helpful for CC. The nutritional information acquired from the facts label should be clearly interpreted and for that some practice and education are required.

Portion size: At home, CC can be done by measuring the food items with the help of some household tools such as – measuring cups, spoons like teaspoon, tablespoon, weighing scale and machine, different bowls and plates etc.

Table 10: Reference portion sizes for common Indian foods

Food	Portion size
Milk	1 cup
Dal	½ bowl
Bread	1 slice
Apple	1 small
Chapati	1 number
Sprouts	1/2 bowl
Poha	1 bowl
Khichdi	1 bowl
Sandesh	1 number

Serving size: the serving size refers to the quantity a person usually eats i.e., number of calories, protein and other nutrients. The number of servings on the label of the package should be compared against how much a person actually eats. If the serving size specified in the package is one cup but the amount eaten is two cups, then all the nutrients being consumed are doubled.

Ingredient list: each packaged food items have a specific and clear ingredients list which has been written in descending order by weight. However, nowadays a common note on the packet is 'sugar-free' that does not mean it is 'calorie-free' or 'fat free', these products should have < 0.5% of sugar per servings. Food labelled as 'diabetic-food' are mostly expensive with high amount fat and extra calories'; may also be mixed with sweeteners like sugar alcohol.

Insulin-to-Carb Ratio (ICR), Insulin Sensitivity Factor (ISF), and Glycemic Index (GI)

Total Daily Dose (TDD)

- TDD refers to the units of insulin taken by a PLT1D per day

- TDD requirements can vary between 0.7 to 1.0 IU/kg/day in prepubertal children and 1.0 to 1.5 IU/kg/day in pubertal children and adults
- **TDD=Weight of the PLT1D x TDD requirement**

Insulin to Carbohydrate Ratio (ICR)

- ICR refers to the grams of carbohydrates that can be disposed with 1 unit of insulin
- **ICR =** $\frac{\textbf{500}}{\textbf{TDD}}$

Note: 450 or 300 may also be used for very young children who need less than 10 units of insulin a day

- ICR is individualised and depends on one's sensitivity to insulin, which is how many grams of carbohydrates 1 unit of insulin covers
- ICR allows PLT1D to obtain their insulin needs at mealtimes based on the carbohydrates that will be consumed at that time, their BG level, and their anticipated physical activity

Insulin Sensitivity Factor (ISF)/correction factor

- ISF is the extent to which BG is expected to drop with 1 unit of insulin
- The formula for ISF varies by the type of insulin taken by the PLT1D:
  a) In case of regular insulin, ISF = $\frac{1500}{TDD}$
  b) In case of rapid-acting insulin, ISF = $\frac{1800}{TDD}$
- Insulin sensitivity can vary during the day with stress and physical activity

Both ICR and ISF must be fine-tuned based on SMBG results. The use of these ratios to calculate the pre-meal bolus dose of insulin can improve HbA1c significantly.

Glycemic Load (GL)

Glycemic load refers to as the quality and quantity of carbs in a food. It is useful for the dietary management of people with T1DM. Foods with lower GL have little effect on BG levels and it is recommended to be included in the meal planning. So, it is expected that the foods with higher GL raise the serum glucose per servings. The formula for the estimation of GL is – **GL= GI***

Carbohydrate content (in gm)/100.

Table 11: Glycemic load category classification

Category	Glycemic Load (GL)
Low GL	10 or less
Medium GL	11-19
High GL	20 or more

Glycemic Index (GI)

Not all carbohydrates work the same in the body. GI is a measure of how quickly a food can make blood glucose rise.

It is a number from 0 to 100 assigned to a food, which represents the relative rise in the BG level two hours after consuming that food. Low GI foods can help gain tighter control over BG.

Table 12: Classification of common foods by GI

High GI (>70)	Medium GI (56-69)	Low GI (<55)
• Chips, packaged snacks, and fast food like pizza • Jaggery, Bakery made food with refinedflour like white bread • White polished rice, puffed rice, rice porridge • Watermelon, pumpkin, amaranth, potato	• Brown rice, poha, upma beetroot, Sweet potato sabudana, ice cream, honey, Pineapple, papaya, banana	• Beans and lentils like chickpea, soyabean , basmati rice • Most fruits like apple, orange, berries etc. • Dairy products like custard (plain), buttermilk • Vegetables like cauliflower, bitter gourd (karela), cucumber

Figure 23: Blood glucose level change with respect to high, medium and low GI foods

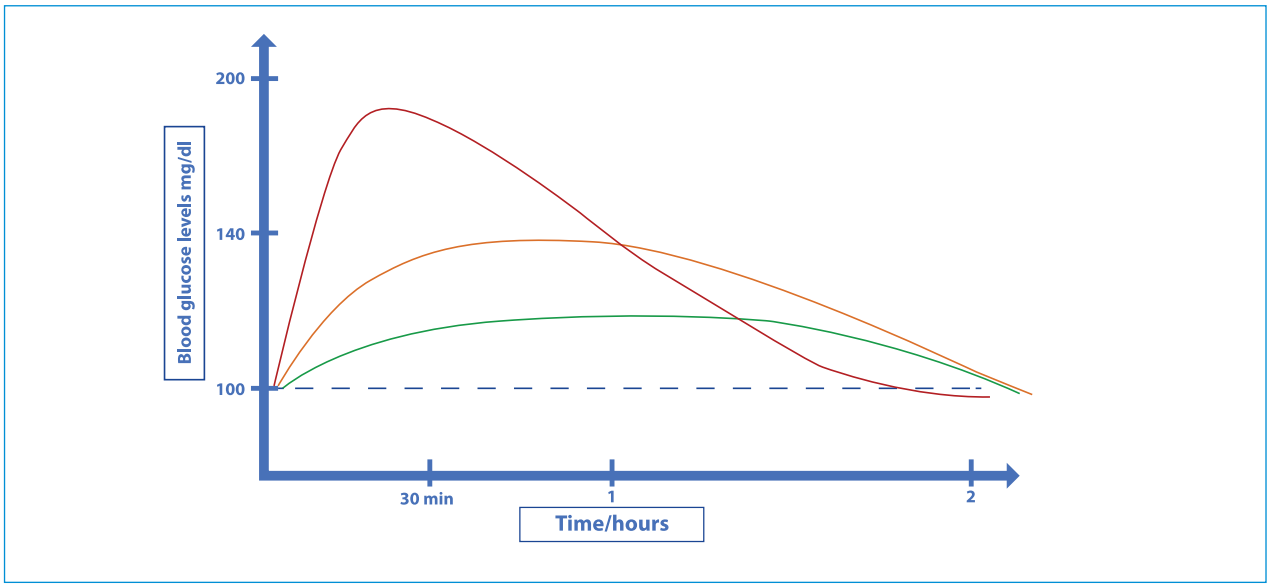
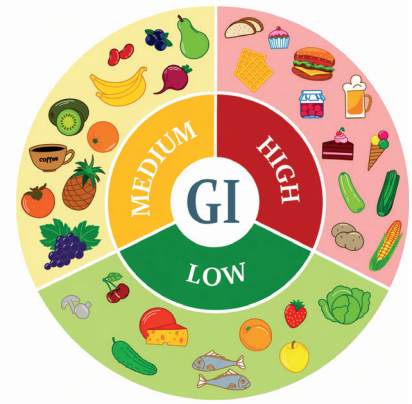


Figure 24: Examples of high, medium and low GI foods



Carbohydrate exchange

Carbohydrate exchange is a structured method for quantifying dietary carbohydrate intake, used in the management of T1DM to support insulin dose adjustment. One carbohydrate exchange is defined as a portion of food that provides approximately **15 grams of carbohydrate**, regardless of the food's weight or volume. For example, a single slice of bread may weigh ~40 g but may contain only 15 g of carbohydrate and therefore represents **one exchange**.

This method enables clinicians and PLT1D to convert diverse food items into standardised "units" of carbohydrate, thereby simplifying meal planning and improving the accuracy of insulin dosing. By estimating the carbohydrate exchanges in a meal, the bolus insulin dose can be titrated using the PLT1D's ICR.

The following list provides examples of serving sizes of foods that are equal to one exchange (~15 g of carbs). These are intended as a general guide, as the carbohydrate content of foods may vary by brand, preparation, or portion size.

Table 13: 15 gram carbohydrate exchange reference chart

15 gram carbohydrate chart	
Food category	**Quantity**
Milk group	1 cup of milk 1/4 cup of milk powder 1 cup of buttermilk 2/3 cup of plain yogurt
Starch group (measured after cooking)	1 slice of bread (weighing 1 ounce) 1 roti 1/2 cup rice 1/2 cup beans 1/2 cup starchy vegetable (potato, peas, sweet potato, yam) 1/2 cup poha 1 small homemade dosa

Fruit group	1 small apple, orange, or pear (1/2 if large fruit) 1 small banana 3/4 cup fresh pineapple 17 grapes 1 and 1/4 cups strawberries, or watermelon 2 tablespoons raisins 1/2 cup orange juice, apple juice, or grapefruit juice

Other food components

Table 14: Dietary recommendations for other food components for PLT1D

Proteins	Protein intake decreases during childhood from approximately 2 g/kg/day in early infancy to 1g/kg/day for a 10-year-old and to 0.8 – 0.9 g/kg/day in later adolescence
Vitamins, minerals, and antioxidants	Meal planning should optimize food choices to meet recommended dietary allowance/dietary reference intake for all micronutrients
Sodium	People with diabetes should limit their sodium intake to avoid vascular dysfunction. Guidelines for sodium intake in children: 1 to 3 years: 2.5 g salt/day 4 to 8 years: 3 g salt/day 9 years and older: 3.8 g salt/day
Non-nutritive sweeteners	Acceptable daily intake Sucralose (0-15 mg/kg/ day) Saccharin (0-5 mg/kg/ day) Aspartame (0-40 mg/kg/ day)

Exercise and physical activity with T1D

Regular physical activity is one of the cornerstones of diabetes management. PLT1D can play sports and exercise at the same level as other people. Staying active helps insulin work better and can keep BG levels in a healthy range. Exercise also promotes cardiovascular health, strengthens bones, and muscles, and relieves stress.

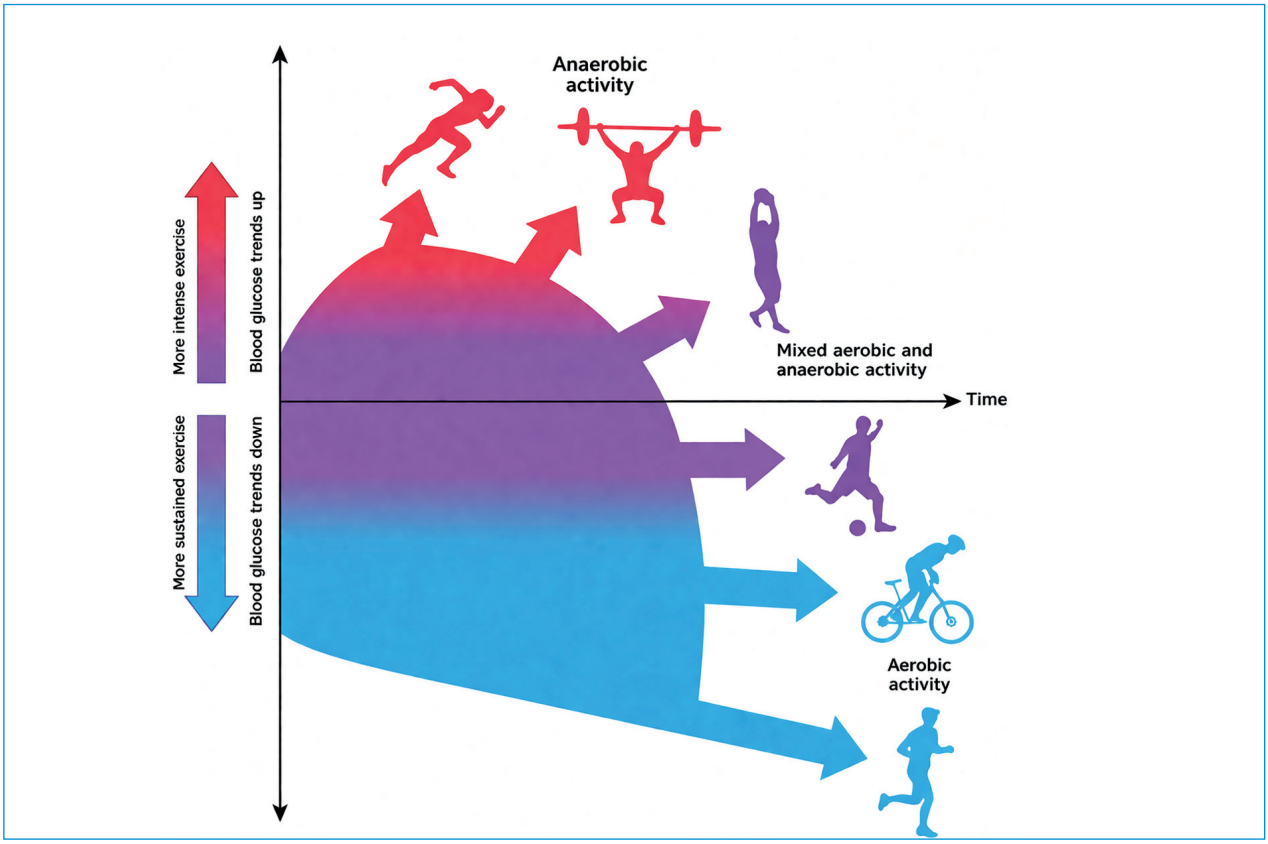
> **PLT1D should do at least 60 minutes per day of moderate to vigorous-intensity, primarily aerobic activity at least 3 days per week including brisk walking, dancing, running or skipping.**

Table 15: Effect of exercise on BG levels

Factor	Effect on glycemia
Duration of exercise	Nearly all forms of activity lasting >30 min require some adjustment to food or a reduction in insulin
Intensity of exercise	Increase in the intensity of exercise increases the risk of hypoglycemia requiring more significant insulin decrements.
Type of exercise	Anaerobic efforts increase the BG level due to the release of epinephrine and glucagon. On the other hand, aerobic activities can lower BG levels during (usually within 20–60 min after the onset) and after the exercise. Combining intermittent bouts of anaerobic exercise with aerobic forms may prevent hypoglycemia during long-duration aerobic activities. Weightbearing activities may cause hyperglycemia due to the release of growth hormones, and the performance of these activities before aerobic activities may prevent hypoglycemia
Timing of exercise	Morning activity, done before insulin administration, is less likely to result in hypoglycemia as circulating insulin levels are typically low, and glucose counter-regulatory hormones may be high
Conditioning	Hypoglycemia is less with regular conditioning. It may be due to the reduction of insulin in anticipation or the better utilization of lipids as fuel
Muscle mass/ number of muscles used in the activity	Exercises that involve a higher number of muscles during aerobic exercise led to a higher drop in BG. More significant energy consumption occurs during weight-bearing activities than non-weight-bearing activities
Type and timing of insulin	Rapid-acting insulins typically cause hypoglycemia 60-90 min after administration, whereas regular insulin does so at 2-3 hours

Factor	Effect on glycemia
Choice of injection site	Injection of insulin in the exercising muscle leads to the rapid absorption of insulin, with risk of hypoglycemia
Ambient temperature	Insulin absorption is increased by high temperature and decreased by low temperature.
Target BG level	126-180 mg/dL (prior to exercise)

Figure 25: Impact of exercise type on BG level



Source: *National Diabetes Services Scheme (NDSS), "Physical activity", NDSS Youth Zone. Available at: https://youth.ndss.com.au/physical-activity/ (accessed 16 April 2026).*

Nutritional management of exercise and physical activity

PLT1D should receive some carbohydrate snacks before physical activity. If pre-exercise insulin doses are appropriately reduced, a carbohydrate intake of 0.3-0.5 g/kg/h of moderate physical activity may be sufficient. A relatively lower BG level at the initiation of physical activity and not adjusting the insulin doses before physical activity increases the hypoglycemia risk despite being in the fed state. The occurrence of hypoglycemia on the previous day blunts the autonomic and counter-regulatory response to hypoglycemia. Hence, in all these situations, 2-3 times more carbohydrates (1.0-1.5 g/kg/h) need to be supplied to prevent hypoglycemia.

Suggestions for carbohydrate intake during physical activity:

Table 16: Carbohydrate intake recommendations based on pre-exercise blood glucose level

< 90 mg/dL	Ingest 0.3-0.5 g/kg/h of quick-acting carbohydrate and increase BG level to ≥ 90 mg/dl before initiating exercise. For prolonged activities, consume additional carbohydrate (0.5–1.0 g/kg/h of exercise) based on BG testing results
90–150 mg/dL	Consume carbohydrates (0.8–1.0 g/kg/h) starting from the onset of exercise
150–250 mg/dL	Start an exercise and avoid consumption of carbohydrates until BG levels are < 150 mg/dL
> 250 mg/dL	Check for ketones and avoid exercise if ketones are moderate-to large. If BG 250-350 mg/dL and ketones are negative, initiate mild-to moderate intensity exercise but delay intense exercise until BG level is < 250 mg/dL. If ketones are negative but BG > 350 mg/dL consider insulin correction by ~ 50% depending on the active insulin

For activities lasting more than 30-60 minutes, slow-releasing carbohydrates, whereas for activities lasting less than 30-60 minutes, moderately fast releasing carbohydrates is advisable-foods containing fat or protein with carbohydrates (e.g., chocolates, milk, curd, etc.) for the former situation and predominant carbohydrate foods (e.g., fruits, a cereal) for the latter. It is essential to maintain adequate hydration before, during, and after exercise to achieve optimal exercise performance.

Insulin adjustments with exercise

- For pre-planned physical activity pre-meal insulin can be reduced by 30-50% or the exercise can be delayed during peak levels of insulin action.
- With prolonged exercise, basal dose can be reduced by 20-50% to prevent late onset hypoglycemia.

Management in special situation

Sick day management: PLT1D suffer more in some vulnerable acute illnesses like metabolic instability for e.g., high-grade fever, gastrointestinal disturbances etc. Any kind of illness requires special care as both physical and emotional distress increase the stress level in the body characterized by increase secretion of counter-regulatory hormones such as - glucagon, catecholamines and epinephrine. As the insulin secretion is compromised, there is elevated BG level and this may lead to significant risk of DKA. The effects of illness in individual with T1DM include - viral illness with febrile condition which may range from 104-105° F causing sharp elevation in BG level and progressing to ketosis. Risk of dehydration is notable in different ways like- polyuria, vomiting, high sweating and perspiration due to fever, diarrhea. Additionally,

development of a sour throat may make it difficult for children to swallow solid and liquid foods, which may pose a challenge in maintaining a balanced nutritional status. Several gastrointestinal symptoms like nausea, vomiting, diarrhea hinder the normal food intake and glucose absorption and can lead to hypoglycemia. Children with T1DM are already in a catabolic state and are more prone to develop infections or severe acute emergencies like DKA and hypoglycemia.

Sick-day nutritional management is an integral component of achieving glycemic control, preventing dehydration and associated complications. While in most cases, sick day management can be handled at home, help of a medical expert / nutritionist at a healthcare facility should be sought when necessary (refer to chapter-8 for more details). The key principles of sick day management for children with T1DM are: Adequate basal insulin should be continued during illness, in accordance with blood glucose and ketone levels; Blood glucose and urine/blood ketones should be monitored closely every 2 to 6 hours; Ample oral fluids should be provided to prevent dehydration - suitable options include plain water, salty buttermilk, and vegetable soup with moong dal pressure-cooked with a little oil, cumin powder, and salt; If blood glucose levels are low, liquids containing sugar should be given; If oral intake is restricted or vomiting persists, fluids should be offered in small sips; Carbohydrate intake should be maintained, as low carbohydrate foods increase the risk of DKA during illness; When there is loss of appetite, easily-digested, low-fat foods such as bananas and khichdi should be offered; Fever may be managed with antipyretics, and strenuous physical activity should be avoided. In summary, individualised dietary adjustments, a nutrient-rich diet, adequate hydration, and appropriate insulin therapy form the foundation of effective sick day management in T1DM.

Diabetic Ketoacidosis (DKA): DKA is one of the major, common complications of T1DM in children requiring immediate medical care. It is characterized by high levels of ketone bodies in the blood and urine; called ketonemia and ketonuria respectively, hyperglycemia with ~200 mg/dl of BG, metabolic acidosis (pH <7.3): resulting in vomiting, abdominal pain, fruity smelling breath and dehydration. Fluid replacement is more urgent than insulin therapy as rate of mortality is higher for this reason. Correction of hypokalemia and cerebral oedema are suggested. Gradual reduction of hyperglycemia and ketogenesis are crucial with insulin therapy. Dehydration should be gradually restored over 48 hours. Safe shift of oral nutrition is recommended when metabolic acidosis is resolved and the PLT1D's condition is clinically stable. Initially, small, frequent meals are preferred with moderate carbohydrates (45-50%), adequate protein and low amount of fat.

Hypoglycemia: Hypoglycemia or low BG level may precipitate from several causes such as-imbalance in insulin dose, physical activity, improper food intake like delayed or missed meals leading to blood sugar level below 70 mg/dL. Management of hypoglycemia also involves reducing the recurrent episodes of hypoglycemia. A glass of milk is a typical choice. If there is a probability of fall in sugar level around 2-3 am; called nocturnal hypoglycemia with rise in BG level in the morning, inclusion of a snack of nuts and seeds is recommended for management. Another effective concept is the "15-15" rule i.e., it is recommended to consume 15 g of fast acting carbohydrates like any sugary drinks, then wait for 15 minutes and reassess the BG after 15 minutes. It can be continued, if necessary, until the BG level reaches the value more than 100 mg/dL.

Strengthening nutritional care at secondary health care (DH level)

Secondary care facilities, specially district hospital is a vital interlink between primary healthcare centres and tertiary level. Health care professionals like, dietiticians, and the whole team provide structured diabetes education for self-management in long run. They also conduct minute clinical and nutritional assessment by 24-hour recall method for dietary history, anthropometric measurements like height, weight, BMI and highlight the main nutritional deficiencies. By this detailed assessment an individualized nutrition planning is made keeping in mind the availability, affordability, accessibility, eating pattern and personal choices. Proper nutrition education is provided to the caregivers about the medical nutrition therapy, management of hypoglycemic episodes, importance of regular meal pattern, ensured by regular SMBG and match the carbohydrate intake with insulin dose. Different outreach programs and community awareness camps are organised for bridging the gap between existing knowledge and modified dietary intervention.

- **Family and peer support:** PLT1D may suffer from emotional stress, anxiety or imbalance of mental peace. So, it is suggested to provide emotional security and support. The functional guidance is to broaden up the path of T1DM management thorough long-term self-care. They should not treat the complications like a distress or curse and build motivation to enhance the self-confidence and involve each family members and caregivers about diabetes care is essential. A supportive and empathetic home environment augments the treatment process so that they never feel isolated. The caregivers should encourage them to take adequate nutritional care, medication and routine follow up.

Chapter 8

Management of Acute Emergencies

Learning objectives

1. Recognise the clinical signs and biochemical criteria for Diabetic Ketoacidosis (DKA), hypoglycemia, and hyperglycemia in children.
2. Describe the immediate steps to be taken at the point of first contact for each acute emergency, including when to refer urgently to the DH.
3. Explain sick day management principles and counsel PLT1D and caregivers on when to seek emergency care.

Note: DKA and sick day management are relevant for T1DM. Hypoglycemia can occur in both T1DM and T2DM - in the latter, it is relevant when the person is on insulin therapy.'

Diabetic Ketoacidosis (DKA)

Diabetic ketoacidosis (DKA) is an acute, major, life-threatening complication of diabetes characterized by hyperglycemia, ketoacidosis, and ketonuria. It occurs when absolute or relative insulin deficiency inhibits the ability of glucose to enter cells for utilization as a metabolic fuel, the result being that the liver rapidly breaks down fat into ketones to employ as a fuel source. The overproduction of ketones follows, causing them to accumulate in the blood and turn the blood acidic.

In most cases, DKA is caused by new onset of diabetes, omission of insulin injections, or inadequate management of an infection. Severe insulin deficiency occurs in previously undiagnosed T1DM and when PLT1D deliberately or inadvertently do not inject insulin, especially the long-acting component of a basal-bolus regimen, or markedly reduce the doses of insulin, for example, during an intercurrent illness such as gastroenteritis.

Clinical presentation and diagnosis

A history of the classical triad of hyperglycemia (polyuria, polydipsia and polyphagia), nocturia, generalized weakness, weight loss despite a good appetite, recurrent infections (UTI, vaginal candidiasis), and a history of ants collecting around the child's urine may be present in the days or months before the acute episode.

As ketoacidosis sets in, nausea and vomiting, abdominal pain, acidotic breathing with a peculiar fruity odor and signs of dehydration appear. The PLT1D is often drowsy at the time of presentation,

though coma is rare. Infants tend to present with decreased energy and activity, irritability, weight loss, and physical signs of dehydration. Severe diaper dermatitis due to candidal infection is common in infants presenting with DKA.

Table 17: Differential diagnosis: pointers to the diagnosis of DKA

Pointer	Differential diagnosis	Pointer to DKA
Encephalopathy	CNS infection, malaria, poisoning	Acidotic breathing
Acute abdominal pain	Pancreatitis, appendicitis	No tenderness
Dehydration	Gastroenteritis	High, normal or low urine output
Tachypnea (rapid breathing)	Bronchial asthma, pneumonia	No chest signs
Hyperglycemia and acidosis	Septicemia, renal failure	Ketosis
Ketoacidosis	Starvation, organic academia	Hyperglycemia

Diagnosis

The diagnosis of DKA is based on the triad of hyperglycemia, ketosis and metabolic acidosis. All three biochemical criteria are required to diagnose DKA:

- **Hyperglycemia – Blood glucose > 200 mg/dL, and**
- **Metabolic acidosis – Venous pH < 7.3 or serum bicarbonate < 18 mmol/L, and**
- **Ketosis – Blood ketone ≥ 3mmol/L or urine ketone > 2+**

The severity of DKA can be classified as mild, moderate and severe based on the following parameters:

Table 18: Severity classification of DKA: mild, moderate and severe

Features	Mild	Moderate	Severe
Dehydration	<5%	5 to 10%	>10%
pH	7.25 to 7.3	7.0 to 7.25	<7.0
Bicarbonate	15-18 mmol/L	10-15 mmol/L	<10 mmol/L
Ketones	3-6 mmol/L	3-6 mmol/L	>6 mmol/L
Consciousness	Alert	Alert, drowsy	Comatose
Base excess	-5 to -10 mmol/L	-10 to -15 mmol/L	<-15 mmol/L

Setting for management

DKA is a life-threatening condition and should be managed in an in-patient setting equipped with facilities for IV infusion and measurement of blood gas and electrolytes. The PLT1D should be managed by a pediatrician/pediatric endocrinologist (in case of children) or endocrinologist /MD Medicine (in case of adults). Children below the age of 5 years presenting with severe DKA must be managed in an ICU setting.

Initial assessment and monitoring

1. **Conduct a clinical assessment of the PLT1D, including clinical history and examination:**
    a. Severity of dehydration: The usual level of dehydration is 5 to 10% and is often overestimated in DKA. Key indicators of dehydration status include sunken eyes, absence of tears and reduced skin turgor (5% dehydration). Prolonged capillary refill time (greater than 3 seconds), cold periphery and hypotension suggest a greater level of dehydration. Clinical assessment of dehydration may be difficult and levels of blood urea hematocrit and serum albumin may be used as surrogate markers of dehydration.
    b. Level of consciousness using the Glasgow Coma Scale (refer to table 19 below)
    c. Evidence of infection
2. **Weigh the PLT1D:** The current weight of the PLT1D should be taken and not a measurement from the previous clinic visit
3. **Measure blood glucose levels** (both using a glucometer and laboratory investigation if possible)
4. **Measure ketone levels with urine dipstick** (conduct a blood ketone measurement if possible)
5. **Conduct the following laboratory investigations:**
    a. Blood glucose
    b. Serum electrolytes
    c. HbA1c
    d. Blood urea nitrogen
    e. Serum creatinine
    f. Venous blood gas analysis (for pH, bicarbonate, anion gap)
    g. Hematocrit

Note: Several biochemical parameters may have fallacious readings in the setting of DKA. Plasma glucose may not be elevated in PLT1D with repeated episodes of vomiting, reduced carbohydrate intake or those who have already received some treatment before presentation. Serum sodium can be falsely low due to dilutional hyponatremia resulting from hyperglycemia-induced fluid shift from cells. An elevation of serum amylase and rarely, serum lipase may be present, unrelated to acute pancreatitis. Leucocytosis is common in DKA and does not always indicate infection.

Table 19: Glasgow Coma Scale (GCS) for consciousness assessment in DKA

Best eye response	Best verbal response	Best verbal response (non-verbal children)	Best motor response
1. No eye opening 2. Eyes open to pain 3. Eyes open to verbal command 4. Eyes open spontaneously	1. No verbal response 2. No words, only incomprehensible sounds; moaning 3. Words, but incoherent 4. Confused, disoriented conversation 5. Oriented, normal conversation	1. No response 2. Inconsolable, irritable, restless, cries 3. Inconsistently consolable and moans; makes vocal sounds 4. Consolable when crying and interacts inappropriately 5. Smiles, oriented to sound, follows objects and interacts	1. No motor response 2. Extension to pain (decerebrate posture) 3. Flexion to pain (decorticate posture) 4. Withdrawal from pain 5. Localizes pain 6. Obeys commands

Note: The GCS consists of three parameters and is scored between 3 and 15; 3 being the worst and 15 the best. One of the components of the GCS is the best verbal response, which cannot be assessed in non-verbal young children. A modification of the GCS was created for children too young to talk.

Correction of shock

- Ensure appropriate life support (Airway, Breathing, Circulation)
- Give oxygen to PLT1D with severe circulatory impairment or shock
- Provide respiratory support, if required
- Insert a nasogastric tube and conduct nasogastric aspiration in the presence of altered sensorium. Nasogastric drainage is desired in PLT1D with recent intake of sugar-containing liquids to avoid sudden increases in BG levels after improved gastric emptying with treatment of DKA.
- In the rare cases of shock or severe circulatory collapse, rapidly restore circulatory volume with normal saline (0.9% saline, half-strength Darrow's Solution with Dextrose or ORS) in a 20 ml/kg bolus over 60 minutes until perfusion improves.

Note: Shock must be adequately treated before proceeding. There should be good peripheral perfusion and adequate blood pressure.

Fluid replacement

- **First Hour:** If there is no shock but dehydration is ≥ 5%, give an IV bolus of 10 ml/kg normal saline (0.9%) over 1 hour
- **Next 48 hours:** The goal should be to provide maintenance fluid and deficit evenly over 48 hours. In most cases, the fluid deficit is 5 to 10%.
  - Rehydrate the child with normal saline (0.9%). Aim to provide maintenance fluid and to replace any deficit (up to 10%) over 48 hours.
  - Do not add the urine output to the replacement volume and assess hydration regularly
  - Rapid and excessive intake of fluids should be avoided as it is a risk factor for development of cerebral edema
  - Addition of dextrose:
    - When the blood glucose falls below 200-250 mg/dL, dextrose normal saline can be added. The addition of 5% dextrose to normal saline may be considered earlier (i.e., after the initial two hours of treatment), if blood glucose drops at a rate exceeding 90-100 mg/dL/hour.
    - At blood glucose below 150 mg/dL, 10% dextrose can be added
  - The below table serves as a guideline for fluid infusion rate (ml/hour) in DKA:

Table 20: Guide for intravenous fluid infusion rate (ml/hour) by weight and dehydration severity in DKA

Weight	Mild/ no dehydration	Moderate dehydration	Severe dehydration
5 kg	24	27	31
7 kg	33	38	43
8 kg	38	43	50
10 kg	48	54	62
12 kg	53	60	70
14 kg	58	67	79
16 kg	64	74	87
18 kg	70	80	95
20 kg	75	87	104
22 kg	78	91	110
24 kg	80	95	115

Weight	Mild/ no dehydration	Moderate dehydration	Severe dehydration
26 kg	83	100	121
28 kg	86	104	127
30 kg	89	108	133
32 kg	92	112	139
34 kg	95	116	145
36 kg	98	120	151
38 kg	101	125	156
40 kg	104	129	162
42 kg	107	133	168
44 kg	110	137	174
46 kg	113	141	180
48 kg	116	146	186
50 kg	119	150	191
52 kg	122	154	197
54 kg	124	158	203
56 kg	127	162	208
58 kg	130	167	214
60 kg	133	171	220
62 kg	136	175	226
64 kg	139	179	232
66 kg	142	183	238
68 kg	145	187	244
70 kg	148	191	250

Insulin administration

Although fluid replacement by itself lowers blood glucose, insulin therapy is required to lower it further, and suppress lipolysis and ketogenesis. Intravenous insulin bolus at start of the therapy is not recommended.

- **Timing**
  - Insulin treatment can be started once shock has been corrected and fluid replacement has commenced. Start insulin infusion 1 hour after IV fluid therapy.
  - **Do not start/hold insulin if serum potassium < 3.5 mmol/L, restart after correction**
- **Preparation**
  - Insulin infusion should be given via a dedicated intravenous line
  - The IV tubing should be flushed with insulin since insulin binds to the plastic tube
  - Regular insulin should be given using an infusion pump. To prepare the insulin drip, 50 units of regular insulin should be dissolved in 50 ml of normal saline.
- **Initial rate of infusion**

  Regular insulin should be initiated intravenously by continuous infusion, at least 1 hour after starting intravenous fluids at the below rate:
  - Moderate to severe DKA: 0.1 unit/kg/hour
  - Mild DKA, severe hypokalemia: 0.05 unit/kg/hour (0.03 unit/kg/hour for <5 years with mild DKA)
- **Subsequent modifications**
  - When CBG < 250 mg/dL, initial insulin infusion rate should be continued till resolution of DKA (BG 7.3, bicarbonate> 18 mmol/L and normalization of AG). After resolution of acidosis, the insulin infusion rate should be reduced in a quantum of 0.05 unit/kg/hour
  - The dose should be increased if the fall in glucose level is less than 50 mg/dL/hour, in a quantum of 0.02 unit/kg/hour. Wait for at least 30 minutes before modifying the dose again.

Potassium replacement

Potassium replacement is required regardless of the serum potassium concentration, except if renal failure is present.

- Measure blood potassium level as part of the initial assessment. If this measurement cannot be done immediately, hypo- and hyperkalemia may be observed on an ECG.
  - Flattening of the T wave, prolongation of the QT interval and the appearance of U waves indicate hypokalemia
  - Tall, peaked, symmetrical T waves and shortening of the QT interval are signs of hyperkalemia
- In most situations, potassium replacement should be started after initial fluid resuscitation and concurrent with insulin therapy at a concentration of 40 mmol/L unless:
  - Serum potassium is > 5 mmol/L
  - PLT1D is anuric
  - ECG changes of hyperkalemia are present

- In the rare scenario of hypokalemia at presentation, potassium replacement should be started in the hydration phase (20 mmol/L)
- Insulin infusion should be stopped or reduced in PLT1D who develop hypokalemia during the treatment of DKA despite increased potassium infusion

Bicarbonate therapy

Bicarbonate should not be routinely given, but in very rare cases, if the child is in shock with severe acidemia (pH < 7), it may be appropriate to use bicarbonate. If bicarbonate is considered necessary, cautiously give 1-2 mmol/kg IV over 60 minutes, diluted in half normal saline. Watch out for sudden hypokalaemia when administering bicarbonate.

Clinical and biochemical monitoring

Successful management of DKA and HHS requires meticulous monitoring and recording of the clinical and biochemical response to treatment so that timely adjustments in treatment can be made when indicated by clinical or laboratory data.

- **Hourly (or more frequently as indicated)**
  - Vital signs (heart rate, respiratory rate, blood pressure)
  - Neurological assessment (Glasgow Coma Scale score or similar assessments) for warning signs and symptoms of cerebral injury
  - Amount of administered insulin
  - Accurate fluid input (including all oral fluid) and output
  - Capillary blood glucose concentration should be measured hourly (but must be crosschecked against laboratory venous glucose because capillary methods may be inaccurate when there is poor peripheral circulation and when plasma glucose levels are extremely high)
- **At admission and every 2–4 h, or more frequently, as clinically indicated**
  - Serum electrolytes, glucose, blood urea nitrogen, calcium, magnesium, phosphate, and blood gases
  - Blood BOHB concentrations, if available, are useful for tracking DKA resolution

Transitioning to subcutaneous insulin

When ketoacidosis has resolved (hydration corrected, glucose controlled CBG < 200 mg/dL, ketones cleared < 0.6 mmol/L), oral intake is tolerated, and the change to subcutaneous insulin is planned, a dose of basal (long-acting) insulin should be administered in addition to rapid- or short-acting insulin. The most convenient time to change to subcutaneous insulin is just before a mealtime.

- Initiation of insulin regimen at transition provides faster glycemic control compared to sliding scale. Insulin requirement following DKA is usually 2-2.5 unit/kg/day (may go as high as 3 units/kg/day in some cases)

- Subcutaneous insulin should be given 60 minutes before stopping insulin infusion for short-acting insulin and 30 minutes for rapid-acting analogs. Early discontinuation of insulin is associated with recurrence of hyperglycemia. Basal insulin should be given 12 hours prior to the planned transition.
- Monitor blood glucose after one hour and two hourly thereafter for six hours

Treatment of infection

Infection can precipitate the development of DKA. Persistent fever and leukocytosis are indicators of infection. Diagnosis can be made with the help of blood culture, chest X-ray and sputum culture whenever necessary. It is recommended to send blood, urine, and other suspicious secretions at the beginning of therapy. In case of bacterial infections, antibiotics can be given. For fungal infections, management with antifungals is suggested.

Cerebral edema

Cerebral edema is a rare but often fatal complication of DKA. Its occurrence may be related to various factors including the degree of hyperglycemia, acidosis, dehydration and electrolyte disturbance at presentation, as well as over-rapid correction of acidosis, dehydration or hyperglycemia.

- **Risk factors**
  - **PLT1D related**
    - Age less than 5 years
    - Severe disease – severe acidosis, high plasma osmolality, low CO_2, and high blood urea
  - **Treatment related**
    - Fluid – excessive volume (> 4 L/m^2/day), hypo-osmolar fluid
    - Alkali treatment
- **Onset**

  Usually 4-12 hours of treatment (can occur at any time and may even be present at diagnosis especially with intravenous fluid treatment from another center)
- **Indicators to diagnosis**
  - Persistent hemodynamic instability
  - Worsening in clinical condition after initial improvement
- **Clinical features**
  - Early: headache, vomiting, drowsiness, irritability, hypertension with relative bradycardia compared to earlier readings
  - Late: unconsciousness, focal neurological deficits, papilledema, fixed dilated pupils, cranial nerve palsies

Diagnosis

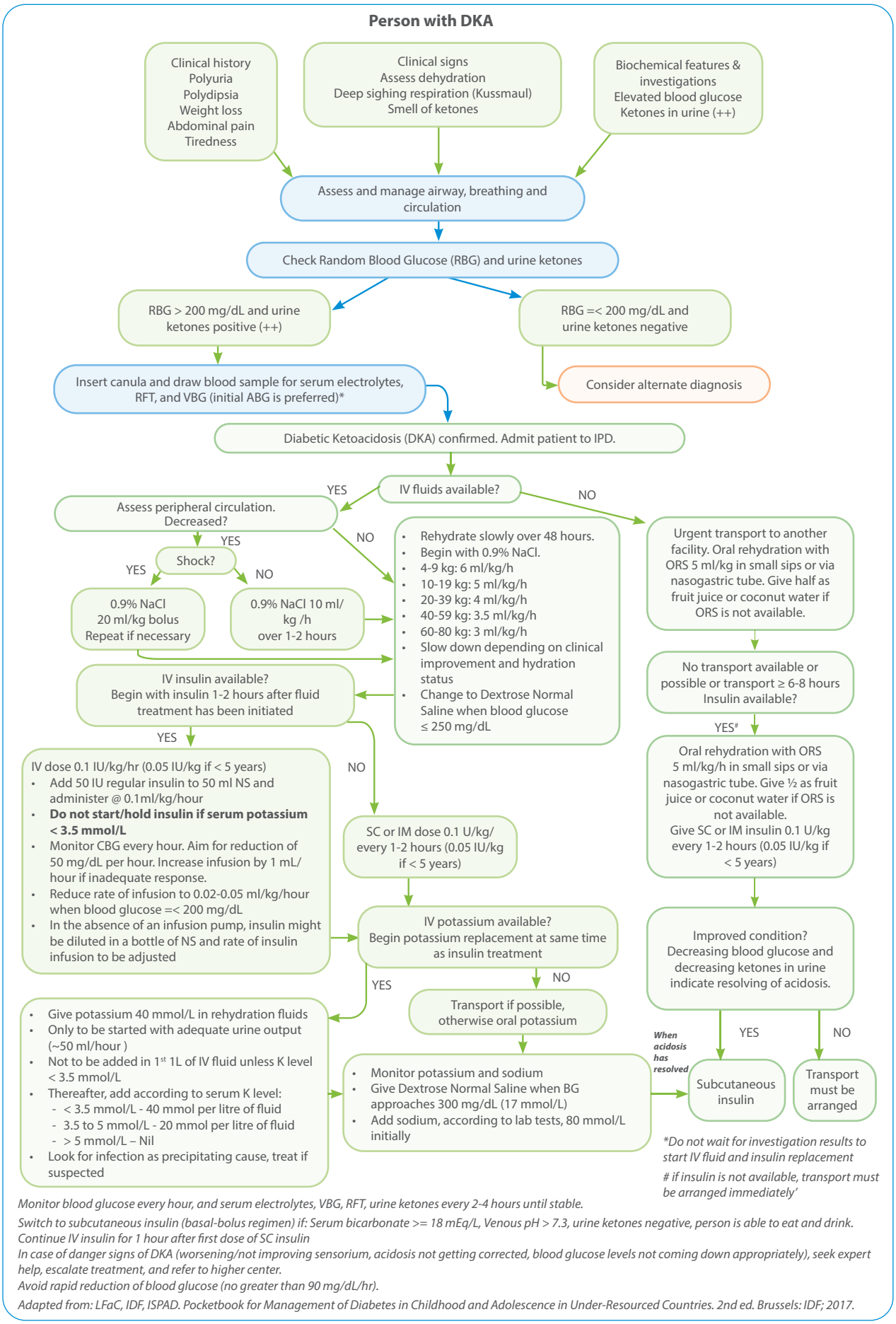
Diagnosis of cerebral edema during DKA can be made based on clinical parameters and does not require confirmation with imaging. Neuroimaging should, however, be considered after stabilization in PLT1D with persistent neurological features to exclude intracranial haemorrhage, rhino cerebral mucormycosis, and cortical venous thrombosis.

Treatment

- Intravenous mannitol (0.25 to 1 g/kg) over 20 minutes; the dose can be repeated in two hours, if there is no initial response
- Hypertonic (3%) saline, at 2.5–5.0 ml/kg over 10–15 minutes may be used as an alternative to mannitol, especially in cases where there is no initial response to mannitol
- Reduce the rate of fluid administration by one-third
- Elevate the head of the bed
- Ventilation may be necessary for a PLT1D with impending respiratory failure. Hyperventilation should be avoided.

Cerebral edema is an unpredictable complication of DKA, often occurring when the general condition of the PLT1D has improved, and monitoring is less strict. Survivors are often left with significant neurological deficits. Meticulous management of the DKA can decrease the risk of developing cerebral oedema. DKA should therefore be managed at the best available facility with strict monitoring.

Figure 26: Clinical algorithm 2 for emergency management of Diabetic Ketoacidosis in pediatric emergency or ICU by a specialist clinician



Monitor blood glucose every hour, and serum electrolytes, VBG, RFT, urine ketones every 2-4 hours until stable.

Switch to subcutaneous insulin (basal-bolus regimen) if: Serum bicarbonate >= 18 mEq/L, Venous pH > 7.3, urine ketones negative, person is able to eat and drink. Continue IV insulin for 1 hour after first dose of SC insulin

In case of danger signs of DKA (worsening/not improving sensorium, acidosis not getting corrected, blood glucose levels not coming down appropriately), seek expert help, escalate treatment, and refer to higher center.

Avoid rapid reduction of blood glucose (no greater than 90 mg/dL/hr).

Adapted from: LFaC, IDF, ISPAD. Pocketbook for Management of Diabetes in Childhood and Adolescence in Under-Resourced Countries. 2nd ed. Brussels: IDF; 2017.

Hypoglycemia

Hypoglycemia occurs when blood sugar levels drop too low.

Table 21: Classification and thresholds for hypoglycemia for T1DM

Definition	Clinical hypoglycemia alert	Clinically important or serious hypoglycemia	Severe hypoglycemia Coma/convulsions/ severe cognitive impairment
Threshold	< 70 mg/dL	< 54 mg/dL	No specific glucose threshold
Action	Requires hypoglycemia treatment	Requires hypoglycemia treatment	Requires third-party assistance to administer carbohydrates, or intravenous dextrose

Hypoglycemia and fear of hypoglycemia (FOH) are major physiological and psychological barriers to achieving optimal glycemia and may result in significant emotional morbidity for PLT1D and their caregivers. The treating clinician and staff at the NCD clinic should educate the PLT1D and their caregivers to be able to identify signs and symptoms of hypoglycemia and take necessary steps as detailed below.

Causes

- Excessive insulin
- Missed meals
- Exercise without insulin adjustment
- Disruption in sleep timings

Symptoms

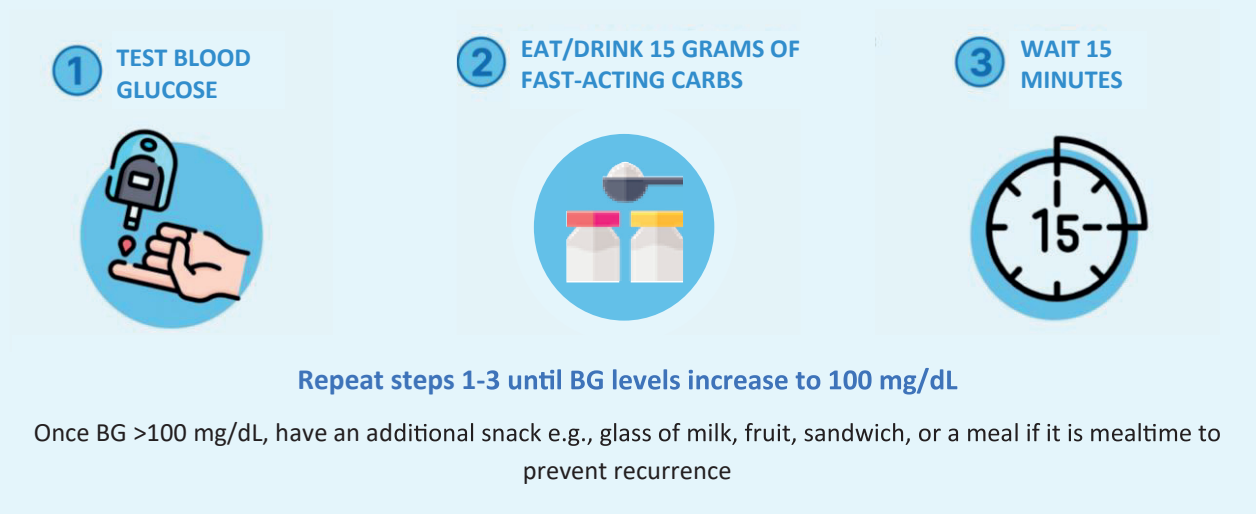
- Shakiness
- Pounding heart
- Sweatiness
- Headache
- Drowsiness
- Difficulty in concentrating
- Irritability
- Agitation
- Quietness

Treatment of hypoglycemia

- Hypoglycemia should be treated with oral glucose; by administering 0.3 g/kg glucose orally, which equates to 9 g of glucose for a 30 kg PLT1D and 15 g for PLT1D > 50 kg

- Treatment of hypoglycemia should increase blood glucose level by 54 to 70 mg/dL (ideally above 100 mg/dL)
- Following initial hypoglycemia treatment, blood glucose should be retested in 15 minutes. If there is no response or an inadequate response, repeat hypoglycemia treatment. Retest glucose in another 15 minutes to confirm that target glucose has been reached. Once blood glucose comes above 100 mg/dL, an additional snack e.g., glass of milk, fruit, sandwich, or a meal if it is mealtime can be given to prevent recurrence of hypoglycemia.

Figure 27: Treatment of hypoglycemia (15-15 rule)



- Severe hypoglycemia requires urgent treatment. In a hospital setting intravenous glucose 2-5 mL/kg of 10% dextrose, or 1-1.5 ml/kg of 25%-30% dextrose can be administered, and drip of fluids should be continued until the sensorium stabilizes and the child can tolerate oral intake comfortably. Observation for 12-24 hours is advisable.
- If the PLT1D is unable to be taken to the hospital/unconscious, a thick paste of sugar (powdered sugar with a few drops of water) or honey can be smeared on the PLT1D's buccal mucosa, with the PLT1D in lateral position. Powdery substances like glucose powder or thin liquids like glucose solutions should not be given forcibly to the semiconscious/unconscious PLT1D.

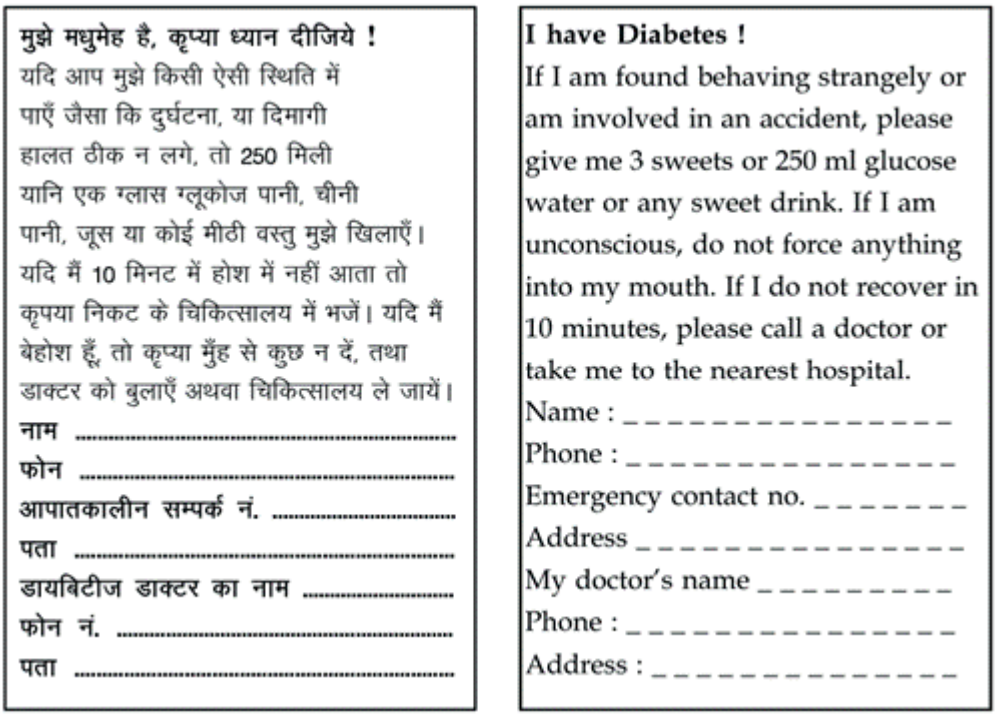
Prevention of hypoglycemia

Diabetes education is critical in the prevention of hypoglycemia.

- Education about the risk factors for hypoglycemia should be given to PLT1D and their families to alert them as to times and situations when increased glucose monitoring is required and when treatment regimens need to be changed
- PLT1D, parents, school teachers, colleagues/employers and other caregivers should be counselled to recognize the early warning signs of hypoglycemia and treat low blood glucose immediately and appropriately
- Any change in daily routine or treatment regimen should be monitored
- During sick days, while usually the blood glucose levels are high, hypos may also occur. Frequent monitoring on those days is essential.

- Glucose monitoring should be performed prior to exercise, and extra carbohydrates may be consumed based on the glucose level and the expected intensity and duration of exercise
- Bedtime blood glucose level must be paid attention to
- Blood glucose goals may need to be adjusted upwards in PLT1D with recurrent hypoglycemia and/or impaired hypoglycemia awareness
- If unexplained hypoglycemia is frequent, evaluation for unrecognized hypothyroidism, celiac disease and renal function issues should be considered
- PLT1D should wear an identification or alert indicating they have T1DM

Figure 28: PLT1D identification card in Hindi and English



मुझे मधुमेह है, कृप्या ध्यान दीजिये !
यदि आप मुझे किसी ऐसी स्थिति में
पाएँ जैसा कि दुर्घटना, या दिमागी
हालत ठीक न लगे, तो 250 मिली
यानि एक ग्लास ग्लूकोज पानी, चीनी
पानी, जूस या कोई मीठी वस्तु मुझे खिलाएँ।
यदि मैं 10 मिनट में होश में नहीं आता तो
कृपया निकट के चिकित्सालय में भर्जे। यदि मैं
बेहोश हूँ, तो कृप्या मुँह से कुछ न दें, तथा
डाक्टर को बुलाएँ अथवा चिकित्सालय ले जायें।
नाम .....
फोन .....
आपातकालीन सम्पर्क नं. .....
पता .....
डायबिटीज डाक्टर का नाम .....
फोन नं. .....
पता .....

I have Diabetes !
If I am found behaving strangely or am involved in an accident, please give me 3 sweets or 250 ml glucose water or any sweet drink. If I am unconscious, do not force anything into my mouth. If I do not recover in 10 minutes, please call a doctor or take me to the nearest hospital.
Name : _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
Phone : _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
Emergency contact no. _ _ _ _ _ _ _
Address _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
My doctor's name _ _ _ _ _ _ _ _ _
Phone : _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
Address : _ _ _ _ _ _ _ _ _ _ _ _ _ _

Sick day management

An illness like stomach bug, flu, infection etc can have a big impact on a child or adolescent living with diabetes, especially T1DM. Illness can cause unexpected spikes or drops in blood glucose levels. While diabetes may not increase the occurrence of illnesses, it may be associated with increased severity due to altered immunity. Along with treating the underlying infection/ illness and treating fever with anti pyretics, a PLT1D requires additional care measures to avoid acute complications. The clinicians and other staff at the NCD clinic must educate the parents/ caregivers about necessary measures in such scenarios.

Impact of illness on glycemic control in case of T1DM

When PLT1D develop an infection or other severe illnesses, two factors severely affect glycemic control:

1. **The release of stress hormones and cytokines in response to illness:** These lead to an increase in BG levels despite poor oral intake and are often seen in illnesses associated with fever. If the relative insulinopenia during an acute illness is not counteracted by increased insulin dosing, DKA can be precipitated, especially with preceding suboptimal glycemic control. DKA has high mortality and morbidity and should be prevented.

2. **Anorexia, nausea, vomiting or diarrhea:** When these dominate the clinical picture, without a febrile response, hypoglycemia develops. Severe hypoglycemia can cause seizures, unconsciousness, and immediate death, apart from long-term cognitive deficits. Vomiting without diarrhea, if associated with raised BG levels, is due to insulin deficiency.

Timely intervention by parents and healthcare providers can avoid adverse consequences, thereby limiting hospitalisations and the burden on the families.

Sick day management guidelines

Every PLT1D and their caregivers should be familiar with the sick day management guidelines given below. They must know what to monitor, at what frequency, how to adjust insulin, what to eat, and when to rush to the hospital. Guidelines for sick day management should be given to the PLT1D in writing and should be reinforced periodically during follow-up visits. Below is an overview of how to manage T1D during an illness:

1. Monitor blood glucose and ketone levels

Blood glucose levels should be measured **every 2-4 hourly** to recognize high or low BG levels to guide the subsequent steps. Parental assistance is inevitable even in an older child who is ill.

Along with BG levels, ketone levels should also be measured **1-2 times a day**. Parents/caregivers of PLT1D should be advised by the NCD clinic staff to keep urine ketone dipsticks at home. They should also be counselled on how to use and interpret the results of such dipsticks. However, if for any reason parents/caregivers are unable to keep urine ketone dipstick at home or are unable to carry out urine ketone test at home, they should consult the NCD clinic in case of illness.

The aim is to maintain BG level between 80–180 mg/dL and ketones at trace or absent in urine (and <0.6 mmol/L in blood).

Urine and blood ketone test

Ketone monitoring with the help of blood is preferred over urine since blood ketone test measures Beta-hydroxybutyrate (BOHB), which is the prominent ketone body in DKA. The urine test measures acetoacetate (AcAc) and underestimates the degree of ketosis. In normalcy, the ratio of BHOB to AcAc is 1:1 while in DKA it can be as high as 10:1. During recovery from ketosis, the BHOB gets converted to AcAc and urine tests may show false persistence of ketosis for up to 24 hours with risk of overtreatment with insulin and late hypoglycemia.

The presence of ketones in urine or blood would mean either:

- Carbohydrate deficiency due to poor intake, in which case the BG levels would be less than 100 mg/dL, OR
- Insulin deficiency when BG levels are more than 180 mg/dL

It might not be feasible to carry out a blood ketone test at home and hence, parents/caregivers should be counselled on the use of urine ketone dipsticks and scenarios where they should bring the PLT1D to the DH NCD clinic for blood ketone test.

2. Insulin

Insulin **must not be skipped** even if the PLT1D is unable to eat well. Doses of insulin should be adjusted based on the BG levels and ketone levels as detailed in the below table.

Reduction in insulin dose

Insulin dose can only be reduced when the BG levels are below 80-100 mg/dL and the PLT1D is unable to eat to prevent hypoglycemia. Detailed action for insulin dose reduction is outlined in table 22 below.

Increase in insulin dose

When BG levels are more than 180 mg/dL, a supplement of short or rapid acting insulin should be given immediately, either subcutaneously or intramuscularly. The supplement is calculated as a % of the Total Daily Dose (TDD), which is the sum of all insulins taken in 24 hours on routine days. The supplement may range from 5-20% of TDD based on blood glucose and urine ketone levels and is always given as regular insulin. Table 22 below outlines the calculation of insulin supplement in different scenarios.

When taking insulin serial supplements, care must be taken that that some of the previous dose might not have been absorbed, since the rate of absorption with rapid acting insulin is 30% per hour. At the end of 2 hours, 60% would have been absorbed while 40% is yet to commence working and this amount should be taken into account before calculating the next supplement Individual discretion needs to be applied before deciding on next supplemental dose of insulin.

Table 22: Suggestive actions for insulin dose adjustment during sick day management

Aim	Blood glucose levels (mg/dL)	Urine ketones	Action
Hypoglycemia prevention	< 80	Absent/trace	Omit regular insulin / if oral intake is poor. Continue long-acting basal analog
	< 80	> Trace	Omit regular insulin / if oral intake is poor and decrease long-acting basal analog by 20-30%. ***Give sugary drinks before initiating insulin**
DKA prevention	100-180	Moderate/large	Increase insulin by 5% of TDD
	> 180	Absent/trace	Increase insulin by 5-10% of TDD
	180-400	Small/moderate	Increase insulin by 10-15% of TDD
	> 400	Small/moderate	Increase insulin by 15-20% of TDD
	180-400	Large	Increase insulin by 20% of TDD; Possibility of DKA – admission is suggested
	> 400	Large	Increase insulin by 20% of TDD; Possibility of DKA – admission is suggested

3. Diet

a) Adequate fluid intake:

Fever and hyperglycemia can cause increased fluid losses. Oral rehydration fluid provides a source of both fluid and energy. If BG level > 180 mg/dL, PLT1D should be given plenty of salty liquids such as vegetable soup, buttermilk, dal soup, milk without sugar etc. if they are unable to eat their regular meal. If BG level <180 mg/dL, sweet liquids such as fruit juices, milk with sugar or ORS should be given.

Liquids must be taken in small, frequent sips to minimize the chance of vomiting. Cool liquids are preferred as they are less likely to induce nausea or vomiting.

b) Easily digested foods

The PLT1D should be fed easily digested foods when there is loss of appetite.

Note: Strenuous exercise should be avoided during an illness

4. Hospitalisation

The family should know when to bring the child to hospital. The indications are:

- If blood glucose and ketones cannot be monitored at home
- Pain in abdomen, vomiting, severe diarrhea or poor oral intake, especially if hypoglycemia is occurring
- Presence of symptoms of ketoacidosis such as rapid breathing, drowsiness, or altered behaviors
- Temperature is > 101°F
- PLT1D is less than 5 years of age (may become dehydrated more rapidly than older children or adolescents.)
- Child exhibits general signs of illness
- Severe hypoglycemia (as mentioned above)
- Ketones are moderate-high or if the ketones are rising despite giving corrective insulin doses

Summary of sick day management by parents/caregivers in case of a PLT1D:

- **Monitor:** Blood glucose levels every 2-4 hours; ketone levels using urine ketone dipstick 1-2 times a day
- **Insulin administration:** Insulin must not be skipped; doses may be adjusted based on the results of blood glucose monitoring and ketone levels
- **Diet:** Adequate fluid intake to be ensured
- **Hospitalization:** If the monitoring or additional support can be provided at home, or if the condition worsens, the PLT1D should be immediately taken to the DH

Note: Emergency ambulance services, such as through 112 helpline or any equivalent mechanism available in the state, should be mobilised as needed to facilitate timely patient transfer.

Chapter 9

Diabetes Education and Counselling

Learning objectives

1. Explain the role of structured diabetes self-management education (DSME) in improving outcomes for children with diabetes and their caregivers.
2. Identify the key education topics to be covered at diagnosis and during ongoing follow-up visits, mapped to appropriate checkpoints.
3. Adapt diabetes counselling to the age group of the child, addressing specific needs of pre-school children, school-age children, and adolescents.

To maintain quality diabetes management and meet desired treatment outcomes, PLT1D and their caregivers need to perform a multitude of self-management tasks daily - responding to changes in activity, food, and physiology - and remain vigilant about signs of emergency events or complications. Hence, they must receive continuous and age-appropriate diabetes self-management education (DSME) at the NCD clinic during treatment initiation and follow-up visits.

Communication rules for effective diabetes education and counselling at the NCD clinic:

- Do not overwhelm the PLT1D and caregivers with too much information in a single instance, which may become difficult to retain. Education should be provided in a structured and phased manner.
- Be compassionate and empathetic while providing diabetes education and counselling to PLT1D and their caregivers.
- Strive to create a judgement-free environment so the PLT1D and their caregivers can feel comfortable in asking questions and gain a thorough understanding of all the components of self-management.

Healthcare providers need to deliver diabetes education that optimizes the PLT1D and their caregivers' knowledge and understanding of the condition and its treatment, while simultaneously assisting them to adjust to the impact of diabetes management on their everyday lives. Diabetes management requires frequent and high levels of educational involvement at diagnosis and ongoing to support PLT1D and their caregivers.

Format

A team of doctors (MD pediatrician/ MD Medical Officers), nurses, dietician and psychologists at the NCD clinic should deliver education and counselling to PLT1D and their caregivers.

The basics of T1DM including insulin administration, site rotation, monitoring of BG levels, maintaining logbooks, diet etc. should be taught in the initial 3-4 days during initial management in the hospital. For the first few days to a month, support over the phone should be provided for initial handholding. Following discharge from the hospital, education and counselling on T1DM should be continued in the subsequent follow-up visits.

The list below details out the key DSME topics that should be covered at key checkpoints.

Table 23: DSME topics and delivery checkpoints

Topics to be covered	Checkpoints			
	At diagnosis and initial management	Monthly / not meeting treatment targets	When transitions in life and care occur	New factors influence self-management
T1DM overview (lifelong condition, need for insulin replacement, no use of alternative medicines)				
Pathophysiology, "cause" – no one's fault, not communicable, different from T2DM, other forms of diabetes, honeymoon phase (not cured)				
Psychological support in accepting the diagnosis, allay guilt and reassure, normal life possible with proper management				
Insulin administration technique, site rotation, storage and transportation (encourage demonstration of technique by caregiver / PLT1D during admission)		*Reinforce during subsequent visits*		
Self-monitoring of blood glucose levels, maintaining a logbook and target levels		*Reinforce during subsequent visits*		
Hypoglycemia symptoms and management		*Reinforce during subsequent visits*		

Topics to be covered	Checkpoints			
	At diagnosis and initial management	Monthly / not meeting treatment targets	When transitions in life and care occur	New factors influence self-management
Basic sick day guidelines		*Reinforce during subsequent visits*		
Basic dietary advice (healthy eating, avoiding simple sugars) with a simple-to-understand diet plan		*Reinforce during subsequent visits*		
Basic modification of insulin doses according to blood glucose levels				
Physical activity and sports				
Special occasions: festivals, travel, diabetes camp, school camp/excursion				
Managing T1DM at school and workplace				
Short-term and long-term complications and screening schedule				
Carb-counting, insulin-to-carb ratio and carbohydrate exchanges				
Urine ketone monitoring and DKA prevention				
Transitioning from adolescence to adulthood				
Careers, marriage, contraception, planning conception, driving				
Smoking, alcohol, drugs, other addictions and risk-taking behaviours				
Management of co-morbidities and complications				

Topics to be covered only once the PLT1D and caregiver have built a complete understanding of the remaining topics.

In addition to the above topics, the following age-appropriate themes should also be addressed and discussed with the caregivers and PLT1D for different age groups:

Pre-school children

- Need for repeated counseling of parents to allay their anxiety and concerns
- Need for frequent BG monitoring and insulin adjustment for unpredictable eating pattern
- High index of suspicion for hypoglycemia
- Need for higher glucose cutoff
- Care in pre-school setting to include school staff

School-age children

- Increase self-reliance in glucose monitoring and management
- Emphasis on early detection of hypoglycemia in school
- Key adaptation for school programs including sports and physical activity
- Care during school trips, annual functions and sports day

Adolescents

- Comprehensive re-education of children diagnosed at an early age
- Focus on peer pressure and social group effects
- Handling variations in eating and exercise (often tuitions or extra-academic burden)
- Weight control and healthy eating
- Caution against risk-taking behaviors like smoking, alcohol consumption and recreational drugs
- Information about safe measures related to eating out, parties and sex

Chapter
10

Follow-up Care and Complication Prevention for Children with Diabetes

Learning objectives

1. Describe the components of monthly follow-up visits, including review of glycemic control, growth monitoring, injection site assessment, and psychosocial well-being.
2. Identify the schedule and tests for quarterly and annual reviews, including screening for microvascular and macrovascular complications.
3. Explain the programmatic actions required at different levels of care when complications or comorbidities are detected.

T1DM is primarily managed in the outpatient setting, where all PLT1D should receive specialized care from a multidisciplinary team, qualified to provide up-to-date education and support. The period following diabetes diagnosis and stabilization is a critical opportunity to commence education and preparation for outpatient care. Thereafter, regular, ongoing follow-up diabetes care should be provided throughout childhood and adolescence and be complemented with a well-supported program to facilitate transition to adult care at the appropriate time.

People diagnosed with T1DM who are not currently on basal-bolus insulin regimen should be transitioned to this regimen within the outpatient setting. The steps to transition PLT1D to basal-bolus insulin regimen are outlined in Annexure 3.

Goals of follow-up care

Comprehensive follow-up care focuses on achieving the following goals:

- Satisfactory biochemical control
- Maintaining growth and development
- Preventing acute complications
- Preventing/delaying late onset complications
- Ensuring emotional stability of the PLT1D and the family

To achieve the above goals, follow-up care must comprise two components:

- Monthly routine follow-up visits
- Annual and periodic reviews for screening of complications and comorbidities

Monthly follow-up visit

After the initial stabilization, PLT1D should be called for follow-up monthly at the DH NCD clinic, where they are evaluated by the treating pediatrician. Each follow-up visit should include a comprehensive assessment to ensure effective management and address any emerging issues. The staff nurse and other support staff at the NCD clinic should be responsible for monitoring follow up adherence by PLT1D and reaching out telephonically in case of missed visits. The follow-up visits should cover the following areas:

Follow-up visits comprising of:

- Clinical evaluation
- Insulin dose titration (if needed)
- HbA1c (HPLC method) testing (every 3 months)
- Complication screening
- Education and counselling
- Supply/provision of commodities/deliverables

History

The clinical assessment begins with taking history regarding the following:

Well-being

- Conversation around general well-being of the PLT1D
- Any recent events disturbing the PLT1D's life (including school absences, behavioral issues)

BG levels

- Review of SMBG logbook and crosschecking with glucometer readings
- Any experiences of hypoglycemia, and its causes, such as skipping of meals, uncovered exercise and missed snack. Suspect hypothyroidism, celiac disease or adrenal insufficiency with unexplained hypoglycemia or requirement for reduction in insulin dosage.

Insulin and dietary compliance

- Review of insulin therapy with particular attention to adequacy of insulin, injection technique and rotation of injection sites
- Review of dietary behavior and exercise

Comorbidities and complications

- Any failure to gain weight, weight loss, polyuria or polydipsia
- Review of any associated medical conditions, especially other autoimmune disorders such as thyroid disease, celiac disease or adrenal insufficiency
- Review of any symptom suggestive of long-term complications
- Underlying psychopathology: features of depression, overeating and altered sleep rhythm

Physical examination

Growth and pubertal development (for children and adolescents)

Height, weight, and pubertal assessment is an integral part of each clinic visit. Poor glycemic control may lead to poor linear growth, inadequate weight gain, delayed puberty and delayed skeletal maturation. Other causes of poor weight gain could be an eating disorder, or an associated chronic disease such as tuberculosis, celiac disease, or Addison disease. Conversely, excessive insulin therapy has been associated either with overeating or with frequent hypoglycemia can result in excess weight gain. Monitoring weight gain is important in adjusting insulin doses.

Height and weight should be monitored carefully and plotted on a growth chart at least twice a year. It is important to use population specific percentile charts and take mid-parental height into account. The WHO recommended growth charts Annexure 7 can be used for reference.

Important hormonal, metabolic and psychological changes occur at puberty, impacting the management of T1DM. The decline in insulin sensitivity warrants appropriate readjustment and redistribution of insulin doses to maintain glycemic targets. Psychological changes should be monitored. Supportive therapy and appropriate referrals should be provided as and when required.

Blood Pressure (BP)

Blood pressure measurement using an appropriate size cuff should be part of every diabetes physical examination. Hypertension is defined as systolic or diastolic BP > 95th centile for age, gender and height percentile, measured on three separate occasions. PLT1D with hypertension should be evaluated for renal functional status and urinary albumin excretion. Therapy with lifestyle modification and ACE inhibitors such as enalapril should be instituted for those diagnosed with hypertension.

Insulin site checking

Insulin administration sites should be checked in each follow-up visit to check for evidence of lipohypertrophy and lipoatrophy. Providers should reinforce the need for rotation of sites for insulin administration.

Lipohypertrophy has been associated with poor rotation of injection sites, reusing needles and longer duration of diabetes. Areas of lipohypertrophy usually show slower absorption of insulin. Avoid the affected sites for 2-3 months to promote resolution of lipohypertrophy.

Annual and periodic reviews

Quarterly review

HbA1c

Measurement of HbA1c every 3 months prior to the clinic visit should be conducted to judge adequacy of insulin therapy. Results should be discussed with the PLT1D and caregivers and documented in the medical records. The general goal should be to keep HbA1c levels below 7.5% in all PLT1D.

Potential interferences such as hemoglobinopathies can affect HbA1c values. Values that are inconsistent with clinical presentation should be investigated further

Systemic examination

This should focus on palpation of the liver, elicitation of the deep tendon reflexes (DTR) and sensations, thyroid gland palpation and limited joint mobility (LJM). Limited joint mobility occurs due to stiffening of soft tissues due to glycosylated collagen in longstanding diabetes, leading to contracture of small or large joints and waxy skin. It is best elicited by the 'prayer sign', wherein the PLT1D is unable to oppose the fingers completely when the hands are folded as in prayer. LJM is regarded as a harbinger of chronic microvascular and macrovascular complications of diabetes.

Foot inspection

In each clinic visit, conduct evaluation of feet for corns, calluses and abrasions. Examination of the footwear and socks of the PLT1D should also be performed. PLT1D and/or their caregivers should be educated about preventative foot care.

Annual review

Annual review for long term complications should begin from the age of 10 years after 3-5 years duration.

Neuropathy

Neuropathy is rare in children and adolescents with T1DM. The most common neuropathic complication with diabetes is generalized sensorimotor polyneuropathy, which occurs insidiously, first manifesting as sensory loss and later motor weakness. A history of paraesthesia, numbness or persistent pain and examination of light touch with graded microfilaments will help in diagnosis.

Nephropathy

The earliest sign of diabetic nephropathy is microalbuminuria. Microalbuminuria is defined as the persistent urinary excretion of albumin in the following range:

- Albumin/creatinine ratio 30-300 mg/g (spot urine).

If a microalbumin report is abnormal, the screening should be repeated twice more within the next 3 to 6 months; 2 out of the 3 reports should be abnormal to classify the result as persistent microalbuminuria. Microalbumin measurement should not be done during an acute illness or fever, urinary infection, menses, or after vigorous physical exercise. It should also not be done during poor glycemic control and hyperlipidemia.

Screening for microalbuminuria should be done annually, should start from 10 years of age, or at onset of puberty if this is earlier, with 2-5 years diabetes duration as per recommendations of the International Society for Pediatric and Adolescent Diabetes (ISPAD 2022).

The presence of microalbuminuria calls for improved glycemic control, attention to normalization of blood pressure and lipid profile and treatment with ACE inhibitors, if necessary. Microalbuminuria if treated early can prevent or even reverse progression of renal disease.

Retinopathy

Assessment of retinopathy should be done by an ophthalmoscope through dilated pupils by an experienced ophthalmologist. Stereoscopic fundus photography and fluorescein angiography are more sensitive in detecting background or proliferative retinopathy. The presence of only microaneurysms denotes mild non-proliferative diabetic retinopathy (NPDR); the addition of haemorrhages and hard exudates (protein and lipid leakage) denotes moderate NPDR and severe NPDR is characterized by greater numbers of haemorrhages with venous beading and intraretinal microvascular abnormalities (IRMA). Proliferative diabetic retinopathy (PDR) is present if soft exudates (ischemic areas) and new vessel formations are seen. In addition, maculopathy is given a different staging irrespective of retinopathy and is characterized by exudation and microaneurysms in central retina. Maculopathy is not common in children and adolescents.

If significant retinopathy is present, more frequent reviews by the ophthalmologist are necessary. Risk factors for diabetic retinopathy include longer duration of diabetes, poor metabolic control, presence of microalbuminuria, hypertension, abnormal lipid profile and higher BMI. Interventions should include improving glycemic control and addressing associated risk factors. Laser therapy should be considered for proliferative retinopathy or maculopathy.

Cataracts

Clinical examination of the eye for cataracts should be done soon after diagnosis.

Macrovascular disease

Hypertension and atherosclerosis are major risk factors for macrovascular disease. It is important to regularly screen and maintain BP in the normal range (< 120/80 mmHg for more than 13 years old or <90 percentile for age, gender and height). If persistently > 130/80 mmHg (or > 95th percentile), antihypertensive treatment is started. Lipid profile should be performed at onset, after BG control, if there is family history of hypercholesterolemia, and at age 10 years, if there is not. Thereafter, if the result is normal, it should be repeated after 5 years. If hypercholesterolemia is detected, the person should be referred to tertiary care for consultation.

Serum lipids

Screening for fasting lipid profile should be performed in all PLT1D aged over 10 years soon after diagnosis preferably after glycemia improvement. If there is family history of hyperlipidaemia, testing should be performed from the age of 2 years. If normal, the tests should be repeated every 3 years.

The normal values for lipids are given in the table below. Hyperlipidemia should be managed by strict glycemic control, dietary intervention (weight reduction, if obese and reduction of saturated fat intake) and an exercise schedule. Treatment with a statin may be considered (at age > 10 years) if the LDL cholesterol remains > 160 mg/dL despite the above measures; or is > 130 mg/dL in the presence of other risk factors for cardiovascular disease. There is limited experience with fibrates, bile acid sequestrants and nicotinic acid in children.

Table 24: Lipid target values

Lipid	Target
LDL cholesterol	< 100 mg/dL
HDL cholesterol	> 40 mg/dL
Triglyceride	< 150 mg/dL

Complication screening guidance for children with DM

Table 25: Complication screening guidance for children with DM

Complications	Test/examination	Initial testing	Frequency of testing
Glycemic control	HbA1c: High Performance Liquid Chromatography method (HPLC)	At diagnosis	Every 3 months
Thyroid disorder	TSH, total or free T4	At diagnosis	Every 1-2 years, earlier if symptoms arise
Celiac disease	Anti-TTG IgA, Total IgA	At diagnosis	Within 2 years of diagnosis, thereafter every 5 years or if symptoms arise
Hypertension	Blood Pressure	At diagnosis	Every follow-up visit
Dyslipidemia	Lipid profile	At diagnosis if person is more than 10 years of age	If abnormal (LDL > 100 mg/dL), repeat annually. If normal, repeat every 2 years
Nephropathy	Albuminuria; urine albumin-to-creatinine ratio	After 3-5 years of diagnosis, beginning at the age of 10 years or at puberty (whichever is earlier)	Annually
Retinopathy	Fundoscopy	After 3-5 years of diagnosis, beginning at the age of 10 years or at puberty (whichever is earlier)	Annually
Neuropathy	Foot examination		Annually
Psychosocial screening (PLT1D/ PLT2D and family)	History and clinical evaluation for diabetes distress, depression, and eating disorders	Begin shortly after diagnosis	Annually, or as suspected
Growth (absolute and centile)	Height Weight BMI	At diagnosis	2 times annually 4 times annually 2 times annually

Summary of acute and chronic complications of T1DM

Table 26: Acute and chronic complications of T1DM: warning signs and programmatic actions

Type of complication	Examples	Warning signs/ features	Programmatic actions (RBSK / NP-NCD)	Level
ACUTE (immediate, life-threatening)	Diabetic Ketoacidosis (DKA)	Excessive urination, thirst, abdominal pain, vomiting, rapid breathing, fruity breath, confusion	• MHT/School: Identify red flags/ symptoms • Immediate referral to DH	Appropriate referral
	Severe hypoglycemia	Sweating, shaking, headache, confusion, seizures, unconsciousness	• School: Give oral glucose if conscious • Emergency referral if unconscious or not improving • NCD clinic: adjust insulin dose (in the subsequent clinic visit, if needed) and reinforce caregiver education	Appropriate referral
	Severe hyperglycemia (non-DKA)	High glucose, fatigue, dehydration	• School: Refer to NCD clinic for urgent assessment • NCD clinic: ensure hydration guidance and follow-up	Appropriate referral
CHRONIC (long-term, gradual onset)	Growth and pubertal delay	Poor height/weight gain, delayed puberty	• RBSK: track growth charts; refer deviations • NCD: provide endocrine evaluation and insulin optimisation	Appropriate referral

Type of complication	Examples	Warning signs/ features	Programmatic actions (RBSK / NP-NCD)	Level
	Eye disease (retinopathy)	Often asymptomatic initially; later blurred vision	• Annual eye screening at DH	Appropriate referral
	Kidney disease (nephropathy)	Protein in urine; swelling (late stage)	• Annual urinary albumin: creatinine ratio and renal tests at NCD clinic	Appropriate referral
	Nerve damage (neuropathy)	Tingling, numbness, foot problems	• Annual foot/ neuropathy screening at NCD clinic	Appropriate referral
	Cardiometabolic risks (hypertension, dyslipidemia)	High BP, abnormal lipids (usually asymptomatic)	• Annual BP and lipid profile at DH	Appropriate referral
	Psychosocial complications	Stress, depression, bullying, school absenteeism	• School vigilance • Clinical psychologist at the DH/NCD clinic provides counselling	Appropriate referral

Follow-up care for T2DM (and other metabolic conditions)

This chapter focusses on follow-up protocol for T1DM, which requires more rigorous, regular and specialized follow-up care, which should be provided at the DH NCD clinic by a specialist clinician. In case of children and adolescents diagnosed with T2DM (and other metabolic conditions), a check up every 3-6 months is recommended. Drugs and essential commodities for T2DM may be dispensed at AAM-PHC, community health centres or sub-district hospital to reduce burden on the DH. Support of frontline healthcare providers at the community level and primary healthcare facilities may be sought ensure follow up adherence.

Additionally, protocols detailed in the operational guidelines of NP-NCD may be followed along with relevant elements from the ones detailed above for T1DM.

Chapter

11 Reporting and Referral

Learning objectives

1. Correctly complete the follow-up register and SMBG logbook at each clinic visit, ensuring accurate and complete records.
2. Describe the data flow between the RBSK and NCD portals through API linkage and explain the importance of real-time data entry for case tracking.
3. Identify valid reasons for referral of a PLT1D to another healthcare facility and correctly complete a referral letter with all required information.

Note: This chapter is meant to complement the reporting and referral protocols already laid down under the operational guidelines for the NP-NCD. Most of the content here is to guide data recording and reporting pertaining to people diagnosed with T1DM. The data linkage between the RBSK portal and the NCD portal should be ensured for all cases of children and adolescents diagnosed with diabetes – both T1DM and T2DM.

The reporting mechanism helps the service provider at the NCD clinic observe several clinical factors, insulin values, and degree of fluctuation in blood glucose in a consolidated format. The month-on-month data recording in a single page allows the service provider to make a tangible comparison and advise the PLT1D accordingly. This in turn will promote better long-term diabetes management.

Follow-up register

At the time of enrollment in the NCD clinic, once the basic information on the demographics of the individual is captured, the following sections are to be filled by the trained staff nurse and the doctor at every visit of the PLT1D in the clinic:

Physical examination

- Height (in cm)
- Weight (in kg)
- BMI
- Blood pressure
- RBS
- Injection site checked (Y/N) - healthy, unhealthy
- Growth assessment (to be checked twice a year

Symptoms experienced in the last one month (Y/N)

- Polyuria (excessive urination)
- Polydipsia (excessive thirst)
- Weight loss
- Vomiting
- Abdominal pain
- Dizziness
- Sweating
- Extreme hunger
- Blurred vision
- Weakness

SMBG evaluation

- Number and percentage readings in range out of total readings (in range = SMBG readings between 70 and 180 mg/dL)
- Number and percentage of days in range out of total days monitored
- Number of hypo readings (<70 mg/dL)
- Number of hyper readings (>200 mg/dL)

Acute diabetes complications in last one month

- Diabetes Ketoacidosis (DKA)
- Hypoglycemia
- Infections

Laboratory investigations with results

- HbA1c (%) – should be done every 3 months
- Other tests done with values

Insulin therapy (daily dose prescribed)

- Regular insulin (IU per day)
- Glargine insulin (IU per day)

T1D supplies distributed

- Regular insulin
- Glargine insulin
- Glucometer
- Blood glucose test strips (Qty: 100 strips per month)

- Syringe 40 IU (Qty: 30 syringes per month)
- Syringe 100 IU (Qty: 10 syringes per month)
- Lancing device
- Lancet (Qty: 25 lancets per month)

This would be followed by additional remarks, if any, and the name of the service provider assessing the person along with their designation and signature.

The above-mentioned fields must be filled during each visit the individual makes to the NCD clinic. The doctor and the nurse should ensure correctness and completeness of each record.

Annual tests

Annual tests done are also captured along with their values. Some common annual tests are:

- Fundus examination
- Foot examination
- Urine albumin/creatinine ratio
- Serum creatinine
- Thyroid stimulating hormone
- Lipid profile:
  - HDL cholesterol
  - LDL cholesterol
  - Triglyceride

Figure 29: Follow-up register format, page 1

MONTHLY FOLLOW-UP VISIT

NAME : _____ AGE : _____ GUARDIAN'S NAME & RELATION : _____

ADDRESS : _____ GENDER (M/F/OTHER) : _____ DATE OF DIAGNOSIS (DD/MM/YYYY) : _____

_____ CONTACT NUMBER 1 : _____ CONTACT NUMBER 2 : _____

VISIT	DATE OF VISIT (DD/MM/YYYY)	PHYSICAL EXAMINATION								SYMPTOMS EXPERIENCED IN THE LAST ONE MONTH (Please (✓) all the symptoms that were experienced)										SMBG EVALUATION			
		Height (in cm)	Weight (in Kg)	BMI (kg/m²)	Blood Pressure (mmHg)	Random Blood Sugar (mg/dL)	Growth Parameters Assessed? (to be checked twice a year) (✓/X)	Injection site checked (✓/X)		Polyuria (excessive urination)	Polydipsia (excessive thirst)	Weight loss /no weight gain (for those <14 years of age)	Vomiting	Abdominal Pain	Dizziness	Polyphagia (extreme hunger)	Blurred Vision	Weakness	Sweating	Number of readings in range out of total readings*	Number of days in range out of total days monitored	Number of hypo readings (<70 mg/dL)	Number of hyper readings (>200 mg/dL)
								Healthy	Unhealthy (tenderness, lipohypertrophy/ palpable swelling)														
Visit 1																							
Visit 2																							
Visit 3																							
Visit 4																							
Visit 5																							
Visit 6																							
Visit 7																							
Visit 8																							
Visit 9																							
Visit 10																							
Visit 11																							
Visit 12																							

*In range = SMBG readings between 70 mg/dL and 180 mg/dL

ANNUAL TESTS (To be done 5 years after diagnosis)

TESTS	Fundus examination	Foot examination	Urine albumin/ creatinine ratio	Serum creatinine	Thyroid Stimulating Hormone (TSH)	Lipid Profile		
						HDL Cholesterol	LDL Cholesterol	Triglycerides
Done (Y/N)								
Date								
Results								

Figure 30: Follow-up register format, page 2

SCHOOL NAME: _____

NAME OF SCHOOL TEACHER : _____ **PREVIOUS TREATMENT FACILITY :** _____

CONTACT NUMBER OF SCHOOL TEACHER : _____ **PREVIOUS INSULIN REGIMEN :** _____

ACUTE DIABETES COMPLICATIONS IN LAST ONE MONTH (✓/✗)			LABORATORY INVESTIGATIONS WITH RESULTS		INSULIN THERAPY (Daily Dose Prescribed)		TYPE 1 DIABETES SUPPLIES DISTRIBUTED					REMARKS	ASSESSED BY		
Diabetes Ketoacidosis (DKA)	Clinically significant / Serious Hypoglycemia#	Infections	HbA1c (%) (to be done every 3 months)	Any other tests done	Regular Insulin (IU/day)	Glargine Insulin (IU/day)	Regular Insulin (Qty)	Glargine Insulin (Qty)	Glucostrips (Qty)	Syringe 40 IU (Qty)	Syringe 100 IU (Qty)		Name	Designation	Signature

BG <54 mg/dL OR unconscious OR requiring external help/medical intervention

REFERRALS :

Date of referral	Referred to (Name of facility)	Reason for referral

NOTES :

SMBG logbooks to be filled by PLT1D/caregiver

Logbooks are crucial in managing T1DM because they serve as a detailed record of blood glucose levels, insulin doses, carbohydrate intake, and other relevant factors that affect blood glucose control. Systematically maintaining SMBG logbooks can help in the identification of patterns and trends in daily blood glucose levels, titration of doses and management of carbohydrate intake.

Please refer to chapter 6 for details on the SMBG logbook including – information to be filled in the SMBG logbook, SMBG rotation schedule, logbook format and cover page.

Referral to medical college or other healthcare facilities

Refer to chapter 4 for details on referral to medical college or other healthcare facilities.

Referral letters

Referral letters are formal communications between healthcare providers that facilitate the transfer of care. These letters ensure seamless continuity of care, offer context to the receiving doctor, and assist in coordinating specialized treatments or additional investigations as required. The final pages of the SMBG logbook will include a standardized referral letter template, designed to facilitate communication between referring and referral doctors, and maintain all data within the same book regardless of where the individual receives care.

It will contain the following headers:

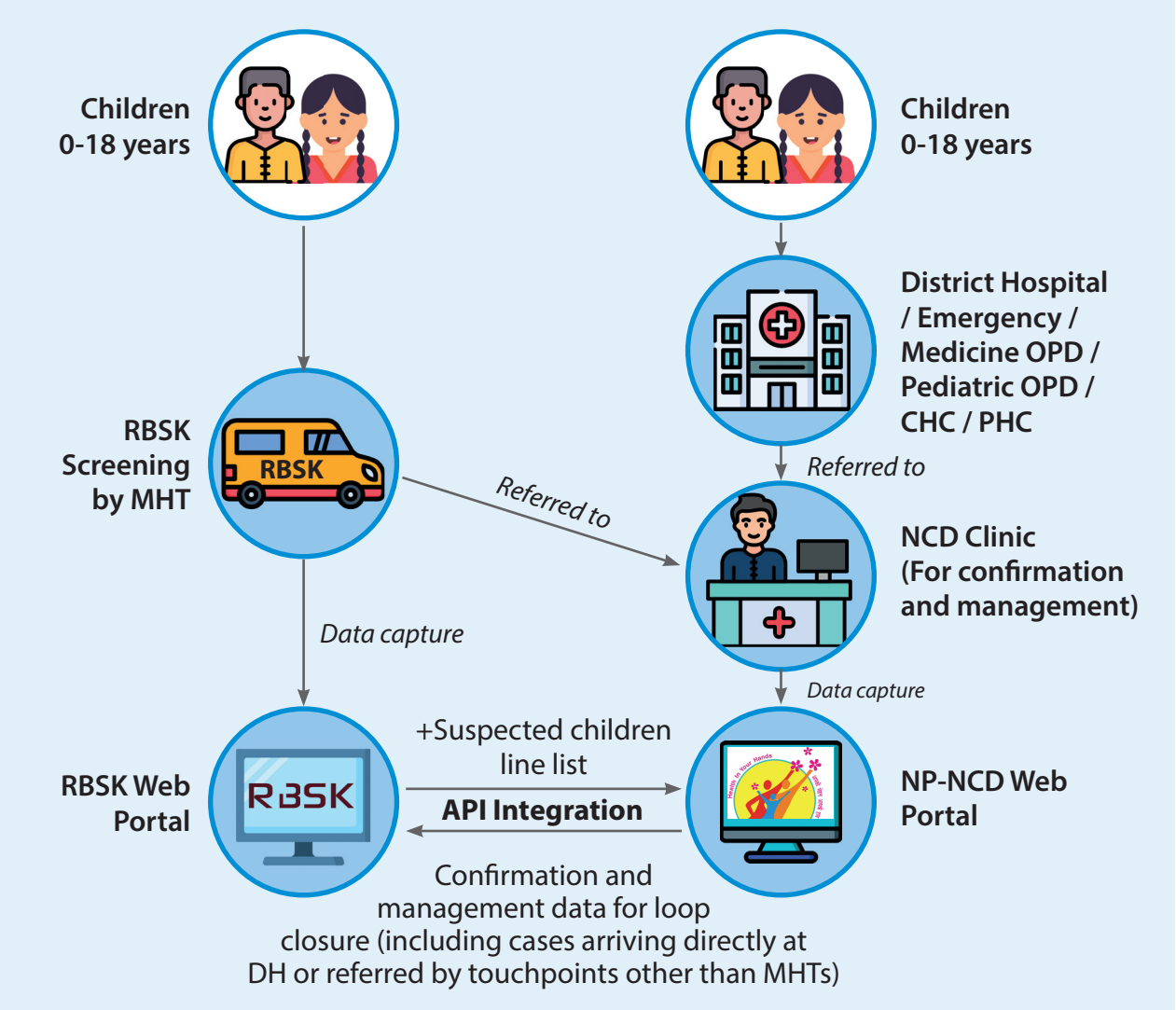
- Date of referral
- Referred by (facility and doctor's name)
- Referring to (facility and doctor's name)
- Reasons for referral
  - Emergency event
  - Comorbidity
  - Uncontrolled glycemic control
  - To follow up on existing care plan and dispense insulin
- Current insulin regimen
- Number of emergency events in past 1 year:
  - DKA
  - Hypoglycemia
  - Any other emergency event
- Remarks

Data capture and sharing

API linkages to be established between the RBSK portal and the NCD portal to facilitate comprehensive data capture and seamless data sharing between the two programmes. Mobile Health Teams to enter the data of any child or adolescent screened positive for diabetes and referred to the NCD clinic onto the RBSK portal, from where the details of such individuals to be pushed to the NCD portal to enable visibility for service providers at the NCD clinic.

The NCD clinic, after carrying out confirmatory diagnosis and enrolling individuals diagnosed with diabetes, to record the diagnosis results and enrollment data onto the NCD portal. Any case of diabetes in children presenting directly at the DH, whether through the emergency or OPD route, to also be recorded on the NCD portal, and this data should be shared with the RBSK portal through the API linkages. This mechanism will enable identification of individuals lost to follow-up post referral to the NCD clinic, facilitating timely follow-up action.

Figure 31: Data recording and sharing mechanism between RBSK and NCD portals



The majority of T1DM cases will present with the 4T symptoms and should be identified at any level of healthcare and referred appropriately to the DH urgently for emergency management where required and treatment initiation.

Chapter
12

Guidance for Parents, School Teachers, and School Health and Wellness Ambassadors

Learning objectives

1. Recognise the signs and symptoms of T1DM (4Ts) and the risk indicators of T2DM in children and adolescents, and describe the appropriate referral steps.
2. Explain the immediate first-aid response for hypoglycemia and DKA at the community and school level, including when to seek emergency care.
3. Describe the role of parents, school staff, and frontline health workers in supporting daily diabetes management, promoting a healthy environment, and providing psychosocial support to children living with diabetes.

Type 1 Diabetes Mellitus

1. Identification of T1DM in community / primary health centres

- Recognising red-flag symptoms (4Ts): frequent urination, drinking excessive water, unexplained tiredness, sudden weight loss
- Noticing changes in academic performance or behaviour

2. Emergency response training

Hypoglycemia first-aid

- Symptoms: sweating, tremors, irritability, headache, confusion
- Immediate action: Give glucose tablets, honey
- If unconscious: Place in recovery position and call for medical help immediately; smear honey on buccal mucosa

DKA early signs

- Symptoms: rapid breathing, vomiting, abdominal pain, fruity breath
- Action: Arrange immediate referral to DH; inform MHT/parents

3. Support for daily diabetes management

- Allowing glucose checks and insulin administration as needed
- Ensuring access to clean drinking water
- Preventing missed meals or prolonged fasting during exams/sports
- Knowing the child's personalised care plan (provided by NP-NCD clinic)

4. Psychosocial support

- Identifying signs of distress or bullying
- Encouraging inclusion in sports and activities with appropriate precautions
- Maintaining confidentiality and dignity of the child

Type 2 Diabetes Mellitus

In case of T2DM (and other metabolic conditions), there should be a strong emphasis on health promotion focused on preventive education and sensitisation.

1. Basic understanding of T2DM

- T2DM can occur in adolescents, especially those who are overweight or physically inactive
- It develops gradually and is often asymptomatic in early stages
- Early lifestyle changes can prevent or delay diabetes

2. Identify high-risk children

Parents, school teachers and School Health and Wellness Ambassadors should watch for the following signs. If any child screens positive, a RBG test should be performed.

- Overweight or obesity
- Darkened skin around neck or armpits (acanthosis nigricans)
- Persistent tiredness or low participation in physical activities
- Family history of diabetes (if known)
- Adolescent girls with irregular periods or features suggestive of PCOS

3. Promote healthy lifestyle practices in community/schools

Physical activity

- Ensure at least 60 minutes of physical activity daily (sports period, yoga, drills)
- Encourage participation of overweight students without stigma
- Reduce prolonged sitting during school hours

Healthy eating environment

- Discourage sugary drinks and junk food within school premises
- Promote water, fruits, and healthy snacks
- Support healthy mid-day meal practices where applicable

Screen time and behaviour

- Encourage adequate sleep and regular meal timings

4. Referral and linkage

- Health personnel/school staff/parents to promptly inform MHT/RBSK teams when high-risk children are identified
- Facilitate referral and communication with parents
- Encourage families to attend DH NCD clinic for assessment

5. Psychosocial support

- Avoid labelling or isolating overweight children
- Address bullying related to body weight or appearance
- Encourage confidence, participation, and inclusion

6. Key messages for students (age-appropriate)

- Being active every day keeps the body healthy
- Eating less junk food helps prevent future illness
- Healthy habits started early protect you for life

Chapter 13

Roles and Responsibilities

The MHTs under RBSK are responsible for screening of children and adolescents in school and Anganwadi settings for DM. Any person under the age of 18 screened positive for signs, symptoms or risk factors for T1DM or T2DM should be referred to the DH NCD clinic, where they will undergo diagnosis. The NCD clinic is responsible for enrolling children and adolescents diagnosed positive for T1DM and T2DM, initiating treatment, provision of essential drugs and commodities, follow-up care, education and counselling, and other components of holistic diabetes care.

The following table lists the responsibilities of public functionaries across different tiers of the public health system in operationalizing these care guidelines for DM among children and adolescents:

Table 27: Roles and responsibilities for screening and management of DM in children and adolescents

Level	Stakeholder	Key roles and responsibilities
State level	State NCD cell	• Implement national guidelines and disseminate to districts • Operationalize weekly clinic for DM among children and adolescents integrated within the NCD clinics at all DH • Facilitate availability of insulin and other essential commodities at the NCD clinics, for in-facility use and home provision to children and adolescents living with DM • Identify dedicated human resources for the NCD clinics as per the guidelines and ensure they are capacitated to provide T1DM and T2DM care • Conduct periodic state-level reviews • Strengthen convergence betweenMHTs and NCD clinics • Development of monitoring competencies and training delivery skills of district level trainers • Data management and analysis • Checking completeness of data coming from districts through the NCD portal and and ensuring sharing of data with the RBSK web portal through API
	State RBSK cell	• Implement national guidelines and disseminate to districts • Facilitate training of MHTs and other human resources under their ambit • Conduct periodic state-level reviews • Strengthen convergence between MHTs and NCD clinics • Data management and analysis • Monitoring and supervision
		• Checking completeness of data coming from districts and ensuring sharing of data through API linkages with the NCD portal

Level	Stakeholder	Key roles and responsibilities
District level	District NCD officer	• Facilitate operationalization of weekly clinic for DM among children and adolescents integrated within the DH NCD clinics • Assess availability of adequate infrastructure and make necessary arrangements • Identify named staff in each of these clinics as per the guidelines and ensure they are capacitated to diagnose suspected cases and provide necessary care • Monitor availability of insulin and other essential commodities • Facilitate availability of diabetes education services • Monitor data recording by the NCD clinics • Conduct supervisory visits with RBSK team • Sensitization of ANMs and ASHAs to facilitate awareness generation about DM among children and adolescents at the community level • Spreading information about DM among children and adolescents to PHCs and sub-centers through leaflets/ pamphlets/ posters
	RBSK district coordinator	• Facilitate T1DM and T2DM screening via MHTs • Ensure availability of logistics for screening • Supervise MHT schedules, data quality, and referral follow-up • Facilitate linkage between MHTs and NCD clinics • Review monthly data and check completeness • Monitor overall service delivery process
Facility Level	Mobile Health Team (RBSK)	• Screen children and adolescents at Anganwadis and schools for T1DM/T2DM • Perform RBG testing for symptomatic children • Refer children screening positive for DM or exhibiting risk factors of T2DM to the NCD clinic • Record the details of individuals screening positive with symptoms of DM onto the RBSK portal
	RKSK counsellors	• RKSK counsellors shall accompany MHTs during school visits to provide counselling support for children identified and living with DM • Psychosocial support to children living with DM to address bullying related to body weight or appearance • Lifestyle counselling to children at risk of developing T2DM encourage adequate sleep and regular meal timings

Level	Stakeholder	Key roles and responsibilities
	DH NCD clinic team	**Doctors (pediatrician, physician/medical officer):** • Screening, diagnosis, management and follow-up of person living with T1DM/T2DM • Real-time data keeping • Facilitate education and counselling of children and adolescents with T1DM/T2DM and their caregivers **Designated Nursing Staff:** • Creating list of beneficiaries • Registration of children and adolescents diagnosed with DM under the programme • Dispensing of insulin and other consumables • Stock maintenance • Monitoring follow-up visit adherence in case of PLT1D **NCD counsellor/nutritionist/clinical psychologist** • Counselling of children and adolescents diagnosed with diabetes, and their parents on OPD basis • Providing structured diabetes education • Providing psychological support **Data entry operator** • Data entry • Maintenance of NCD portal data • Reporting of data to District NCD cell
School level	School teachers/nodal teachers	• Report symptomatic children to MHTs • Create supportive school environment for children with T1DM/T2DM
	Health & Wellness Ambassadors (HWA) / messengers of School Health and Wellness Programme and Peer Educators in RKSK	• Support RBSK MHTs during school visit for health screening and assist with referrals • Follow-up and compliance for treatment for students identified with DM • Document signs and symptoms: excessive thirst, fatigue, frequent toilet use, weight loss • Aid in prior prelisting of students living with T1DM/T2DM based on day-to-day interaction and share the same with RBSK MHT • Ensure communication with parents during Parent Teacher Meeting (PTM) or otherwise regarding medical condition • Be aware of red flag signs of hypoglycemia and emergency protocols • Lifestyle counselling to children at risk of developing T2DM
Primary care/ community level	CHOs, ANMs, ASHAs	• ASHAs to fill up CBAC form • Enumeration of eligible population • Health promotion and awareness generation • Follow-up with PLT1D/PLT2D on treatment • Support in screening and documentation

* All human resources at the proposed weekly clinics for DM among children and adolescents (integrated within the DH NCD clinic, involved in this programme, must be named individuals with dedicated job responsibilities and accountability.

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Annexures

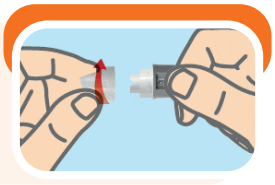
Annexure 1

Using a Lancing Device for Blood Glucose Measurement

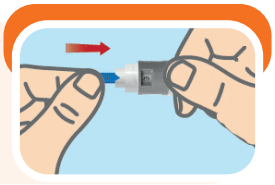
Preparing the lancing device

For fingertip sampling, adjust the depth penetration to reduce discomfort.

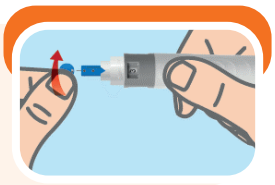
1 Unscrew the lancing device cover from the body of the lancing device. Insert a sterile lancet into the lancing device.



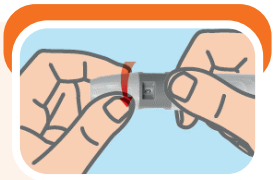
2 Hold the lancet firmly in the lancing device and twist the safety tab of the lancet until it loosens, then pull the safety tab off the lancet. Save the safety tab for used lancet disposal.



3 Carefully screw the cover back onto the lancing device. Avoid contact with the exposed needle. Make sure the cover is fully sealed on the lancing device.



4 Adjust the puncture depth by rotating the lancing device cover. There are several different puncture depth settings. To reduce discomfort, use the lowest setting that still produces an adequate drop of blood.

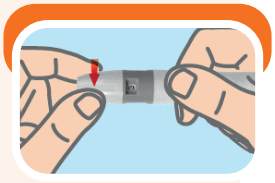


ADJUSTMENTS:

1 — for delicate skin

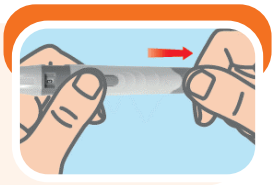
2 & 3 — for normal skin

4 & 5 — for calloused or thick skin



Note: Greater pressure of the lancing device against the puncture site will also increase the puncture depth.

5 Pull the cocking barrel back to set the lancing device. You may hear a click to indicate the lancing device is now loaded and ready for obtaining a drop of blood.



Annexure 2

List of Equipment and Logistics Required for Screening and Management of DM in Children

A. Equipment and logistics for screening required by RBSK MHTs

One time	Recurring
• Weighing scale • Stadiometer • Age and gender-specific charts for BMI • Sharps disposal box • Glucometer • Lancing device/pen	• Blood glucose strips (compatible with available glucometer) • Lancets/needles • Alcohol swabs • Glucometer batteries • Yellow bag for biomedical waste • Screening formats

B. Equipment required for clinical management at DH / NCD Clinic

One time	Recurring
• Stethoscope (with child-size chest piece) • BP machine including child-size cuff • Infantometer • Stadiometer • Weighing scale • Measuring tape • 10gm monofilament • Tuning fork 256Hz • Neurological reflex medical hammer • Ophthalmoscope • Sharps disposal box • Fridge (to store insulin vials) • Age and gender-specific charts for BMI and BP • Table and chair for service providers • Revolving patient stool • Examination bed and curtain • Computer (for real-time data entry and record keeping) with printer and internet services	• Glucometer and blood glucose strips (for provisioning to T1DM patients) • Insulin syringes/pens 100 IU and 40 IU (to be provided along with compatible insulin formulation) • Lancet and needles • Urine dipstick for protein, glucose and ketones

Annexure 3

Transitioning to Basal-bolus Insulin Regimen

The basal-bolus regimen is the recommended regimen for T1DM management. All PLT1D should be shifted to this regimen, irrespective of their age or glycemic control. The steps below provide a rough transition plan to switch PLT1D from their current insulin regimen to the basal-bolus insulin regimen.

1. **Initial assessment:** An HbA1c test (HPLC method) should be conducted to assess the PLT1D's blood glucose control

2. Calculate the total daily dose (TDD) based on the PLT1D's age and weight. Start with the lowest recommended dose for their age group as outlined in the table below:

Age group	TDD	Starting dose
Pre-pubertal children (<13 years)	0.7 - 1.0 IU/kg/day	0.7 IU/kg/day
Puberty and above (≥13 years)	1.0 - 1.5 IU/kg/day	1.0 IU/kg/day

3. Once the TDD has been determined, it should be divided into basal and bolus doses. Typically, 30-40% of the TDD is allocated to basal insulin, and the remaining is distributed among bolus doses administered before major meals.

Dose	Insulin type	% of TDD	Injections per day	Timing
Basal insulin	Long-acting (Glargine)	30-40%	1	Bedtime
Bolus insulin	Short-acting (Regular insulin)	60-70%	3 (Number of injections should change as per meals)	Before each meal

4. Educate and counsel the PLT1D and/or their caregiver on the following topics:

Education topics	Key themes	Key messages
Why the transition?	Discuss benefits of basal-bolus regimen over other regimens, including: • More physiological • Better glycemic control • Lower risk of developing long-term complications	• The basal-bolus regimen replicates how the body naturally releases insulin, helping keep blood sugar levels steady • While the basal-bolus regimen involves more injections, it helps reduce the risk of serious long-term complications, like nerve, kidney and eye damage
Insulin administration	• Types of insulin used • Injection timings and number of injections • Administration and storage technique • Insulin sites and site rotation	• This regimen includes two types of insulin: rapid / short-acting insulin taken before meals that works for 2-3 hours, and long-acting insulin taken at bedtime that lasts for approximately 24 hours • Any insulin dose or major meal should not be skipped • Insulin can be injected in the arm, abdomen, thigh, or buttocks • Sites must be rotated to avoid hardening of the skin and ensure proper insulin absorption
Self-monitoring of blood glucose levels (SMBG)	• SMBG timing and frequency • Target blood glucose levels • How to maintain a logbook • Management of hypoglycemia and hyperglycemia	• Regularly checking and recording blood glucose levels helps monitor how the body responds to insulin, adjust doses if needed, and avoid high and low blood glucose levels

Sick day management	• Adjusting insulin doses on sick days • SMBG frequency on sick days	• Never stop taking insulin on sick days. Adjust the dose based on blood glucose levels and food intake. • Monitor BG levels every 3-4 hours. If home monitoring is not possible, visit a healthcare facility for regular testing.

5. The PLT1D and/or their caregiver should be instructed to perform SMBG at least 3-4 times a day. Target blood glucose ranges must be clearly communicated. A follow-up visit should be scheduled within 1-2 weeks, and the PLT1D should be advised to bring a duly completed SMBG logbook.

6. At the follow-up visit (after 1-2 weeks), the SMBG logbook should be reviewed systematically to assess glycemic patterns and make any necessary adjustments to insulin doses.

7. If insulin dose adjustments are made, the PLT1D should be scheduled for another follow-up visit within 2 weeks. Once blood glucose levels have stabilized, follow-up visits may be conducted on a monthly basis.

Annexure
4

IEC Material

Poster on signs and symptoms of T1DM in English

स्वास्थ्य एवं परिवार कल्याण मंत्रालय
MINISTRY OF HEALTH AND FAMILY WELFARE

RBSK

Signs of Type 1 Diabetes

Watch out for one or more of the **4Ts**

Thirsty

Tired

Toilet

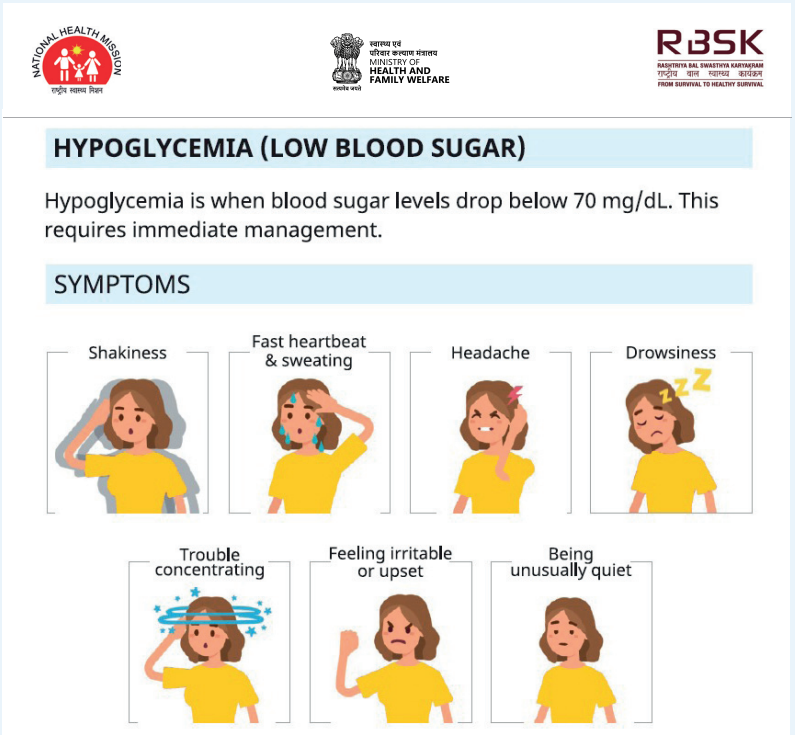
Thinner

If a child presents with any of the 4Ts, refer to nearby health facility for further evaluation.

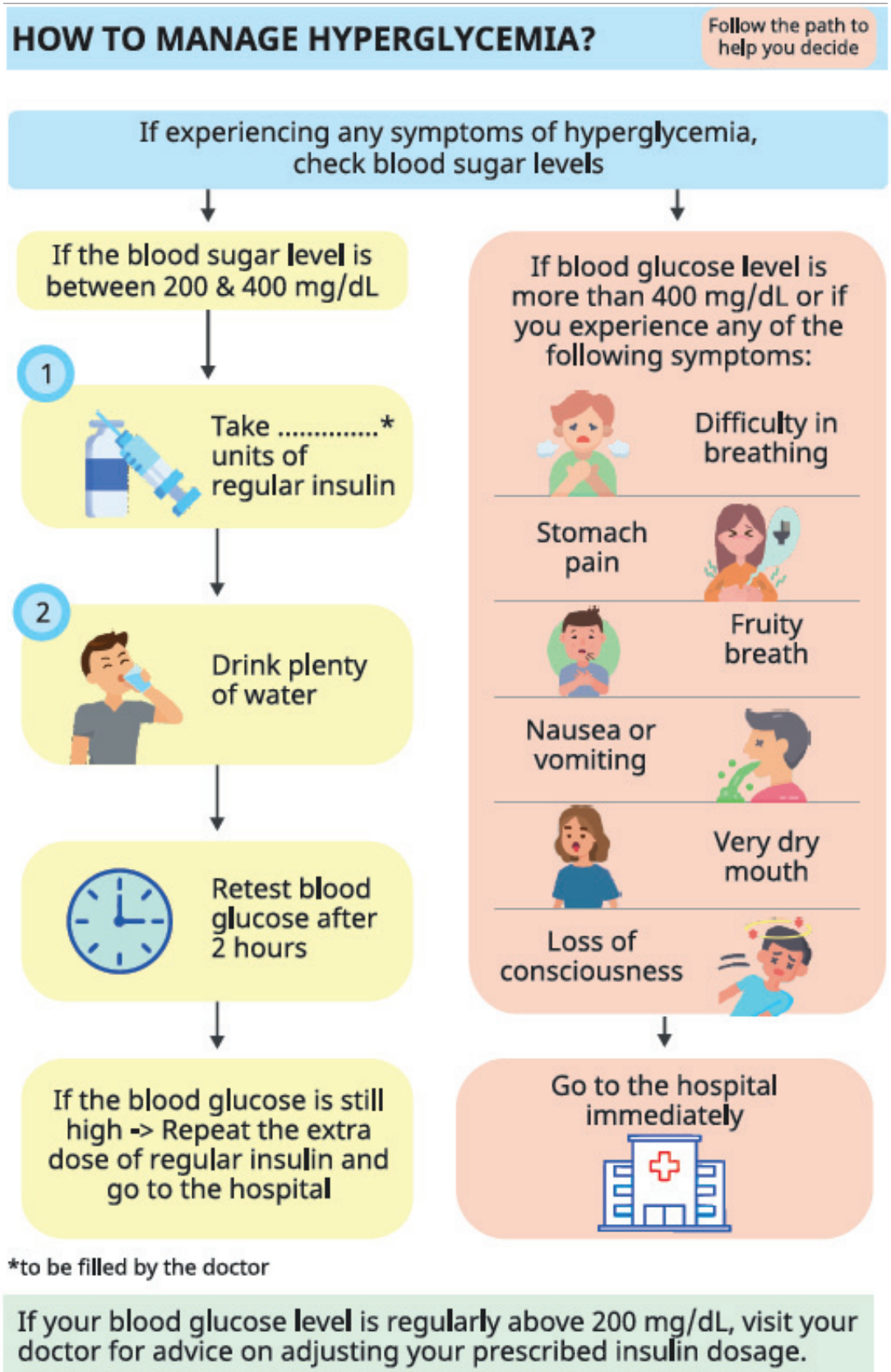
Type 1 Diabetes can be detected using a simple blood glucose test

Poster on signs and symptoms of T1DM in Hindi

Hypoglycemia symptoms



Hyperglycemia management poster



Annexure 5

Hypoglycemia, Sick Day Management and Carbohydrate Counting Guidance

Hypoglycemia management

STEP 1

Give fast acting glucose immediately – 3-4 teaspoons of sugar or honey (if unconscious, smear honey on buccal mucosa)

STEP 2

a If hypoglycemia is caused by a missed meal or snack (but insulin has been taken as usual), follow with a meal or snack including an appropriate amount of carbohydrates. Re-test blood glucose 10-15 minutes after treatment, to confirm the BG level is within normal limits (> 100 mg/dL, 5.5 mmol/L). If the BG level remains low or symptoms persist, repeat Step 1. Once hypoglycemia is corrected, the child must have a carbohydrate containing snack since effect of acute treatment is not sustained.

b If the patient is unconscious or convulsing and unable to take anything by mouth, lie them on their side and keep their airway clear – i.e. the ABC of resuscitation – airway, breathing, circulation.

Severe hypoglycemia with loss of consciousness ± convulsions (or if the child is vomiting) Give intravenous glucose carefully and slowly over several minutes, using 10% or 25% glucose/dextrose solution. Total dose over a several minutes is 0.2-0.5 g/kg of glucose/dextrose (2-5 ml/kg of 10% glucose, 1-1.5 ml/kg of 25-30% glucose).

Sick day management:

1. Do not stop insulin during sick days, even though the child is ill and not eating normally. The insulin dose may need to be adjusted, based on the BG level and food intake, but insulin should not be stopped. If there are no facilities for home monitoring of glucose and ketones, the child should be taken to a healthcare facility for regular testing.
2. Evaluate and treat the acute illness
3. Increase SMBG frequency to 3–4 hourly (and more frequently if the glucose level fluctuates widely or changes rapidly)
    - Monitor ketones 1-2 times per day if possible
    - If blood glucose is high with ketones, more insulin is needed
    - If blood glucose is low with ketones, (i.e. "starvation ketosis") more sugary drink is needed before extra insulin can be given
    - If home glucose and/or ketone monitoring is unavailable, contact DH
4. Supportive care includes:
    - Adequate fluid intake. Fever and hyperglycemia can cause increased fluid losses. Oral rehydration fluid provides a source of both fluid and energy
    - Easily digested food when there is loss of appetite
    - Treat fever with antipyretics and treating/prevent vomiting by frequently offering small volumes of fluid
    - Admit the child to a healthcare facility if these supportive measures cannot be ensured as an out-patient
5. Additional insulin is usually necessary to control blood glucose (unless the illness causes hypoglycemia)
    - **Elevated blood glucose results, with absence or small amount of ketones:** Give 5-10% of total daily dose of insulin (or 0.05-0.1 IU/kg) as short or rapid-acting insulin repeated every 2-4 hours. Total daily dose is the sum in units of all insulin injections on a normal day.
    - **Elevated blood glucose results with moderate or large amount of ketones:** Give 10-20% of total daily dose of insulin (or 0.1 IU/kg) as short or rapid-acting insulin (if available) repeated every 2-4 hours
6. When vomiting occurs in a child with T1DM it should always be considered a sign of insulin deficiency (impending ketoacidosis) until proven otherwise
7. Strenuous exercise should be avoided

8. Consider admission under the following circumstances:
    - Very young children with diabetes, who may become dehydrated more rapidly than older children or adolescents
    - Nausea or vomiting that prevents the child from drinking
    - PLT1D's and/or caregiver's inability to check blood glucose at home
    - If supportive care cannot be ensured at home
    - If the acute illness is severe
    - If there is persistent ketonuria

Carbohydrate counting

Insulin to carbohydrates Ratio (ICR)

The ICR (amount of carbohydrates in grams covered by 1 unit of insulin) is calculated, individualized according to age, sex, pubertal status, duration of diagnosis, and activity. This lets patients adjust their prandial (mealtime) insulin dose according to carbohydrates consumption.

Methods of quantifying carbohydrates include:

- Gram increments of carbohydrates
- 10–12 g carbohydrates portions
- 15 g carbohydrates exchanges

The "500-rule" can be used as a first estimate for ICR, which then is adjusted according to the individual response of the child. Divide 500 by the Total Daily Dose (Total Daily Dose is the sum in units of all insulin injections on a normal day) to find ICR. Fine-tuning of insulin dosage can then be guided by SMBG. Regular review is necessary as children grow and new foods are introduced.

Annexure 6

Technical Specifications for Glucometer to be Used by PLT1D for At-Home Monitoring

Characteristics	Description
Scope	
Intended use	For testing either at point-of-care or self-testing by a layperson for quantitative measurement of blood glucose
Target operator	Adult and pediatric
Target population	Single-patient self-testing and/or multiple-patients point-of-care testing
Target setting	All levels of healthcare
Safety and standards	
Quality management	ISO 15197: 2013 requirements for blood glucose monitoring systems for self- testing in managing DM At least 95% of SMBG results must be within ±15 mg/dL at glucose concentration < 100 mg/dL and within ±15% at ≥ 100 mg/dL. In a consensus error grid analysis, at least 99% of results must be within zones A and B
Technical and operational characteristics	
Linear range	Measurement range < 30 to 400 mg/dL (1.7 to 22.2 mmol/L), preferably 20 to 500mg/dL (1.1 to 27.8 mmol/L)
Accuracy	Stability of analytical performance should be maintained throughout the measurement of analyte

Characteristics	Description
Results format	Quantitative across whole linear range (should be able to switch between mg/dL and mmol/L)
Results unit	mg/dL or mmol/L
Results time	Single-testing: less than 30 seconds Point-of-care: less than one minute
Precision	Repeatability CV < 5.0%
Sample	Capillary whole blood
Sample volume	Less than 15 µl
Principle of assay	Enzymatic method
Test limitations	Hematocrit acceptable range at least from 30% to 55% (better from 15% up to 65%)
Internal quality control	Automatic meter calibration check
External quality control	External Quality Assessment (EQA) material shall be run from a National EQA provider (when available)
Transport stability of kit/reagents	5°C to 35°C (better if up to at least 40°C)
Storage stability of kit/reagents	5°C to 35°C (better if up to at least 40°C)
Shelf-life of kit/reagents upon manufacture	At least 12 months expiry date (better: 18 months) from date of production (better: from date of supply)
Remaining shelf-life of kit/reagents upon delivery	Minimum of 2 (better 3 or more) months shelf life after opening strip vial
Physical characteristics	
Size of device (height × width × depth)	Handheld device (6 cm × 12 cm × 3 cm)
Weight of device	< 0.5 kg including batteries
Operating conditions	10°C to 40°C (better at least: 5°C to 45°C)
Storage conditions	at least -5°C to 50°C (better at least: -10°C to 55°C)
User interface	LCD display

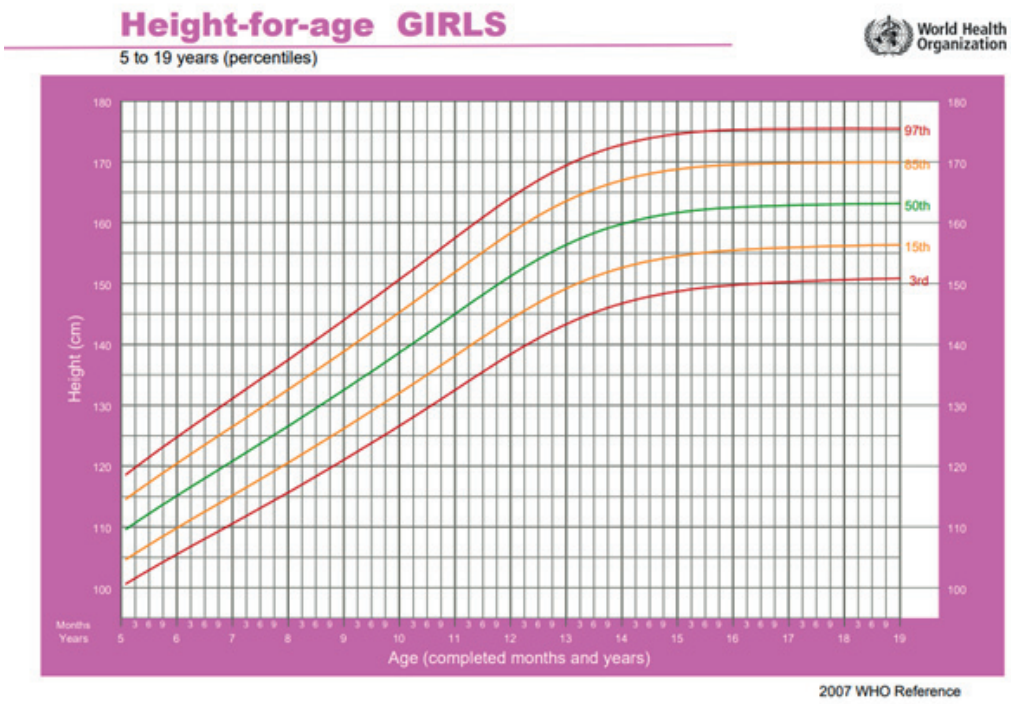
Characteristics	Description
Displayed parameters	Digital display of test results
Built-in memory storage capacity	Single-testing: 100 test results and 5 control results Point-of-care: 300 test results and 10 control results
Diagnostic connectivity	Capabilities for data transmission and storage via USB, Bluetooth, cable
Energy source	
Power source	Operated by internal battery without any memory loss if batteries are removed. Batteries may be single use, or rechargeable (preferred) with external AC battery charger, or by USB connection.
Power requirements	100-240 V (± 10%)/ 50-60 Hz (country dependent) for rechargeable devices
Time to battery charge	< 3 hours
Battery duration	Single-testing: 100 tests Point-of-care: 600 tests
Alternative charging options	Solar
Accessories, consumables and spare parts	
Kit component	All reagents, accessories and consumables (test strips, single-use lancets) to have a "ready to start" system shall be provided by manufacturer. At least strips but also the other consumables/accessories should be available in the local market.
Number of test strips	50
Spare parts	Spare compatible batteries
Documentation	
Instrument operator manual	Required Must be translated in local languages
Instructions for use	Required

Characteristics	Description
Certificate of analysis	Required
Material safety data sheet	Required
Environmental and safety standards	
Hazardous classification	Clearly document potential source of harm in kit inserts
Disposal requirements	Required
Training, installation and utilization	
Requirements for installation and calibration	Power requirement 100-240 V (± 10%)/50-60 Hz for rechargeable devices Device is fully automatic and it shall be provided already calibrated automatic shutoff function
Training of users	Manufacturers shall provide training details related to use and maintenance of the device Preferable: video tutorial
Warranty and maintenance	
Warranty	Minimum of two (2) years warranty from the date of purchase
Preventive maintenance	Can be cleaned and disinfected easily
Decommissioning	
Estimated lifespan	Minimum 5 years

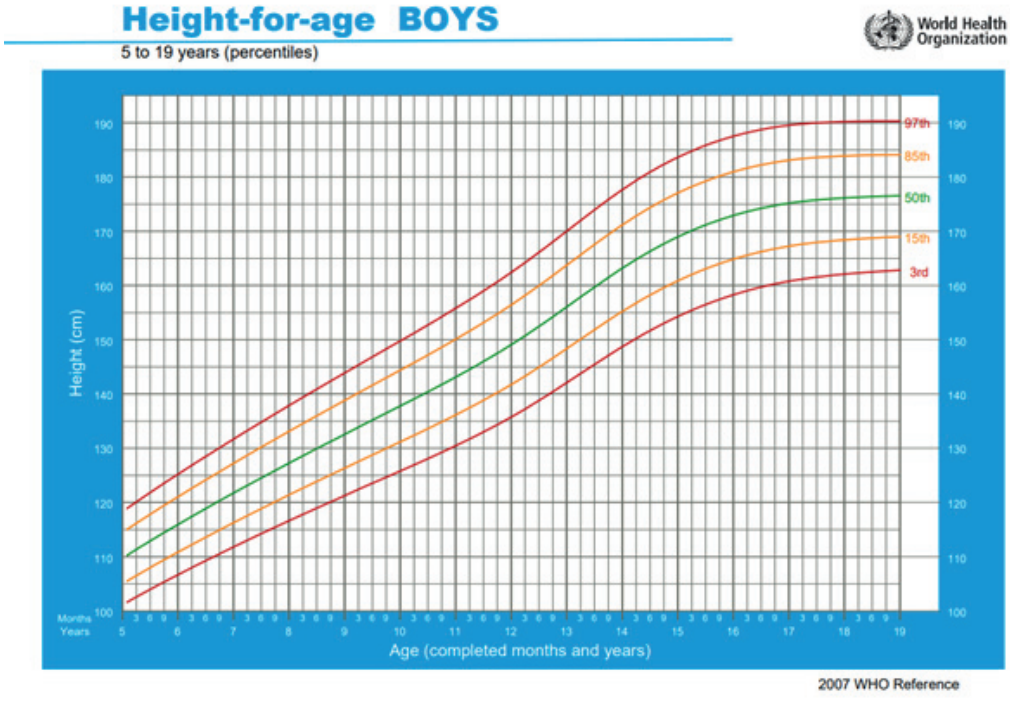
Annexure 7

Anthropometric Charts: BMI, Height and Weight

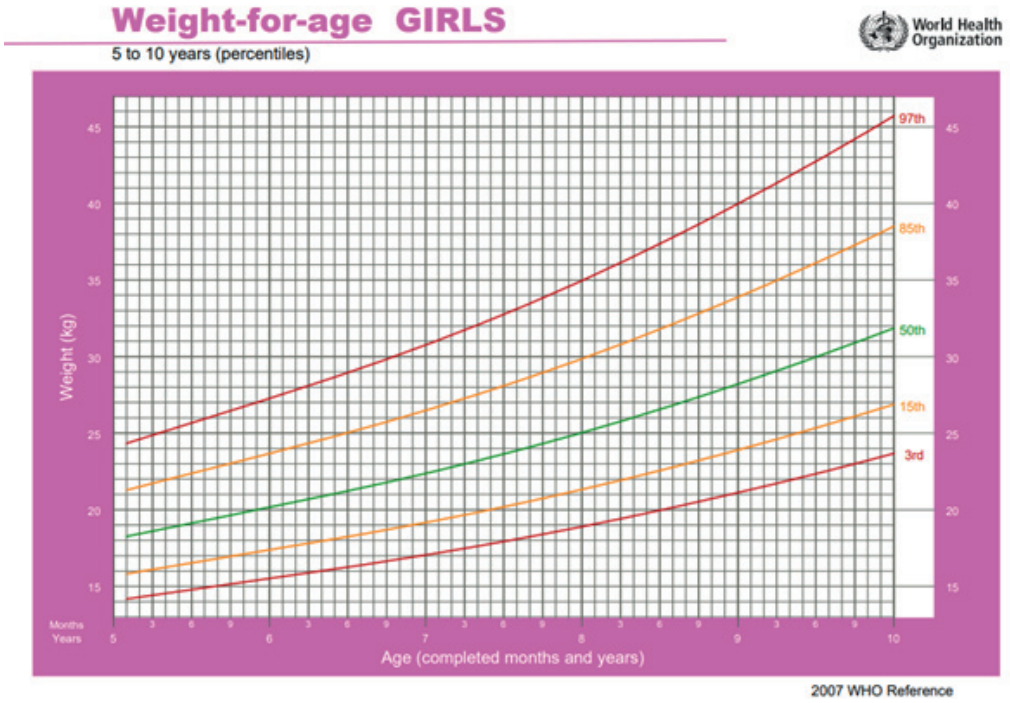
WHO chart for BMI-for-age for girls (5-19 years)



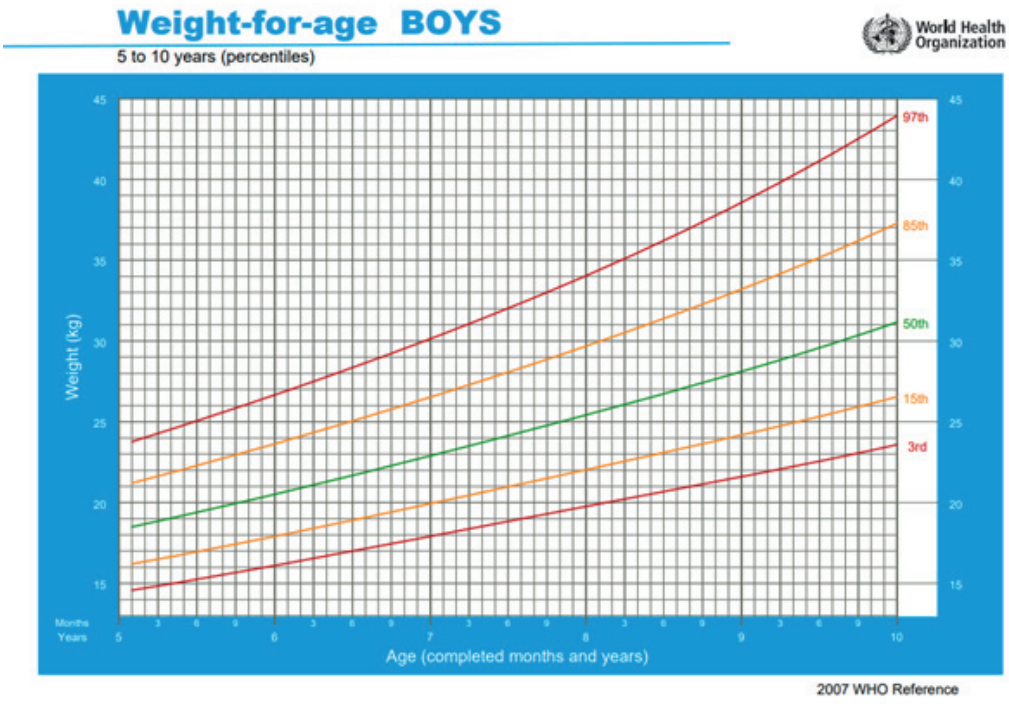
WHO chart for BMI-for-age for boys (5-19 years)



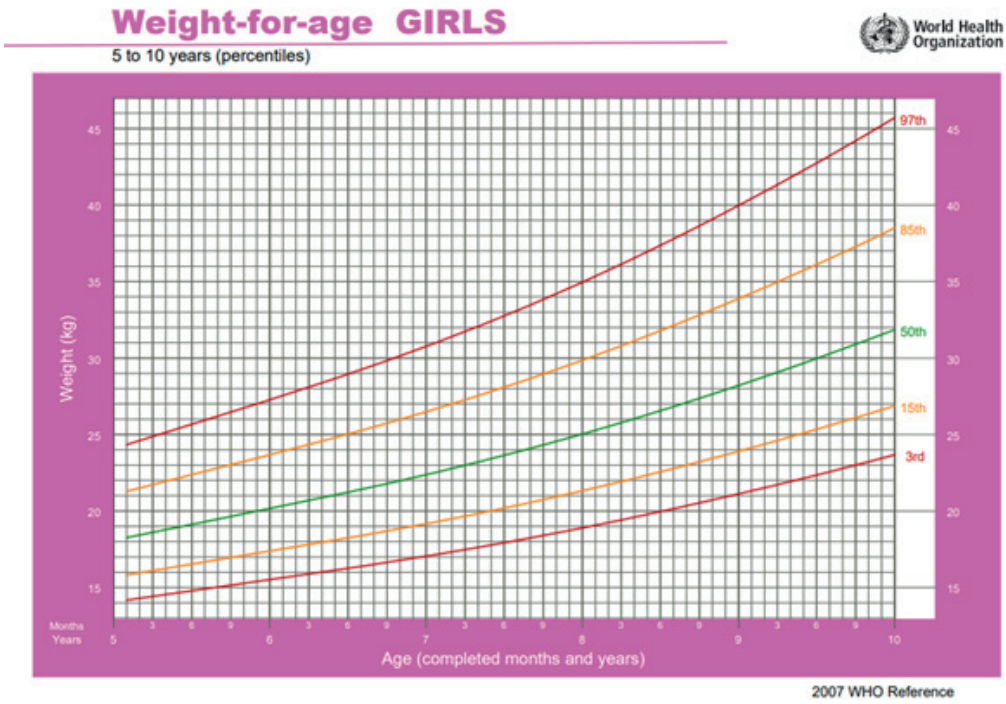
WHO chart for height-for-age for girls (5-19 years)



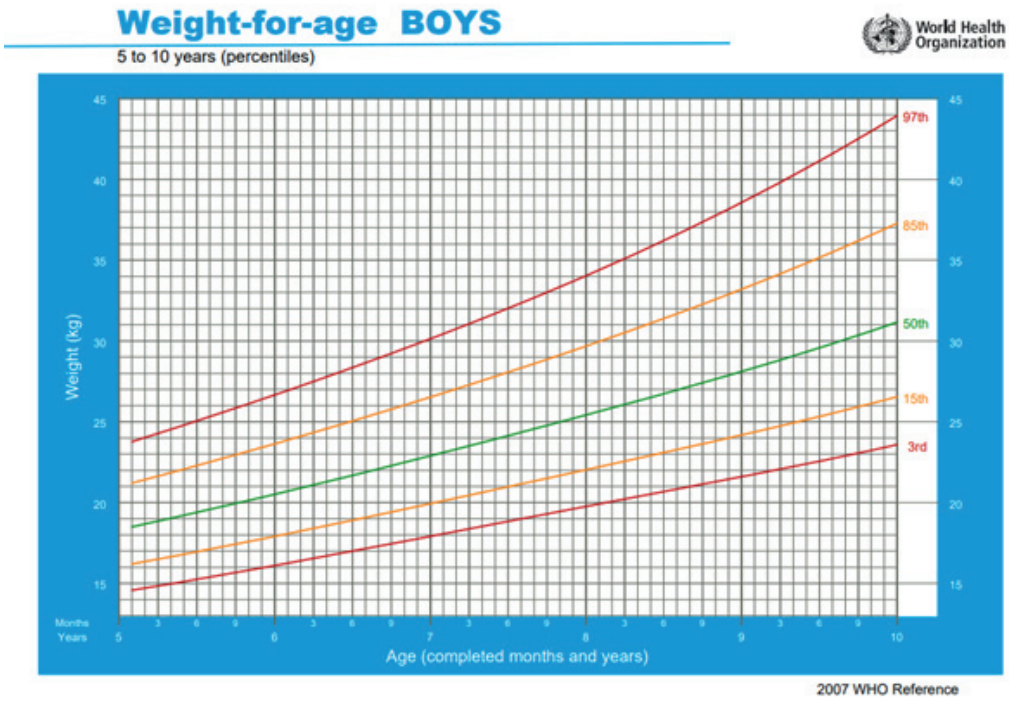
WHO chart for height-for-age for boys (5-19 years)



WHO chart for weight-for-age for girls (5-10 years)*



WHO chart for weight-for-age for boys (5-10 years)*



*Weight-for-age reference data are not available beyond age 10 because this indicator does not distinguish between height and body mass in an age period where many children are experiencing the pubertal growth spurt and may appear as having excess weight (by weight-for-age) when in fact they are just tall.

Annexure
8

Sensitization of All Healthcare Professionals at All Levels of Healthcare

Early detection and management of DM in children under RBSK requires sensitization of all healthcare professionals (HCPs) across all levels of care, including ASHAs, ANMs, CHOs, MHTs, PHC/CHC staff, and DH teams.

All healthcare professionals must be trained to identify, respond, and act promptly in both children without a known diagnosis of diabetes and children with an established diagnosis of DM, with clear referral pathways.

A. Children WITHOUT known diagnosis of DM

1. Identify: 4Ts campaign (prompt recognition of signs and symptoms)

- Toilet- Frequent urination/bedwetting
- Thirsty- Excessive thirst
- Tired- Unexplained fatigue
- Thinner- Unexplained weight loss

Any child presenting with one or more of these symptoms should be considered at risk

2. Test: check Random Blood Glucose

- Perform RBG using a glucometer and blood glucose test strips
- This should be done at the point of contact (school, community, PHC, outreach)

3. Refer: urgent referral pathway

- If RBG ≥ 200 mg/dL and/or presence of symptoms, immediately refer to DH Emergency/Pediatrics Ward/ Medicine Ward and thereafter refer to DH NCD clinic for routine management and follow-up.
- Referral must be on the same day, without delay, and clearly communicated to caregivers.

B. Children WITH known diagnosis of DM

All HCPs should be trained in basic triage, emergency management, and immediate action, even if definitive management is done at higher centres.

1. Routine situation: ensure continuity of care

Reiterate:

- Adherence to insulin/medications
- Regular blood glucose monitoring
- Follow-up at DH NCD clinic
- Sick day rules

Refer to DH/NCD clinic if: Missed follow-up, Poor control suspected, Any complications

2. Low blood sugar (hypoglycemia)

Recognize symptoms:

- Sweating
- Tremors
- Confusion
- Drowsiness/unconsciousness

Management at first contact:

- If child is conscious: Give oral glucose/sugar solution/sweet drink immediately.
- If unconscious or unable to take orally: Do NOT give orally, smear honey on buccal mucosa, urgently refer to DH.
- After initial correction: Refer to DH/NCD clinic for further evaluation.

3. High blood sugar (hyperglycemia)

Recognize symptoms:

- Excessive thirst
- Frequent urination
- Vomiting
- Abdominal pain
- Weakness

Immediate steps:

- Check blood glucose (if possible)
- Encourage oral fluids (if conscious)
- Refer to DH NCD clinic

- Reiterate sick day rules

4. Diabetic Ketoacidosis (DKA) - medical emergency

Recognize danger signs:

- Persistent vomiting
- Severe abdominal pain
- Rapid/deep breathing
- Fruity breath
- Altered consciousness

Action:

- URGENT referral to DH (emergency)
- No delay at any level
- Arrange transport if required
- Reiterate sick day rules

Key message: DKA is life-threatening; early referral saves lives

Sick day managment - Refer to annexure 5

Annexure 9

Do's and Don'ts for Screening and Management of Diabetes Mellitus in Children under RBSK

Do's

1. Screening and early detection

- Screen children using standardized RBSK checklist (symptom + risk-based)
- Identify symptoms suggestive of diabetes and perform on-the-spot RBG testing
- Test symptomatic children and high-risk adolescents (obesity + risk factors)
- Ensure proper technique, hygiene, and use of new lancet for each test

2. Referral

- Immediately refer children with RBG ≥ 200 mg/dL to DH NCD clinic
- Ensure time-bound referral, especially in suspected T1DM
- Counsel caregivers for urgent compliance with referral

3. Diagnosis

- Use standard diagnostic criteria (FBG, RBG, HbA1c)
- Do not repeat testing in symptomatic child with RBG ≥ 200 mg/dL
- Use C-peptide/autoantibodies only in uncertain cases
- Treat doubtful cases as Type 1 Diabetes until confirmed

4. Management of T1DM

- Initiate insulin immediately in all T1DM cases
- Prefer inpatient initiation at DH
- Use basal-bolus insulin regimen
- Provide caregiver education and counselling
- Ensure regular SMBG
- Provide all deliverables
- Maintain supply chain
- Ensure mini-pharmacy within clinic

5. Follow-up and continuity of care

- Ensure monthly follow-up at DH NCD clinic
- Monitor glycemic control and complications
- Maintain electronic registry and physical records
- Ensure continuum of care into adulthood

6. Program implementation

- Conduct training of all HCPs (ASHA, ANM, MHT, MO, etc.)
- Ensure availability of blood glucose meters, blood glucose test strips, insulin, and supplies
- Strengthen RBSK-NP-NCD integration
- Maintain data reporting and monitoring systems

7. Emergency situations

- Recognize hypoglycemia, hyperglycemia, and DKA
- Ensure immediate referral in life-threatening conditions

Don't's

1. Screening and testing

- Do not reuse lancets
- Do not compromise infection prevention and waste disposal protocols
- Do not perform RBG testing without indication (no symptoms/risk)

2. Referral and diagnosis

- Do not delay referral in children with RBG ≥ 200 mg/dL
- Do not wait for confirmatory tests before referral in symptomatic cases
- Do not perform OGTT when diagnosis is already established

3. Management

- Do not delay insulin initiation
- Do not withhold insulin while awaiting investigations

4. Insulin and supplies

- Do not interchange 40 IU and 100 IU insulin syringes
- Do not store insulin improperly (avoid heat/freezing)
- Do not dispense insulin outside designated clinic system

5. Program implementation and follow-up

- Do not allow stock-outs of insulin or essential consumables
- Do not allow interruption in follow-up care
- Do not neglect data entry, registry, and monitoring systems

Annexure
10

Frequently Asked Questions (FAQs) for Parents/Caregivers Managing Diabetes in Children

1. What is diabetes and can my child get it?

Yes, diabetes can affect children of any age. There are two main types - Type 1 Diabetes (T1DM), where the body stops producing insulin, and Type 2 Diabetes (T2DM), where the body does not use insulin effectively. T1DM is more common in children, while T2DM is increasingly being seen in adolescents, particularly those who are overweight or physically inactive.

2. How will I know if my child has diabetes?

Watch out for four key warning signs, easy to remember as the 4Ts - Toilet (frequently needing to use the toilet or bedwetting), Thirsty (drinking much more water than usual), Tired (feeling unusually weak or fatigued), and Thinner (losing weight without any clear reason). If your child shows one or more of these signs, please visit your nearest district hospital without delay.

In addition, if your child is overweight or obese, please be alert to the following signs that may indicate risk of Type 2 Diabetes: darkening and thickening of skin around the neck or armpits, persistent tiredness or low energy, excessive hunger, and difficulty concentrating. In adolescent girls, irregular periods or increased body hair may also be a warning sign. Children with a family history of diabetes or maternal history of gestational diabetes during pregnancy, or those who are physically inactive and consume a lot of junk food or sugary drinks, are also at higher risk.

3. How is diabetes diagnosed in children?

If your child shows any of the warning signs mentioned above, please take them to a pediatrician without delay. They will examine your child and conduct blood glucose testing to confirm whether your child has diabetes. A Random Blood Glucose (RBG) test is usually the first test done. If the blood glucose is above 200 mg/dL in a child with symptoms, diabetes is confirmed. In some cases, additional tests may be done to determine the type of diabetes and guide treatment. Early diagnosis is critical - do not wait for symptoms to worsen, and do not attempt to diagnose or manage the condition at home.

4. What blood sugar levels should my child aim for when managing diabetes?

Keeping your child's blood sugar within a healthy target range is the cornerstone of diabetes management and helps prevent both immediate emergencies and long-term complications. As a general guide, blood sugar levels before meals should ideally be between 90-145 mg/dL, two hours after meals between 90-180 mg/dL, and at bedtime between 120-180 mg/dL. In addition, your child's HbA1c - a three-monthly average of blood sugar levels - should be below 7.5%. However, target ranges may be individualised based on your child's age and specific condition, so always follow the guidance of the treating clinician.

5. Will my child need insulin for life?

A child diagnosed with T1DM will require insulin for life, as their body is unable to produce it. This is not optional - insulin is essential for survival in T1DM. With proper insulin therapy, regular blood glucose monitoring and follow-up care, your child can live a healthy and normal life.

6. How do I give my child insulin? Is it difficult?

As a parent or caregiver, it is essential that you take the initiative to learn how to administer insulin correctly and confidently. You should consult the healthcare team treating your child (clinician/staff nurse/others) and seek hands-on training on all aspects of insulin therapy. This includes how to draw and inject insulin correctly, how to rotate injection sites to prevent skin complications, how to store insulin safely at the right temperature, how to use a glucometer to check blood sugar levels, how to maintain the blood glucose logbook, and how to recognise and manage low blood sugar at home. Do not hesitate to ask questions or request a demonstration.

7. How often does my child need to check blood sugar at home?

In case of Type 1 Diabetes, Ideally, blood sugar should be checked 3 to 4 times a day - before meals and at bedtime. It is important to record all readings in the logbook provided and bring it to every clinic visit.

8. Can my child eat normally or are there strict dietary restrictions?

Children with diabetes do not need to follow an extremely restrictive diet, but healthy eating is important. Encourage home-cooked meals, whole grains like roti and brown rice, dal, vegetables, and fruits with low sugar content. Limit sugary drinks, packaged snacks, fried foods, and sweets. You should consult the treating clinician to develop a personalised diet plan for your child - one that considers your family's food habits, cultural preferences, and daily routine.

9. What happens during a follow-up visit and how often should we go?

In case of Type 1 Diabetes, your child should visit the treating clinician every month. During each visit, the doctor will review blood sugar records, assess growth, check insulin injection sites, and adjust doses if needed. Regular follow-up is essential to prevent complications. In case of Type 2 Diabetes, you may take your child to the treating clinician every 3-6 months depending on the advice of the clinician.

10. Are there any warning signs I should never ignore?

The four key warning signs - frequent urination, excessive thirst, unexplained tiredness, and unexplained weight loss (the 4Ts) - should never be ignored. If your child also has fruity-smelling breath, vomiting, stomach pain, or rapid breathing, take them to the nearest hospital emergency immediately as these could be signs of a serious condition called Diabetic Ketoacidosis (DKA). DKA is often caused by new onset of diabetes, omission of insulin injections, or inadequate management of an infection.

11. What is hypoglycemia and how do I handle it at home?

Hypoglycemia, or low blood sugar, occurs when your child's blood sugar drops below 70 mg/dL. This can happen due to several reasons - taking too much insulin, skipping or delaying a meal, eating less than usual, or engaging in unexpected or prolonged physical activity without adjusting insulin or food intake. Signs of hypoglycemia include sweating, shaking, headache, irritability, pale skin, and confusion. After confirming low blood sugar levels (below 70 mg/dL) using a glucometer, if your child is conscious, give them 15 grams of a fast-acting sugar immediately, such as glucose tablets, 3–4 teaspoons of sugar dissolved in water, or a sweet drink. Wait 15 minutes and recheck blood sugar. Repeat if needed until blood sugar rises above 100 mg/dL. Once the blood sugar is back in range, offer a small snack such as a glass of milk or a fruit to prevent it from dropping again. Always carry sugar or glucose tablets when stepping out with your child.

If your child is unconscious, do not give anything by mouth - smear honey on the inside of the cheek and rush to the nearest hospital with emergency services immediately.

12. What should I do if my child falls ill?

Illness can significantly affect your child's blood sugar levels and requires extra attention and care. The most important thing to remember is that insulin should never be stopped, even if your child is not eating properly. The insulin dose may need to be adjusted, based on the blood glucose level and food intake, but insulin should not be stopped. Stopping insulin during illness can be life-threatening.

During any illness, check your child's blood sugar every 2 to 4 hours. If possible, also check for ketones using urine dipstick strips - the presence of moderate to high ketones along with high blood sugar is a warning sign that requires immediate medical attention. If there are no facilities for home monitoring of glucose and ketones, the child should be taken to a healthcare facility for regular testing.

Monitor for signs of high blood sugar such as excessive thirst, frequent urination, and vomiting. If your child has vomiting, severe stomach pain, rapid breathing, or fruity-smelling breath, take them to a healthcare facility with emergency service immediately without any delay as these may be signs of a serious emergency. Parents and caregivers are encouraged to consult the treating clinician in advance to understand sick day management guidelines in detail, so that they are well-prepared to handle such situations at home confidently and safely.

13. Can my child go to school and participate in sports?

Absolutely. Children with diabetes can and should attend school and participate in physical activities and sports. Inform your child's school teacher about the condition so that appropriate support can be provided. Ensure your child always carries a fast-acting sugar source and has access to water.

14. Can diabetes cause other health problems in my child?

If not managed well over a long period of time, diabetes can affect the eyes, kidneys, nerves, and heart. However, with good blood sugar control, regular follow-up, and timely screening, these complications can be prevented or significantly delayed. Parents and caregivers should proactively consult the treating clinician to understand which screenings are required - whether monthly, quarterly, or annually - and to ensure that these are carried out on schedule without any gaps.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कार्यालय
प्रधान मंत्री
शिक्षा मंत्री
स्वास्थ्य मंत्री
जल व स्वच्छता मंत्री
खेल व सांस्कृतिक मंत्री
पर्यावरण मंत्री


sugar test


Hypertension Protocol

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NATIONAL HEALTH MISSION
राष्ट्रीय स्वास्थ्य मिशन

स्वास्थ्य एवं परिवार कल्याण मंत्रालय
MINISTRY OF HEALTH AND FAMILY WELFARE
सत्यमेव जयते

RBSK
RASHTRIYA BAL SWASTHYA KARYAKRAM
राष्ट्रीय बाल स्वास्थ्य कार्यक्रम
FROM SURVIVAL TO HEALTHY SURVIVAL

SIGNS OF TYPE 1 DIABETES

Watch out for one or more of the 4Ts

Thirsty

Tired

Toilet

Thinner

If a child presents with any of the 4Ts, refer to nearby health facility for further evaluation.

Rashtriya Bal Swasthya Karyakram