DIABETES MELLITUS
DIABETES MELLITUS IN CHILDREN

• Introduction, Definition
• Classification, pathogenesis
• Clinical features
• Investigations and diagnosis
• Therapy and follow up
• Complications
• Carry home message
INTRODUCTION

• Diabetes – to siphon through/ to flow
  Mellitus – honey

• Diabetes Mellitus (DM) is a chronic metabolic disorder in children which is on the rise recently

• Though Type 1 DM is common in children Type 2 DM is also on the rise
DEFINITION

Hyperglycemia is the cardinal biochemical feature

• Symptoms of diabetes – polyuria, polydipsia, unexplained weight loss, glycosuria, ketonuria
  
  Plus

• Fasting (8 hours) plasma glucose $\geq 126$ mg/dl
• Random plasma glucose $\geq 200$ mg/dl
• 2 hr plasma glucose in OGTT $\geq 200$ mg/dl
  
  (OGTT - oral glucose tolerance test)

• HBA1c $\geq 6.5\%$
ETIOLOGIC CLASSIFICATION

• Type 1 Diabetes
• Type 2 Diabetes
• Other types: Genetic Diabetes
  - Drug or chemical diabetes
  - Pancreatic diseases
  - Genetic syndromes
  - Gestational diabetes
  - Neonatal diabetes
TYPE 1 DIABETES MELLITUS

• Commonest type seen in more than 90% of children
• With absolute lack of insulin
• Genetic susceptibility predisposes to DM
• Due to destruction of pancreatic islet cells
• May have autoantibodies
• Insulin dependent- need exogenous insulin
• Ketosis prone
TYPE 2 DIABETES

• Occurs in obese children and adolescents
• Increasing trend in the past few years
• Not insulin dependent
• Less prone for ketosis
• Insidious onset
• Changing life style pattern in a genetically predisposed child
• May have features of insulin resistance like Acanthosis nigricans
ETIOLOGY FOR TYPE 1 DM

• Genetic susceptibility and environmental influence leads to diabetes
• Viral infections like mumps, enteroviruses, rubella
• Hygiene hypothesis - possible protective role by exposure to infections
• Dietary factors like early exposure to cow’s milk protein
• Psychological stress
PATHOGENESIS OF TYPE 1 DM

• A genetically predisposed host develops autoimmunity against his pancreatic islet cells, what triggers this is not defined
• Loss of pancreatic islet cells
• Develops insulin deficiency when more than 90% is destroyed
• Leads to clinical features of diabetes
CLINICAL FEATURES

• Osmotic symptoms: polyuria, polydipsia
• Polyphagia
• Unexplained weight loss
• Lethargy
• Itching or white discharge from genitalia
• Recent onset nocturnal enuresis
• Features of diabetic keto acidosis
EXAMINATION

- Vital signs to be monitored
- Look for dehydration, shock, deep rapid sighing breathing (Kussmaul’s breathing)
- Vaginal /oral/ genital moniliasis
- Look for any focus of infection
- Anthropometric measurements
INVESTIGATIONS

• Finger prick blood glucose
• Confirmation by plasma glucose in lab
• Blood ketones / urine ketones
• Glucose tolerance test is rarely if ever needed in children with diabetes
• HBA1c at diagnosis and subsequently
OTHER INVESTIGATIONS

• In children with Type 1 DM
  – Antibodies like Glutamic acid decarboxylase (GAD), islet cell antibodies
• Evaluation for thyroid antibodies
DIAGNOSIS

• Clinical suspicion with symptoms
• Laboratory criteria of plasma glucose as per definition
• Presence of keto acidosis should be ruled out in all children at diagnosis.
WHEN TO SUSPECT DM IN A CHILD?

- History of polyuria/ polydipsia/ polyphagia
- Unexplained recent weight loss
- Recent onset nocturnal enuresis
- Vaginal or genital moniliasis in a child
- Incidental hyperglycemia or glycosuria
- Vomiting, abdominal pain with breathlessness suggestive of DKA
MANAGEMENT

• Hospitalize all children with high blood glucose
• Immediate Insulin therapy at diagnosis
• Counseling the family about the disease and its management
• Treat intercurrent infection with antibiotics
• Children with DKA need emergency stabilization and intensive care treatment
THERAPY

• Subcutaneous insulin at a dose of 0.3 – 1u/kg/day depending on the age of the child.

• Multiple daily injections-given as basal bolus regimen as a combination of rapid analogs/ short and intermediate insulin is the gold standard therapy - needs 3-4 doses a day
THERAPY

- Insulin pumps can be used if affordable
- Dietary management is essential for euglycemia
- Intercurrent infection management and avoiding complications is needed
FOLLOW UP

• Monitor for glycemic control with home based blood glucose tests and periodic HBa1c
• Growth and development monitoring
• Avoid hypoglycemia and DKA
• Follow up for micro and macro vascular complications- kidney, eye, joint involvement
• Counsel the child and the family for sustained glycemic control
COMPLICATIONS

• Acute complications:
  - Hypoglycemia
  - Diabetic ketoacidosis

• Chronic complications:
  - Renal involvement
  - Eye involvement
  - Joint involvement
HYPOGLYCEMIA

• Common complication in diabetic children
• Presents with tachycardia, sweating, tremors, altered sensorium, lethargy, irritability, convulsions and coma
• Immediate oral or parental glucose or injection glucagon is life saving
• Symptoms persist for sometime despite euglycemia
• Can lead to long term morbidity and even mortality if untreated
• All caregivers should know to recognize hypoglycemia
DIABETIC KETO ACIDOSIS (DKA)

- Triad of hyperglycemia, ketosis and acidosis
- This a medical emergency in Type 1 DM
- Lack of insulin leads to hyperglycemia
- Triggers fatty acid oxidation leading to keto acidosis
- Osmotic symptoms lead to dehydration and dyselectrolytemia
- Needs intensive care by a diabetic care team
DIABETIC KETO ACIDOSIS (DKA)

- Features of diabetes
- Vomiting, lethargy, abdominal pain
- Dehydration
- Acidotic breathing
- Altered sensorium – irritability, confusion, coma
MANAGEMENT - DKA

• Emergency admission to a pediatric intensive care unit
• Hourly blood glucose monitoring
• Monitor electrolytes, urea, creatinine
• Frequent blood gases
• Infection work up - Blood counts
  - Blood and urine cultures
  - Chest x-ray
MANAGEMENT - DKA

- Initial Resuscitation
- Normal saline with potassium as fluid for rehydration
- Insulin infusion
- Correction of dyselectrolytemia
- Avoid using bicarbonate for acidosis
- Control of precipitating infection
- Watch for complications like cerebral edema
• Monitor for complications like hypoglycemia and cerebral edema in DKA
• Check for compliance to prevent recurrence
• Mortality in diabetic children is predominantly due to cerebral edema in DKA.
• Timely identification and urgent intervention can prevent mortality
CARRY HOME MESSAGE

• Type 1 DM is common in children than Type 2 DM
• Type 1 DM may have associated autoantibodies
• Polyuria, polydipsia, polyphagia are osmotic symptoms and can present with DKA
• Diagnosis of DM needs high degree of suspicion
• Insulin to be started on the day of diagnosis of DM
• Dietary management, monitoring and follow up for acute and long term complications is needed.
• Hypoglycemia and DKA should be prevented.
THANK YOU