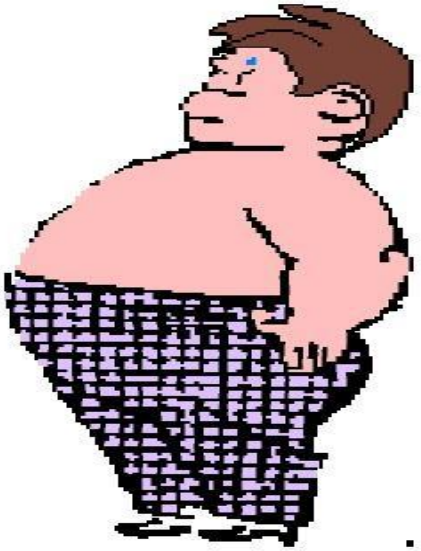
Type 2 DM in Children & Adolescents



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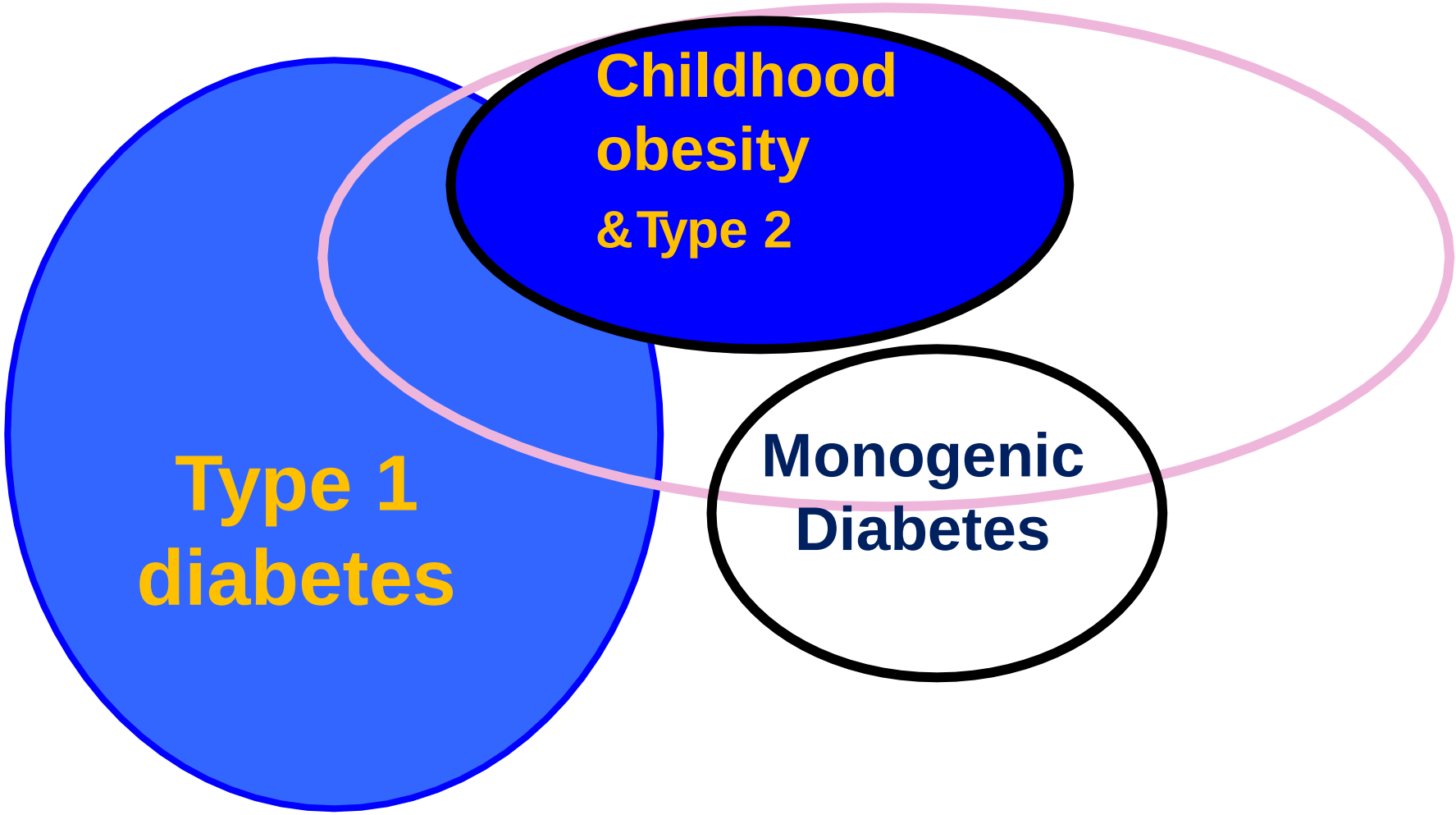
Objectives

By the end of presentation ,following objectives should be understood:

- Various types of diabetes in children.
- Criteria of diagnosis.
- Symptoms & Signs.
- Pathophysiology of type 2 diabetes.
- Investigations.
- Prevention & treatment.
- Complications.

Various types of diabetes in children



Various types of diabetes in children

- Type 1 diabetes (commonest type in children, composed of more than 90% of cases).
- Type 2 diabetes (not common in children but could be seen in an obese child especially above 10 - years of age).
- MODY, monogenic form, inherited as autosomal dominant.
- Neonatal diabetes, monogenic form with onset of diabetes in first 6 months of life.
- Secondary diabetes (certain diseases, syndromes leading to the development of diabetes).

Symptoms

- Polyuria (passing frequent & large volume of diluted urine).
- Polydipsia (drinking more frequents amount of fluid).
- Nocturia (walking up from sleep to pass urine in the night frequently).
- Nocturnal enuresis (passing urine on him/herself during sleep involuntary.
- Weight loss without changing their lifestyle (more commonly seen in type 1 DM rather than type 2).

DIABETES SYMPTOMS

Feeling Hungry

Sudden Weight Loss

Feeling Thirsty

Frequent Urination

Diagnostic criteria

- Clinical symptoms of type 2 are milder than type 1, which include (polyurea, polydipsia & polyphagia).
- Unexplained weight loss, sometimes not seen in type 2 diabetes opposite to type 1 DM.

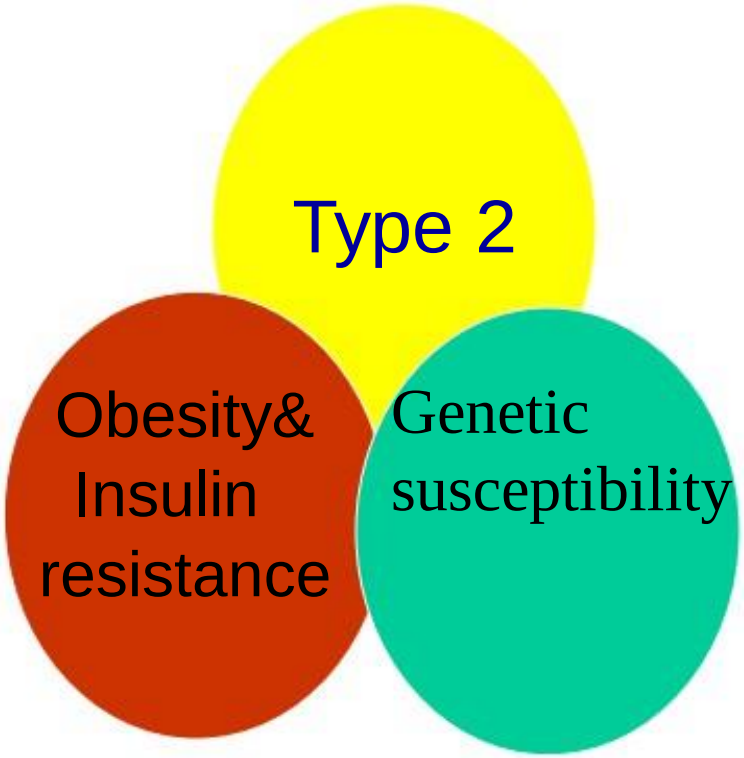
Laboratory criteria of diabetes (regardless of the type):

- Fasting plasma glucose ≥ 126 mg/dl (7 mmol/l).
- Random or 2 hours post prandial glucose ≥ 200 mg/dl (11.1 mmol/l).
- Oral glucose tolerance test, glucose ≥ 200 mg/dl (11.1 mmol/l) after 2 hours of the test.
- Hemoglobin A1c ≥ 6.5 %.

Type 1 Vs Type 2

Type 1	Type 2
Sudden onset	Gradual / insidious onset
Moderate to severe symptoms	Mild or even no symptoms, or discovered by screening
Initially, positive history of marked weight loss	Usually no history of weight loss
Thin children	Over weight / obese
Autoimmune β – cell destruction	Insulin resistance
No acanthosis nigricans	Acanthosis nigricans positive
Ketosis -prone	Ketosis may happen
Autoantibodies positive	Autoantibodies negative
Low insulin / c- peptide	Initially normal/ high insulin & c-peptide
Life threatening if not treated with insulin	Could be managed with diet/ exercise

Pathophysiology



Definition & classification of obesity in adults

- Obesity is defined as abnormal or excessive fat accumulation that may impair health

- Body mass index (BMI) provides the most convenient population-level measure of overweight and obesity currently available

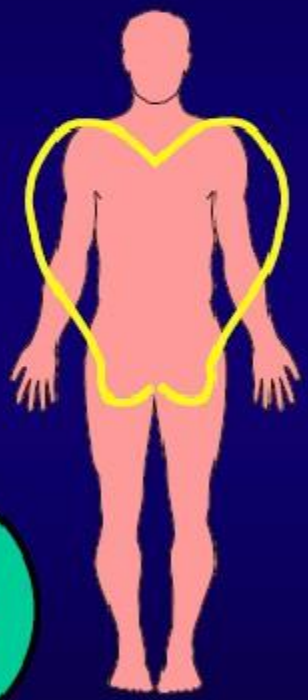
Classification	BMI (kg/m²)
Underweight	<18.5
Normal range	≥18.5 and <25
Over weight	≥25 and <30
Obesity	≥30
Obesity class I	≥30 and <35
Obesity class II	≥35 and <40
Obesity class III	≥40

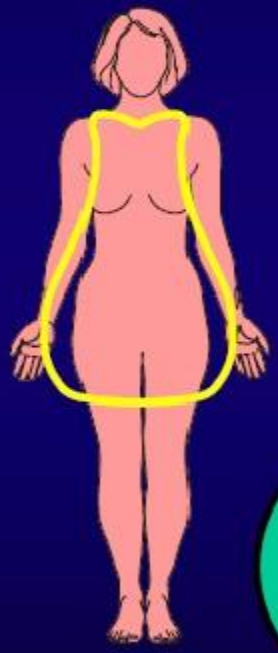
$$BMI = \frac{weight\ (kg)}{height\ (m^2)}$$

Overweight & obesity in children

Classification	Definitions
Overweight	BMI ≥85th percentile for age and sex
Obesity class I	BMI ≥95th percentile for age and sex
Obesity class II	BMI ≥120% of 95th percentile* for age and sex or a BMI ≥35 kg/m^2
Obesity class III	BMI ≥140% of 95th percentile for age and sex† or a BMI ≥40 kg/m^2

Body Type and Obesity





Apple shaped

Pear shaped

Acanthosis Nigricans

Too large meals !
Too high Calories !

Sedentary life style!!

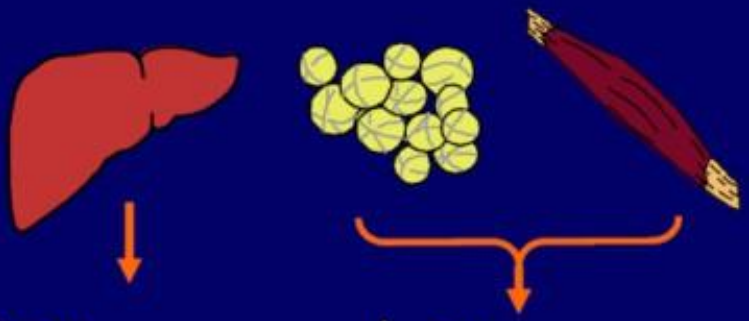
Etiology of Type 2 Diabetes

- Response to insulin is decreased
  - ↓glucose uptake (muscle, fat)
  - ↑glucose production (liver)
- The mechanism of insulin resistance is unclear
- Both genetic & environmental factors are involved
- Post insulin receptor defects

Type 2 Diabetes

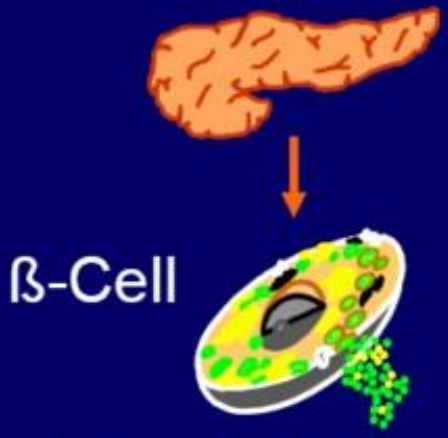
Impaired Insulin Action

β Cell Dysfunction/Death



↑ Glucose Production

↓ Glucose Utilization



ß-Cell

Impaired Insulin Secretion

Screening & Diagnosis

Recommended screening test

=

Fasting plasma glucose

BMI ≥99th %ile

and/or

Multiple risk factors

→

Oral glucose tolerance test (OGTT)

Diagnostic criteria for above same as for adults

Associated diseases with type 2 DM

- Obesity.
- Hyperinsulinism with insulin resistance.
- Arterial hypertension.
- Hyperlipidemia.
- Fatty infiltration of the liver.
- Polycystic ovary syndrome.
- Metabolic syndrome.

Acute complications

- HHNK syndrome — Hyperglycemia, Hyperosmolar, Non- Ketotic‖, which seen mainly in type 2 DM, and carries high mortality rate up to 15 %.

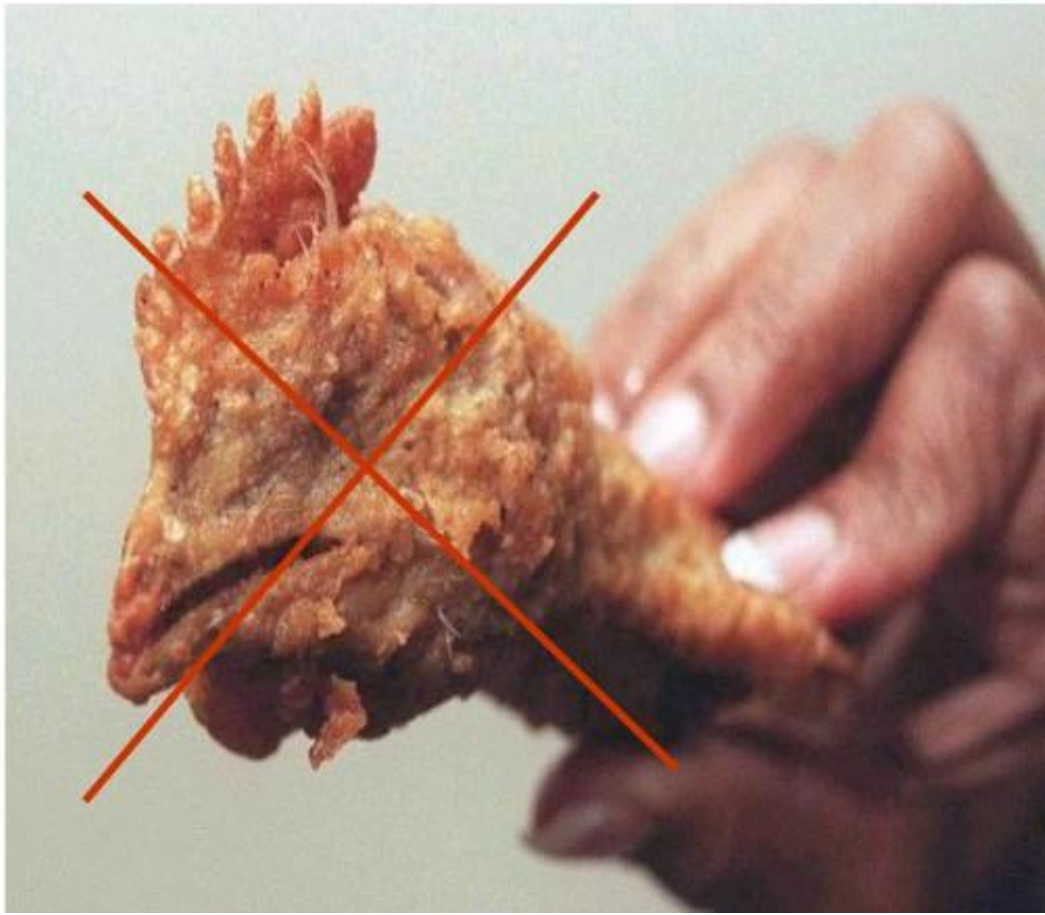
- DKA —Diabetes Ketoacidosis‖, which can happen in type 2 but with low mortality rate of 1-2%.
- Hypoglycemia from either oral hypoglycemic agents or insulin therapy.

Diabetic Complications (Not for any one Only for those with persistent high HbA1c !!)

- Retinopathy.
- Cataracts.
- Hypertension.
- Progressive renal failure.
- Early coronary artery disease.
- Peripheral vascular disease.
- Neuropathy, both peripheral & autonomic.
- Increased risk of infections.

Prevention

عن المقدام بن معدي كرب قال : سمعت رسول الله صلى الله عليه وسلم يقول : ما ملأ آدمي وعاء شرا من بطن ، بحسب ابن آدم أكلات يقمن صلبه ، فإن كان لا محالة ، فثلث لطعامه ، وثلث لشرابه ، وثلث لنفسه رواه الإمام أحمد والترمذي والنسائي وابن ماجه ، وقال الترمذي : حديث حسن .



Prevention

- Breastfeeding beneficial in reducing risk of obesity and subsequent type 2 diabetes.
- Family-based lifestyle interventions with a behavioral component aimed at changes in diet and physical activity patterns have been shown to result in significant weight reduction in children and adolescents.

Multicomponent lifestyle & dietary interventions in children with Type 2 DM

Dietary recommendations in children and adolescents with obesity

NHMRC recommendations

Listen to internal hunger cues and to eat to appetite

Have healthy foods readily available

ENDO recommendations

Reduce consumption of fast foods, added table sugar, high-fructose corn syrup, fruit juices, high-fat, high-sodium or processed foods

Portion control education, timely, regular meals, and avoiding constant ‘grazing’ during the day, recognising eating cues in the child or adolescent’s environment

Increased intake of dietary fibre, fruits and vegetables

Treatment of type 2 DM

- Treatment of type 2 DM initially depends on lifestyle changes:
  - Diet.
  - Exercise.
- Medications:
  - Metformin.
  - GLP-1 receptor agonist (recently approved for adolescents 12 years and above).

Treatment of type 2 DM

- Metformin is an antihyperglycemic agent, which improves glucose tolerance in patients with type 2 diabetes, lowering both basal and postprandial plasma glucose.
- Metformin decreases hepatic glucose production, decreases intestinal absorption of glucose, and improves insulin sensitivity by increasing peripheral glucose uptake and utilization.
- Unlike sulfonylureas, metformin does not produce hypoglycemia in either patients with type 2 diabetes or normal subjects
- With metformin therapy, insulin secretion remains unchanged while fasting insulin levels and daylong plasma insulin response may decrease.

Glucagon-Like Peptide 1 Receptor Agonists for Type 2 Diabetes

- Incretins are peptides produced by the intestinal mucosa in response to oral intake of nutrients that enhance glucose-stimulated insulin secretion & lower blood glucose levels.
- Administration of GLP-1 receptor agonists stimulates GLP-1 receptors, thereby increasing insulin secretion in response to oral glucose.
- Several GLP-1 receptor agonists are now approved in the for the treatment of type 2 diabetes starting from age of 12 years.

Summary

Obesity treatment options for children are limited

Lifestyle treatments are centered in:

- Dietary interventions
- Physical activity & sedentary time
- Behavioural counselling
- Family- centered interventions

Current pharmaco-therapy options include Metformin &GLP-1 medications.





موفقين
بأذن الله