Diabetes and Hypoglycemia

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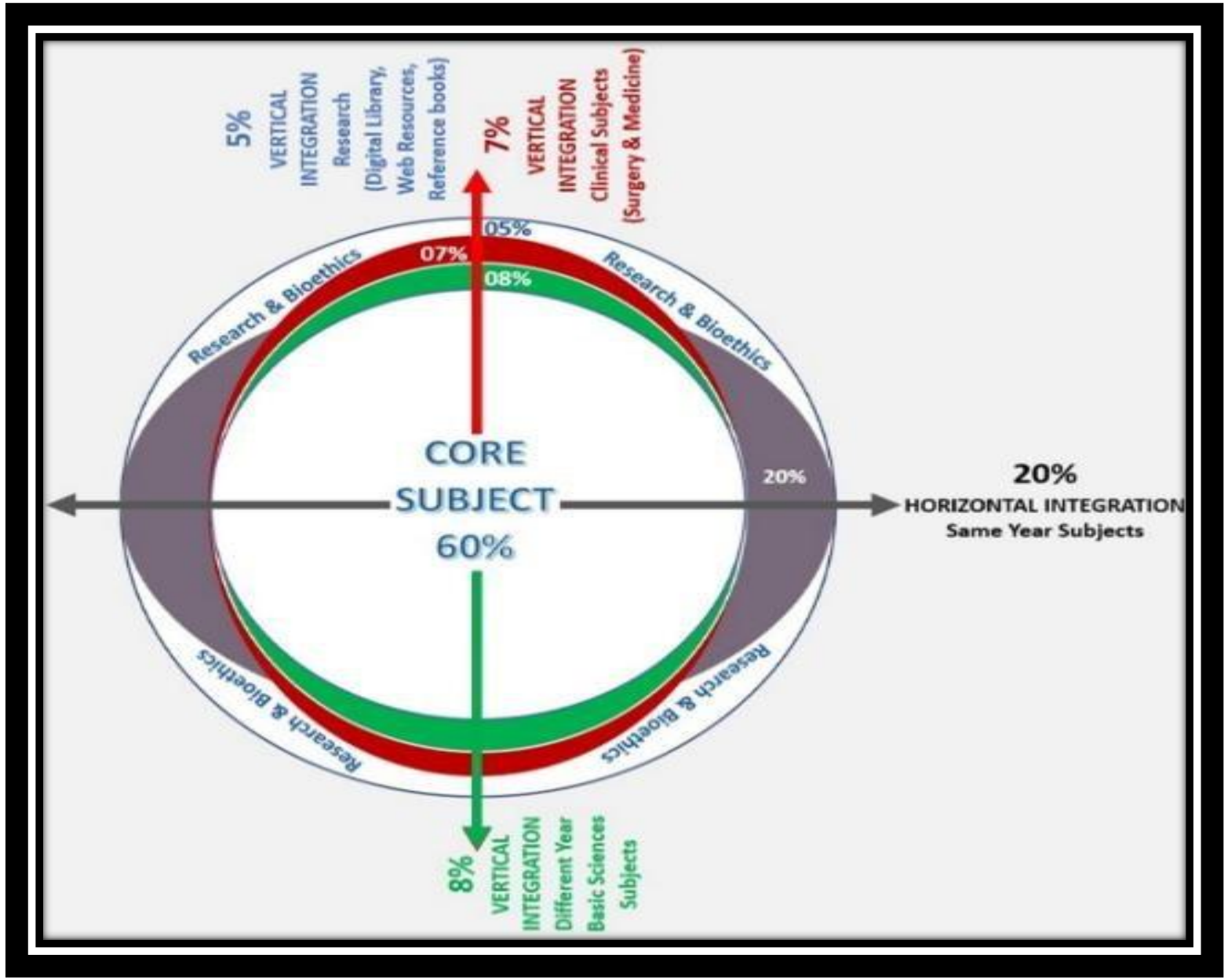
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LECTURE CONTENT ANALYSIS	
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Learning Objectives

At the end of this lecture students should be able to :

1: Define Diabetes Mellitus

2: Describe the diagnostic criteria of Diabetes and classification of DM.

3: Enlist micro and macro vascular complications of diabetes.

4: Define hypoglycemia.

5: Identify clinical features of hypoglycemia.

6: Outline management plan for hypoglycemia.

Diabetes Mellitus

Diabetes mellitus, disorder of carbohydrate metabolism characterized by impaired ability of the body to produce or respond to insulin.

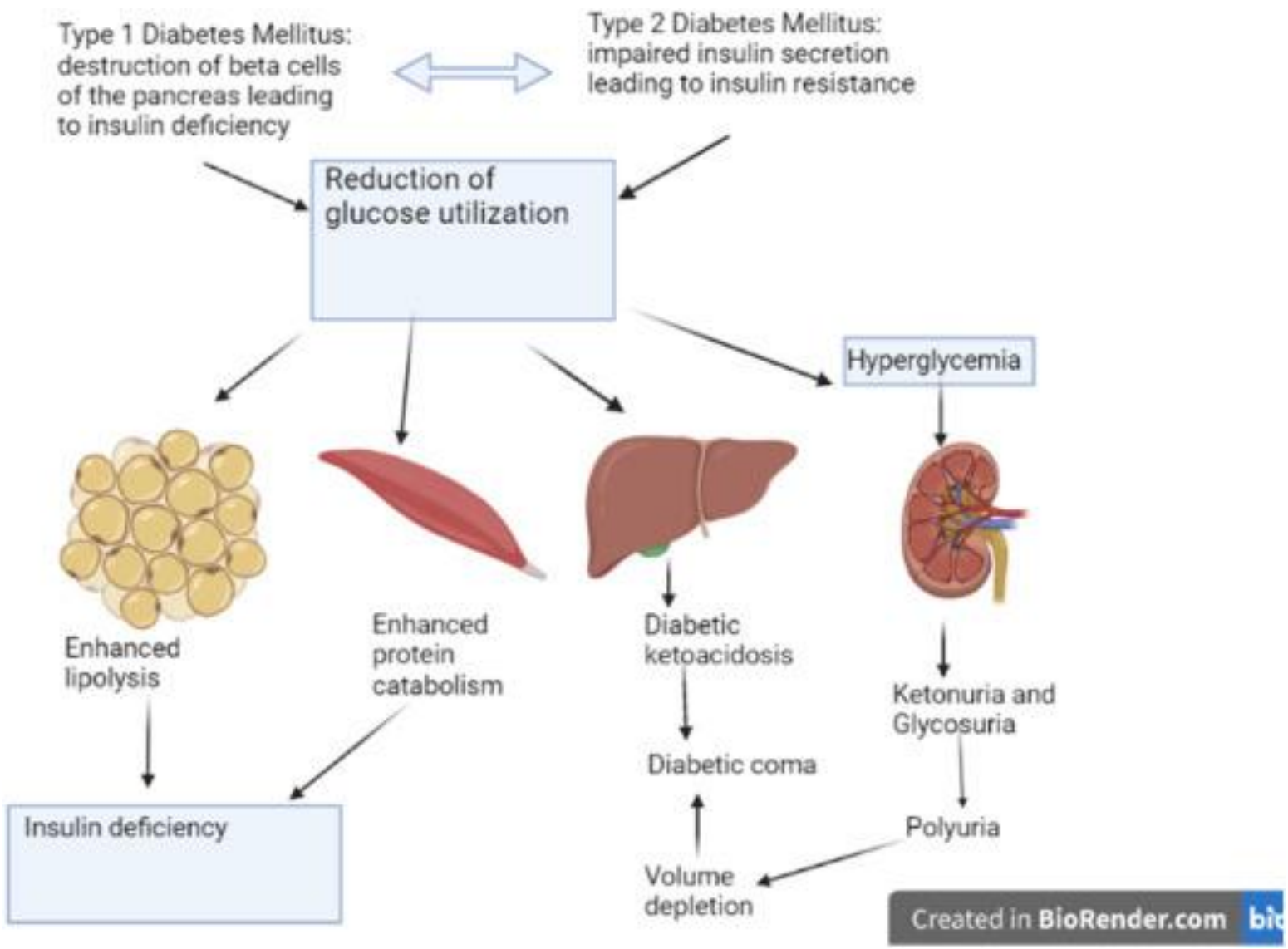
Burden of the disease

- 422 million people worldwide have diabetes.
- 1.5 million deaths are directly attributed to diabetes each year.
- 26.7% prevalence of diabetes in adults in Pakistan.
- 32,964,500 total cases of diabetes in adults in Pakistan.

Normal Function of Insulin

Insulin Function		
Liver	Adipose Tissue	Muscle
↓ glycogenolysis	↓ lipolysis	↓ protein catabolism
↓ gluconeogenesis	↑ glycerol formation	↓ amino acid oxidation
↓ ketogenesis	↑ fatty acid formation	↑ amino acid uptake
↑ glycogen synthesis	↑ glucose uptake	↑ glucose uptake
↑ fatty acid synthesis		↑ protein synthesis
		↑ glycogen synthesis

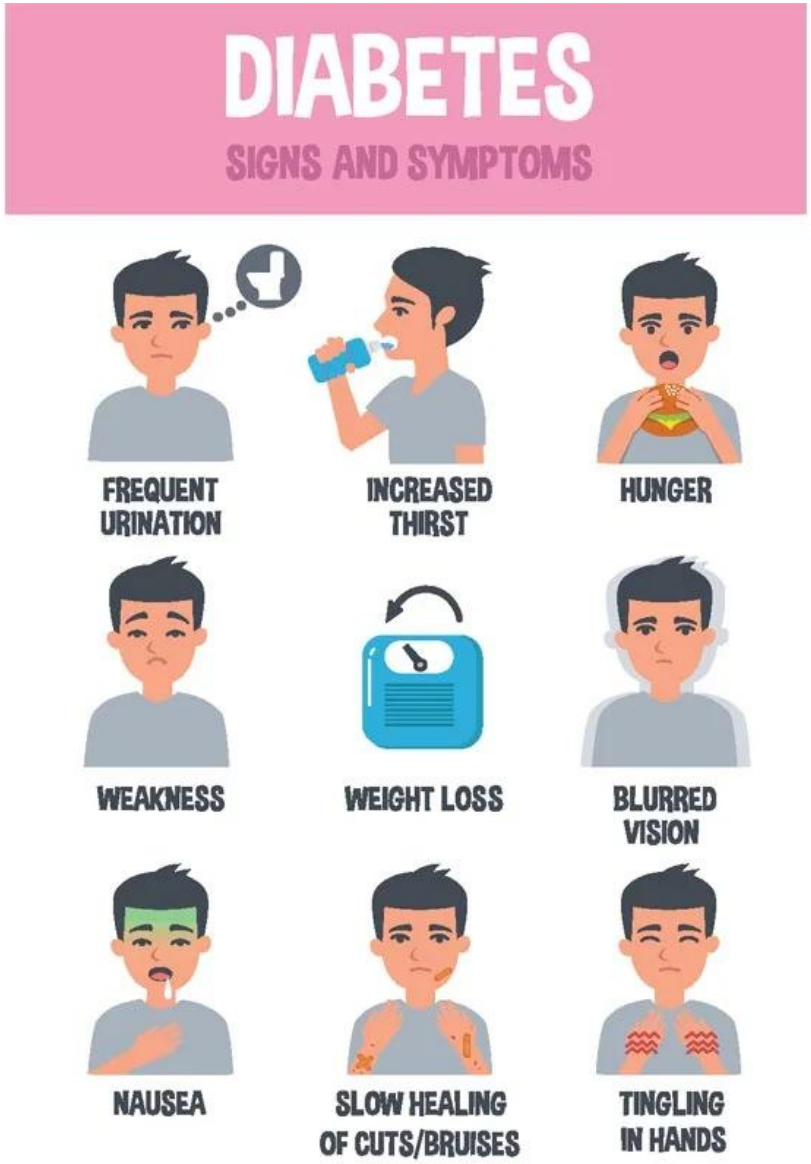
Pathophysiology of Diabetes Mellitus



Classification of Diabetes Mellitus

Type	Comment
Insulin dependent Diabetes Mellitus	Autoimmune β-cell destruction
Insulin independent Diabetes Mellitus	Non-autoimmune progressive loss of adequate β-cell insulin secretion.
Gestational DM	Diabetes diagnosed in the second or third trimester of pregnancy.
Other forms	Monogenic syndromes, diseases of the exocrine pancreas, and drug-induced diabetes

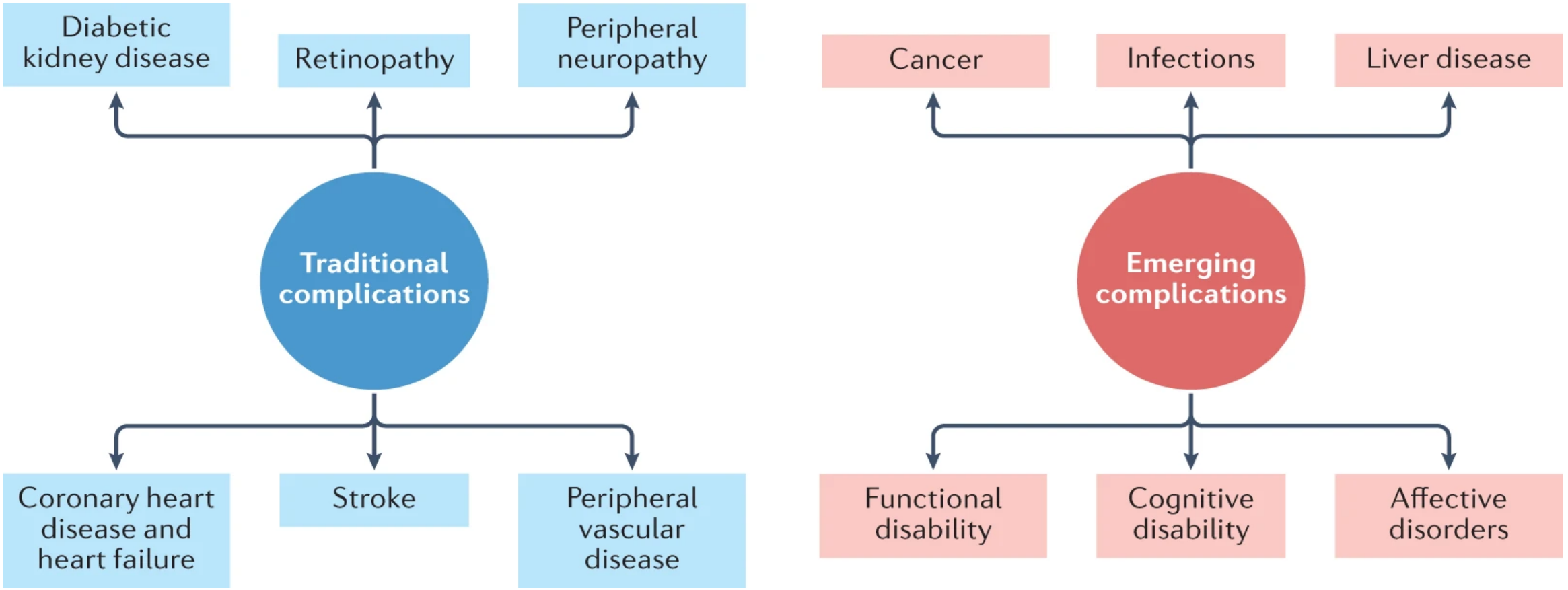
Symptoms of Diabetes Mellitus



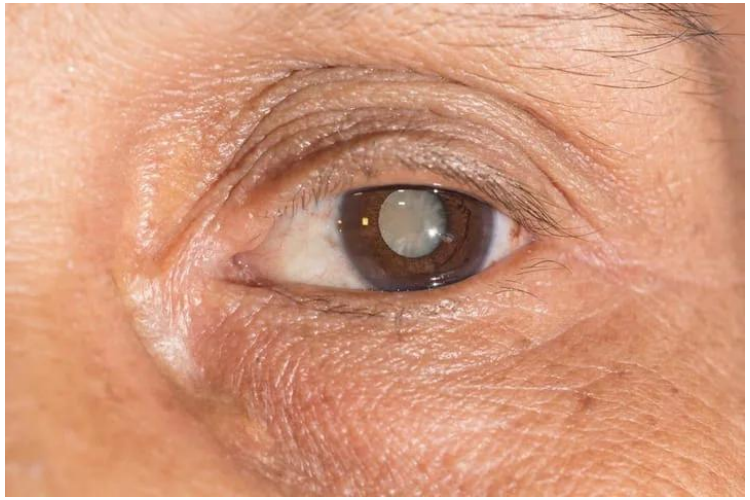
Diagnostic Criteria of DM

FPG ≥126 mg/dL (7.0 mmol/L)
OR
2-h PG ≥200 mg/dL (11.1 mmol/L) during OGTT
OR
A1C ≥6.5% (48 mmol/mol)
OR
With classic symptoms of hyperglycemia, a random plasma glucose ≥200 mg/dL (11.1 mmol/L).

Complications of Diabetes Mellitus



Tomic, D., Shaw, J.E. & Magliano, D.J. The burden and risks of emerging complications of diabetes mellitus. Nat Rev Endocrinol 18, 525–539 (2022). https://doi.org/10.1038/s41574-022-00690-7



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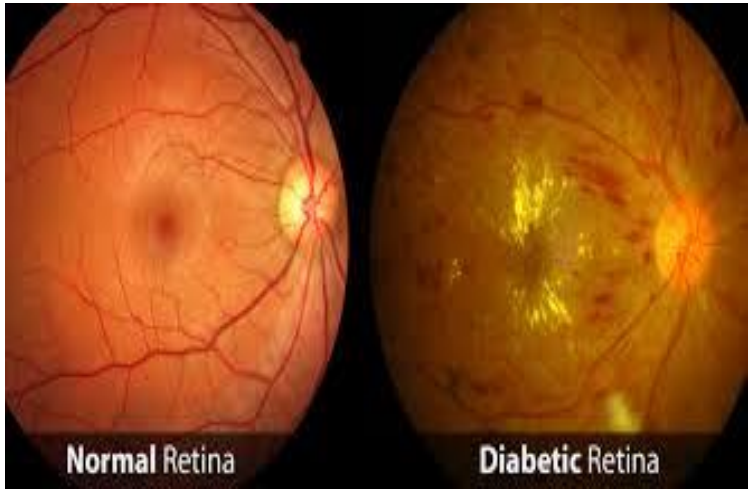


Diabetic foot ulcer

Case Vignette

The 29-year-old man experienced diaphoresis with tremor, chest pain, dizziness, and shortness of breath in the early morning, four days before his admission. He was unable to recognize his older brother when he was taken to the hospital, his blood sugar levels was checked and found to be 20 mg per dL. The symptoms were relieved after administration of intravenous dextrose water.

Definition of Hypoglycemia

Blood glucose below 70mg/dl with symptoms that are relieved promptly after the administration of glucose.

Classification of hypoglycemia

	Glycemic criteria/description
Level 1	Glucose <70 mg/dL
Level 2	Glucose <54 mg/dL
Level 3	Severe event characterized by altered mental and/or physical status requiring assistance for treatment of hypoglycemia, irrespective of glucose level.

Symptoms of Hypoglycemia

Autonomic	Neuroglycopenic	General
Sweating	Confusion	Headache
Palpitation	Drowsiness	Nausea
Shaking	Irritability	
Hunger	Speech difficulty	
	Coma	
	Seizures	

Shaky

Sweaty

Dizzy

Confusion and difficulty speaking

Hungry

Weak or Tired

Headache

Nervous or Upset

Risk Factors for Hypoglycemia

- Intensive Insulin therapy
- Old age
- Longer duration of diabetes
- Chronic kidney disease
- Chronic liver disease
- Dementia
- Fasting

Management of Hypoglycemia

Patient able to eat

1. Give 15- 20g of quick acting carbohydrates.
2. Recheck BSR after 15 mins.
3. BSR > 72 mg/dl, give 15g of long-acting CHO.

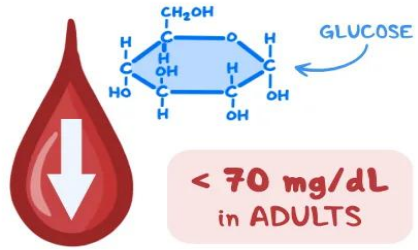
Patient not able to eat

1. Administer 20ml of 50% dextrose

OR

2. Inj Glucagon 1mg IM

LOW BLOOD SUGAR



< 70 mg/dL in ADULTS

CAUSED BY:

(WITH DIABETES)

- TOO MUCH INSULIN
- TOO MUCH DIABETES MEDICATION

(WITHOUT DIABETES)

- EATING LESS or EXERCISING MORE THAN USUAL
- SOME MEDICATIONS
- ALCOHOL
- UNDERLYING CONDITIONS
- REACTIVE

SYMPTOMS:

- HUNGER
- FATIGUE
- SHAKING
- SWEATING
- PALE SKIN
- HEADACHE
- DIZZINESS

- CONFUSION
- SLURRED SPEECH
- BLURRED VISION
- FAINTING
- SEIZURES
- COMA

15-15 RULE:

1. TEST BLOOD GLUCOSE

2. Eat/Drink 15 GRAMS of FAST-ACTING CARBS

3. WAIT 15 MINUTES

THEN TEST AGAIN

* REPEAT UNTIL BLOOD SUGAR LEVELS ARE > 70 mg/dL

GLUCAGON INJECTION:

INJECT AT 90° ANGLE into THIGH or BUTTOCK

Reading Resources

- Glycemic Goals and Hypoglycemia: Standards of Care in Diabetes—2024 https://doi.org/10.2337/dc24-S006

▸ J Clin Med. 2023 Jan 18;12(3):781. doi: 10.3390/jcm12030781

The Advanced Diabetes Technologies for Reduction of the Frequency of Hypoglycemia and Minimizing the Occurrence of Severe Hypoglycemia in Children and Adolescents with Type 1 Diabetes

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Editor: Brian Tomlinson[1]

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The reduction of hypoglycemia, especially the minimization of severe hypoglycemia, is a goal in the management of children and adolescents with type 1 diabetes. Evaluating the risk factors for developing severe hypoglycemia is a matter of great importance for preventing the occurrence of dangerous hypoglycemia. The new concept of TIR is currently used to evaluate glucose variability, glucose trends, and the quality of glycemic control [68]. Achieving the target range of TIR (glucose level of 70–180 mg/dL (3.9–10.0 mmol/L)) in more than 70% with a reduction of TBR (glucose level of less than 70 mg/dL (3.9 mmol/L)) less than 4% and minimizing dangerous hypoglycemia (glucose level of less than 54 mg/dL (3.0 mmol/L)) less than 1% is crucial in the management of type 1 diabetes [68]. This can be achieved through advanced diabetes technologies including CGM and the hybrid closed-loop system, even in pediatric patients.

Ethical Issues

Ethical Issue	Key Concerns
Patient Autonomy and Informed Consent	Educating patients on risks, treatment, and self-management; concerns with cognitively impaired patients.
Overtreatment and Harm Prevention	Balancing tight glycemic control with risk of hypoglycemia, especially in elderly and critically ill patients.
Equity in Access to Care	Disparities in access to CGM, insulin pumps, and emergency treatments; ensuring affordable care.
Duty to Warn vs. Patient Confidentiality	Balancing patient privacy with public safety in cases of recurrent severe hypoglycemia (e.g., driving risks).
Ethical Considerations in Research	Minimizing hypoglycemia risks in clinical trials; ensuring vulnerable populations are protected.

Thank You