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Diabetes Mellitus Type 2

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Type 2 Diabetes Mellitus

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Introduction

- Diabetes mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycemia
- There are three types of diabetes: type 1, type 2, and gestational.

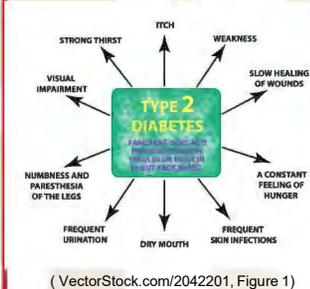
Type 2 Diabetes

- Type 2 Diabetes Mellitus (T2DM) is a lifelong disease that creates insulin resistance
- accounts for around 90% of all cases of DM (Chatterjee et al., 2017)
- 200,000 cases are reported in the US every year
- 84 million in the US are already prediabetes
- CDC data have shown the increasing trend of DM among children and kids since 2002 (CDC, 2022)

Sign and symptoms

The main symptoms of T2DM are described as three polys

- Polydipsia - Being very thirsty
 - Polyuria - Multiple bathroom visits
 - Polyphagia - Feeling hungry
- Beyond three polys other indicators are
- Blurry vision
 - Weight loss without trying
 - Getting more infections
 - Numbness in hands and feet



(VectorStock.com/2042201, Figure 1)

Pathophysiology

Causes

- Two primary factors
- Defective insulin secretion by pancreatic β -cells - The pancreas is unable to produce enough insulin to manage blood sugar levels (Roden & Shulman, 2019)
 - Cells not responding normally to insulin (insulin resistance). Over time, cells stop responding to the insulin thus, the pancreases create more insulin to make the cell respond eventually pancreases cannot keep up and sugar level rises

Risk

- Genetic predisposition
- Race and ethnicity
- Obesity
- Less physical activity
- Unhealthy diet
- Age; 45 or older
- Heart and blood vessel disease
- High triglycerides
- Polycystic ovary syndrome in women



(Galicia-Garcia, et al., 2020, figure 2)

The pathophysiological mechanism leading to T2DM

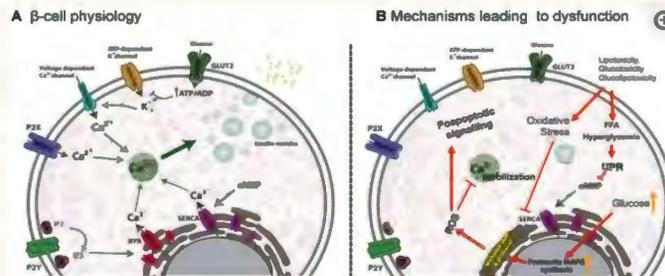


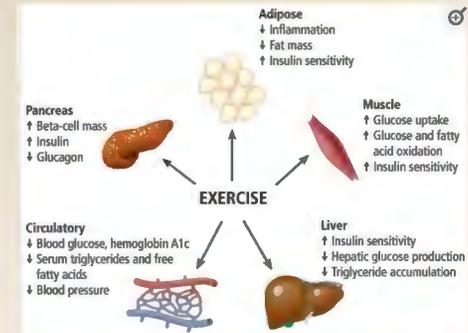
Figure 1

Signaling pathways involved in insulin secretion in β -cells in physiological conditions (A) and mechanisms leading to dysfunction (B). (A) Insulin release is primarily triggered by a response to high glucose concentrations and glucose is mainly internalized mainly through GLUT2 transporter. Glucose catabolism increases ATP/ADP ratio, ATP-dependent potassium channels are closed leading to membrane depolarization and opening of the voltage dependant Ca^{2+} channels. The latter enables Ca^{2+} influx triggering insulin exocytosis. Additional Ca^{2+} channels as P2X, P2Y, SERCA and RYR contribute to Ca^{2+} mobilization and insulin secretion. (B) hyperglycemia and hyperlipidemia promote oxidative stress leading to ROS generation that inhibits Ca^{2+} mobilization and activates proapoptotic signals. Additionally, an excess of FFAs and hyperglycemia lead to the activation of the apoptotic unfolded protein response (UPR) pathways and generation of ER stress. Sustained high glucose levels increase proinsulin and IAAP biosynthesis, which generate ROS. GLUT2: glucose transporter 2, P2X: purinergic receptor X; P2Y: purinergic receptor Y; IP2: inositol 1,3-bisphosphate; IP3: inositol 1,4,5-trisphosphate; RYR: ryanodine receptor channel; SERCA: sarco-endoplasmic reticulum Ca^{2+} -ATPase; FFA: free fatty acid, ROS: reactive oxygen species; UPR: unfolded protein response.

(Galicia-Garcia, et al., 2020, Figure 3)

Significance and Management of T2DM

- Weight loss, Healthy eating
- Exercise is a key component for managing T2DM



Tissue-specific metabolic effects of exercise in patients with type 2 diabetes (Kirwan et al., 2017, figure 4)

Implications for nursing care

- Recognize the clinical manifestations of altered blood glucose levels in patients and integrate glucose monitoring into the plan of care (Goyal & Jialal, 2022)
- Assessing the patients for T2DM complications
- Performing blood glucose testing is a routine component of nursing care for patients with diabetes mellitus.
- Educating patients about the prevention and management of T2DM

Conclusion

- One of the most common metabolic disorders
- It is still in increasing trend even in youth and children (Buttermore et al., 2021)
- Prevented and can be managed with proper implementation of behavioral and lifestyle changes (Kolb & Martin, 2017)
- Further research needs to be done on multiple facets of T2DM to fully understand each of the many stakeholders (Ojo, 2019)

References



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