The impact of metformin on type 2 diabetes management: Mechanism, uses and benefits

Ariadna Nibhi *

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Description

Metformin is an oral antidiabetic medication belonging to the biguanide class. It is primarily used to treat type 2 diabetes but is also prescribed for other conditions, such as Poly Cystic Ovary Syndrome (PCOS) and, in some cases, prediabetes. Metformin works by lowering blood sugar levels, making it easier for people with diabetes to manage their condition and reduce the risk of complications.

Metformin's primary mechanism of action involves reducing the liver's production of glucose (hepatic gluconeogenesis). In people with type 2 diabetes, the liver often produces too much glucose, leading to elevated blood sugar levels. Metformin helps inhibit this process, lowering the amount of glucose released into the bloodstream.

■ Working mechanism of metformin

In addition to reducing glucose production, metformin also manages following factors.

Improves insulin sensitivity: Metformin enhances the body's sensitivity to insulin, particularly in muscle and fat tissues. This allows cells to take up and use glucose more effectively, reducing blood sugar levels.

Reduces intestinal absorption of glucose: Metformin decreases the absorption of glucose from the intestines, which helps lower postprandial (after-meal) blood sugar spikes.

Promotes weight loss or maintenance: Unlike some other diabetes medications that can lead to weight gain, metformin is often associated with modest weight loss or weight stabilization. This is particularly beneficial for people with type 2 diabetes, as obesity is a significant risk factor for the condition.

■ Uses of metformin

While metformin is best known for its role in managing type 2 diabetes, its use extends to several other conditions:

Type 2 diabetes: Metformin is typically the first-line treatment for type 2 diabetes, often prescribed alongside lifestyle modifications such as diet and exercise. It can be used as monotherapy or in combination with other antidiabetic medications or insulin.

Prediabetes: In individuals with prediabetes, metformin may be prescribed to help prevent the progression to full-blown type 2 diabetes, especially in those who are overweight or have other risk factors.

Polycystic Ovary Syndrome (PCOS): Metformin is commonly used to manage PCOS, a hormonal disorder that can lead to insulin resistance and elevated blood sugar levels. By improving insulin sensitivity, metformin can help regulate menstrual cycles, reduce androgen levels, and improve fertility in women with PCOS.

Gestational diabetes: Although not the first-line treatment, metformin is sometimes used to manage gestational diabetes when lifestyle changes and insulin therapy are insufficient.

Non-Alcoholic Fatty Liver Disease (NAFLD): Metformin has shown potential benefits in treating NAFLD, a condition often associated

Department of Endocrinology, SLTC Research University, Padukka, Sri Lanka
**Author for correspondence: E-mail: Anibhi123@gmail.com*

with type 2 diabetes and obesity. By improving insulin sensitivity and reducing liver fat accumulation, metformin may help manage this condition.

Anti-aging and longevity research: Emerging research suggests that metformin may have anti-aging properties and could play a role in promoting longevity. While more studies are needed, some evidence indicates that metformin may reduce the risk of age-related diseases such as cancer and cardiovascular disease.

■ Benefits of metformin

Metformin's popularity as a diabetes treatment stems from its numerous benefits.

Effective blood sugar control: Metformin effectively lowers blood sugar levels, reducing hemoglobin A1c (HbA1c) by 1%-2%. This makes it a potent tool for preventing the complications of diabetes, such as cardiovascular disease, kidney damage, and neuropathy.

Low risk of hypoglycemia: Unlike some other diabetes medications, metformin does not typically cause hypoglycemia (low blood sugar), making it safer for long-term use.

Weight neutrality: Metformin is either weight-neutral or associated with mild weight loss, which is advantageous for individuals with type 2 diabetes who are overweight or obese.

Cardiovascular benefits: Research suggests that metformin may reduce the risk of cardiovascular events in people with type 2 diabetes, particularly those who are overweight or obese.

Cost-effective: Metformin is generally inexpensive, making it accessible for a wide range of patients.

Well-tolerated: Metformin has a good safety profile and is well-tolerated by most people when taken at the appropriate dose.