

Metformin Use Shown to Induce Vitamin B12 Deficiency in Diabetics

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STORY AT-A-GLANCE

- › Metformin is a commonly prescribed medication for managing Type 2 diabetes, but its long-term use is linked to vitamin B12 deficiency, which leads to serious health issues
- › Vitamin B12 deficiency, often seen in metformin users, causes neurological problems like neuropathy and hematological issues such as anemia
- › Regular screening for vitamin B12 levels is recommended for individuals taking metformin to prevent complications from deficiency
- › Lifestyle interventions, including diet and exercise, offer a safer and more effective alternative to prevent diabetes compared to relying on metformin
- › Understanding the research behind metformin's impact on vitamin B12 levels is important for grasping the full implications of its use in diabetes management

Metformin remains the most commonly prescribed oral medication for managing Type 2 diabetes due to its effectiveness in controlling blood glucose levels. However, emerging research indicates a significant concern regarding vitamin B12 deficiency, particularly with long-term metformin use.

This deficiency is associated with several serious health complications, including neurological problems such as peripheral neuropathy and hematological issues like anemia, both of which negatively impact quality of life.

The prevalence of Type 2 diabetes is escalating globally, posing a significant public health challenge. Factors contributing to this rise include increasing obesity rates, sedentary lifestyles and an aging population.¹ Metformin is a conventional first-line treatment for managing Type 2 diabetes.

However, long-term use of metformin is linked to reduced absorption of vitamin B12.² This vitamin is crucial for nerve function and the production of red blood cells. Deficiency leads to serious health issues, including peripheral neuropathy and megaloblastic anemia, significantly impairing the quality of life for diabetic patients.

These findings underscore the necessity for regular monitoring of vitamin B12 levels in individuals undergoing metformin therapy to prevent potential adverse effects.

Early Detection of B12 Deficiency in Metformin Users

In the early 1970s, health care professionals began noticing a troubling pattern among diabetic patients treated with metformin. Research published in the British Medical Journal found that individuals on long-term metformin therapy displayed symptoms like peripheral neuropathy and macrocytic anemia – classic signs of vitamin B12 deficiency.³

Further investigations revealed that metformin interferes with calcium, disrupting the binding of the vitamin B12-intrinsic factor complex to receptors in the ileum, thereby hampering the absorption process. This research prompted recommendations for routine vitamin B12 level monitoring in patients prescribed metformin.

High Prevalence of Vitamin B12 Deficiency in Long-Term Metformin Users

Studies consistently demonstrate that individuals with Type 2 diabetes on long-term metformin therapy exhibit a significantly higher prevalence of vitamin B12 deficiency compared to those not using the medication.⁴ Up to 93% of diabetic patients treated with

metformin may develop this deficiency over extended periods, highlighting the need for heightened awareness and proactive management.

Higher doses of metformin and longer treatment durations are directly associated with an increased risk of deficiency.⁵ Patients on more than 2,000 milligrams (mg) of metformin daily or those taking it for over four years are particularly susceptible. This suggests that clinicians should consider dosage and treatment length when prescribing metformin and implement regular monitoring protocols.

Age, higher dosages and prolonged metformin use increase the risk of vitamin B12 deficiency. Older patients and those requiring high doses may benefit from more frequent screenings and supplementation strategies to prevent complications.⁶

Vitamin B12 deficiency exacerbates neuropathy and impairs cognitive health, leading to issues such as memory loss and increased dementia risk. This interplay between diabetes management and nutritional deficiencies underlines the importance of not only controlling blood glucose but also ensuring overall health.

How Metformin Interferes with Vitamin B12 Absorption

Metformin disrupts vitamin B12 absorption by interfering with calcium ions in the gut, preventing the formation of the vitamin B12-intrinsic factor complex, which is essential for absorption in the ileum.⁷ Additionally, metformin impacts the receptors responsible for recognizing and absorbing this complex, further reducing vitamin B12 uptake.

Furthermore, the effects of metformin on gut motility also contribute to its interference with vitamin B12 absorption. The medication alters gastrointestinal transit time, which impacts the bioavailability of essential nutrients, including vitamin B12.

This effect is especially pronounced in patients taking higher doses over extended periods, necessitating a closer examination of the dosage and the need for supplementation. Recognizing this multifactorial disruption is key in understanding why metformin patients are at an increased risk for vitamin B12 deficiency.

Consequences of Vitamin B12 Deficiency

The neurological implications of vitamin B12 deficiency in patients taking metformin are particularly concerning. Peripheral neuropathy, characterized by tingling, numbness or burning sensations in the hands and feet, is a common issue that may progress to severe nerve damage if untreated. This complication often mimics diabetic neuropathy, making it difficult for health care providers to distinguish between the two conditions without proper screening.

In addition to peripheral neuropathy, vitamin B12 deficiency may lead to cognitive disturbances such as impaired memory, difficulty concentrating and increased risks of developing dementia. These cognitive symptoms substantially impact quality of life, especially in elderly patients who are already vulnerable to cognitive decline. The compounding effect of diabetes management and vitamin deficiency presents a significant challenge for maintaining both physical and mental health.

Hematologically, vitamin B12 deficiency results in megaloblastic anemia, a condition in which red blood cells are abnormally large and inefficient in oxygen transport. Symptoms of this type of anemia include fatigue, weakness, pallor and shortness of breath.

These symptoms exacerbate the already taxing demands of managing Type 2 diabetes, leading to increased health care visits, additional medical costs and decreased patient well-being. The early detection and treatment of vitamin B12 deficiency are therefore vital for maintaining overall health and optimizing diabetes management.

Widespread Societal Impacts of Metformin-Induced Vitamin B12 Deficiency

The long-term use of metformin in managing Type 2 diabetes has significant repercussions on public health. Metformin's association with vitamin B12 deficiency leads to an increased incidence of neuropathy and anemia among diabetic patients. These health complications necessitate additional medical interventions, placing a

greater strain on health care systems already burdened by the rising prevalence of diabetes.

Economically, the implications are profound. Managing complications arising from vitamin B12 deficiency requires more frequent medical consultations, additional laboratory tests and supplementary treatments such as vitamin B12 supplementation. This not only elevates healthcare costs for individuals but also increases the overall financial burden on health care infrastructures, diverting resources from other critical areas of patient care.

Strategies to Mitigate Vitamin B12 Deficiency in Metformin Users

Serum vitamin B12 levels and additional biomarkers like homocysteine and methylmalonic acid provide more sensitive indicators for early detection of deficiency.⁸ Elevated homocysteine and methylmalonic acid levels are particularly useful for identifying functional vitamin B12 deficiency, even when serum B12 levels appear borderline.

By using these biomarkers, health care providers can detect deficiency before symptoms become clinically apparent, ensuring timely intervention. Further, also consider:

- **Supplementation** – Oral or intramuscular vitamin B12 supplements help restore adequate levels, depending on the severity of the deficiency.⁹ Oral supplementation is generally effective for mild to moderate deficiency, with dosages ranging from 1,000 to 2,000 micrograms daily.

Intramuscular injections, typically administered monthly, may be more suitable for patients with severe deficiency or those with malabsorption issues. Patients on long-term metformin therapy should discuss supplementation options with their health care providers to determine the best approach based on individual needs and risk factors.

- **Dietary modifications** — Incorporating B12-rich foods, such as meat and dairy, is essential. Vegetarians and vegans, who are particularly at risk for vitamin B12 deficiency due to dietary restrictions, should consider supplements.¹⁰ Regular dietary assessments help identify gaps in nutrition and guide appropriate dietary adjustments to support optimal vitamin B12 levels.
- **Regular monitoring** — Routine blood tests every six to 12 months allow for early intervention to maintain B12 levels. Monitoring is particularly crucial for patients on higher doses of metformin or those who have been on the medication for several years. Establishing a schedule for regular screening helps catch deficiencies early.
- **Patient education** — Patients need to be educated about the risks associated with metformin and the importance of a healthy lifestyle for diabetes prevention and treatment. Many patients are unaware of the link between metformin use and vitamin B12 deficiency and the alternatives for safer diabetes management.

Lifestyle Strategies Work Better Than Metformin for Diabetes Management

Lifestyle changes such as diet and exercise have been shown to prevent Type 2 diabetes more effectively than metformin alone, reducing reliance on medication and the associated risk of vitamin B12 deficiency.¹¹

Studies indicate that weight loss, increased physical activity and dietary modifications significantly improve insulin sensitivity and glycemic control, allowing patients to reduce or discontinue metformin use. These kinds of lifestyle interventions will also support overall nutritional health, thereby decreasing your risk of nutrient deficiencies.

Sources and References

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