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Research Article

Prevalence of Vitamin B12 Deficiency in Type 2 Diabetes Mellitus Patients on Long-Term Metformin Therapy

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Abstract

Vitamin B12 deficiency is a common concern in patients with Type 2 diabetes mellitus (T2DM), particularly in those on long-term metformin therapy. Metformin, a first-line drug in the management of T2DM, is known to interfere with vitamin B12 absorption, potentially leading to deficiency. This study aims to determine the prevalence of vitamin B12 deficiency in T2DM patients on long-term metformin therapy and to identify associated risk factors. A total of 150 patients with T2DM on metformin for at least one year were included. Serum vitamin B12 levels were measured, and deficiency was defined as levels below 200 pg/mL. The results showed that 27% of patients had vitamin B12 deficiency, with a higher prevalence in those on metformin for more than five years. Risk factors such as age, duration of metformin use, and BMI were also correlated with deficiency. The study highlights the importance of monitoring vitamin B12 levels in long-term metformin users, particularly in those with additional risk factors. Proactive management and supplementation strategies are necessary to prevent complications associated with B12 deficiency, such as neuropathy and anemia.

Keywords: Vitamin B12 deficiency, Type 2 Diabetes Mellitus, metformin, long-term therapy, neuropathy, anemia, risk factors.

Introduction

Vitamin B12 (cobalamin) plays a crucial role in red blood cell formation, neurological function, and DNA synthesis. Deficiency in this essential nutrient can lead to a variety of clinical manifestations, including anemia, peripheral neuropathy, and cognitive disturbances (1). One of the significant concerns in patients with Type 2 Diabetes Mellitus (T2DM) is the potential for vitamin B12 deficiency, especially in those undergoing long-term metformin therapy. Metformin, a widely used first-line medication for managing T2DM, has been associated with a decreased absorption of vitamin B12, particularly when used over prolonged periods (1- 3).

The prevalence of vitamin B12 deficiency in T2DM patients on metformin therapy has been well-documented in the literature, with studies showing varying rates of deficiency ranging from 10% to 30% in this population (2). Vitamin B12 deficiency in these patients can lead to significant complications, including peripheral neuropathy, which may worsen the already existing diabetic neuropathy, and hematological changes, such as megaloblastic anemia (3). The pathophysiology of metformin-induced vitamin B12 deficiency remains poorly understood, but

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it is thought to involve alterations in gut motility and changes in the small bowel, leading to reduced vitamin B12 absorption (4).

Several studies have suggested that long-term metformin use, particularly beyond 5 years, increases the risk of vitamin B12 deficiency, although the exact duration required to cause deficiency is still debated. Additionally, other factors, such as age, BMI, and renal function, have been proposed as potential risk factors for developing B12 deficiency in metformin users. Despite these findings, vitamin B12 monitoring and supplementation are not always routinely implemented in clinical practice for diabetic patients on metformin therapy (5).

The aim of this study is to investigate the prevalence of vitamin B12 deficiency in T2DM patients on long-term metformin therapy and to explore the relationship between B12 deficiency and various clinical factors.

Aim:

To evaluate the prevalence of vitamin B12 deficiency in Type 2 Diabetes Mellitus patients undergoing long-term metformin therapy and to identify associated risk factors.

Objectives:

1. To assess the incidence of vitamin B12 deficiency in patients on metformin for more than one year.
2. To analyze the relationship between vitamin B12 deficiency and clinical factors such as age, duration of metformin use, BMI, and renal function.

Materials and Methods:

This cross-sectional study was conducted at a tertiary care hospital over a 12-month period. A total of 150 adult patients diagnosed with Type 2 Diabetes Mellitus who had been on metformin therapy for at least one year were enrolled. The inclusion criteria consisted of patients aged 40-70 years, with a confirmed diagnosis of T2DM and on a stable dose of metformin. Exclusion criteria included patients with known vitamin B12 deficiency before the study, those with gastrointestinal diseases affecting absorption, and patients with severe renal dysfunction (creatinine clearance <30 mL/min).

Demographic data (age, gender, BMI), clinical data (duration of diabetes, duration of metformin use), and laboratory data (serum vitamin B12 levels) were collected. Vitamin B12 deficiency was defined as a serum vitamin B12 level of less than 200 pg/mL. All patients underwent a clinical examination to assess for symptoms related to B12 deficiency, such as peripheral neuropathy and anemia. The data were analyzed using statistical methods to identify correlations between vitamin B12 deficiency and potential risk factors.

Results:

Table 1: Prevalence of Vitamin B12 Deficiency in Type 2 Diabetes Patients on Metformin Therapy

Vitamin B12 Status	Number of Patients (n=150)	Percentage (%)
Deficient (<200 pg/mL)	40	27%
Normal (>200 pg/mL)	110	73%

Table 2: Risk Factors Associated with Vitamin B12 Deficiency

Risk Factor	Vitamin B12 Deficiency (%)	p-value
Duration of Metformin >5 years	36%	0.04
Age >60 years	45%	0.01
BMI >30	32%	0.03
Renal Dysfunction (eGFR <60 mL/min)	40%	0.05

The overall prevalence of vitamin B12 deficiency in patients on long-term metformin therapy was found to be 27%. Risk factors such as duration of metformin use, age, BMI, and

renal dysfunction were significantly associated with an increased risk of deficiency.

Discussion:

The prevalence of vitamin B12 deficiency in patients with Type 2 Diabetes Mellitus on long-term metformin therapy in this study was 27%, consistent with previous research suggesting a moderate to high prevalence of B12 deficiency in this population (6). This finding highlights the importance of monitoring B12 levels in patients who have been on metformin for extended periods, especially in those who are at higher risk due to factors such as age, obesity, and renal impairment.

The relationship between metformin and vitamin B12 deficiency is not fully understood, but it is thought to involve changes in gut motility and bacterial overgrowth, which impair B12 absorption in the ileum (7) The study found that patients who had been on metformin for more than five years had a significantly higher risk of vitamin B12 deficiency. This supports the growing evidence that prolonged metformin therapy increases the likelihood of developing this deficiency, and regular screening should be considered after five years of metformin use (8).

In addition to the duration of metformin therapy, other clinical factors, such as advanced age, obesity (BMI >30), and renal dysfunction, were also found to significantly increase the risk of vitamin B12 deficiency. Older adults and those with obesity or reduced renal function may have impaired gastrointestinal absorption of B12, further exacerbating the risk in metformin users (9). The presence of vitamin B12 deficiency may also worsen diabetic neuropathy, a common complication of T2DM, leading to more severe symptoms (10).

Despite these findings, routine vitamin B12 monitoring and supplementation are not always implemented in clinical practice. This study underscores the need for proactive screening and the potential benefit of B12 supplementation in high-risk groups, especially those on long-term metformin therapy.

Conclusion:

This study demonstrates that vitamin B12 deficiency is prevalent in Type 2 Diabetes Mellitus patients on long-term metformin therapy, with an overall incidence of 27%. The duration of metformin use, age, BMI, and renal function are significant risk factors for developing this deficiency. Given the potential complications associated with B12 deficiency, such as neuropathy and anemia, it is essential to monitor vitamin B12 levels regularly in high-risk patients and consider supplementation as part of comprehensive diabetic care. Further longitudinal studies are needed to evaluate the long-term consequences of B12 deficiency in this population.

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