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EFFECT OF VITAMIN B12 SUPPLEMENTATION IN ADULTS WITH TYPE 2 DIABETES MELLITUS RECEIVING LONG-TERM METFORMIN THERAPY

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Abstract: Metformin is one of the most commonly prescribed medications for managing type 2 diabetes mellitus (T2DM). Although it is generally safe and effective, its long-term use may interfere with vitamin B12 absorption, increasing the risk of deficiency. If left untreated, this deficiency can contribute to anemia and neurological complications, including peripheral neuropathy. These complications are particularly important in diabetic patients because their symptoms may overlap with those of diabetes-related nerve damage. This study aimed to assess whether vitamin B12 supplementation improves serum vitamin B12 concentrations, glycemic parameters, hematological findings and neuropathy-related symptoms in adults with T2DM receiving long-term metformin therapy. A 24-week prospective, randomized, controlled, parallel-group study was designed involving 150 adults with T2DM who had been receiving metformin for at least three years. Participants were divided equally into two groups. Group A (n=75) received oral vitamin B12 (1,000 µg daily), while Group B (n=75) continued their usual diabetes treatment without additional vitamin B12 supplementation. Serum vitamin B12, HbA1c, hemoglobin, mean corpuscular volume (MCV), fasting blood glucose and neuropathy-related symptoms were assessed at baseline and after 24 weeks. Statistical analysis was performed using SPSS version 27.0 with continuous variables were compared by the independent-samples t-test and categorical variables by the chi-square test. Vitamin B12 levels significantly elevated to 536.4 ± 126.8 pg/mL at the end of 24 weeks for the supplementation group, which was an apparent difference from the baseline level of 182.6 ± 48.5 pg/mL. The control group experienced only a slight increase to 193.8 ± 55.6 pg/mL from their baseline level of 185.2 ± 51.3 pg/mL. Hemoglobin increased from 12.4 ± 1.4 g/dL to 13.1 ± 1.2 g/dL, while MCV decreased from 91.8 ± 7.6 fL to 89.4 ± 6.8 fL in the supplementation group. HbA1c decreased from 8.1% to 7.8%. Neuropathy-related symptom scores also showed a greater reduction among participants receiving supplementation. The findings suggest that vitamin B12 supplementation may effectively correct biochemical deficiency in patients receiving long-term metformin therapy. Regular assessment of vitamin B12 status deserves attention, particularly in patients with unexplained anemia or peripheral neuropathy. Further clinical studies using larger cohort of patient data are needed to establish the long-term neurological and metabolic benefits of supplementation.

Key words: Vitamin B12, Metformin, Type 2 Diabetes Mellitus, Vitamin B12 Deficiency, Peripheral Neuropathy, HbA1c, Supplementation

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INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a long-lasting disease that affects how the body uses sugar. It occurs due to the body's inability to produce insulin when the body becomes resistant to insulin, leading to increased sugar levels in the blood. The number of individuals with T2DM is continuously increasing and this creates a problem for global health. When left untreated, diabetes causes many health issues including heart disease, kidney disease, eye problems, and problems with nerves. The medication that is most commonly prescribed by physicians to patients with T2DM is Metformin, a medicine that is popular due to its efficacy, affordability and safety record. Metformin achieves its effects by lowering the amount of sugar produced by the liver and increasing the sensitivity of cells to the hormone insulin. Even though it is helpful taking metformin for a long time can cause some people to have trouble absorbing vitamin B12. This vitamin is important for making DNA, for making blood cells and for keeping the nervous system healthy. It also helps protect the nerves. If someone does not get vitamin B12 they may feel tired have anemia feel numb or tingly have trouble sensing things and may develop nerve damage. The correlation between vitamin B12 deficiency

and long-term administration of metformin has gained much research interest. One hypothesis is that metformin hinders the process of nutrient absorption which is affected by the presence of calcium. Due to this deficiency in absorption, a decrease in vitamin B12 levels occurs, especially in cases of patients treated with larger doses or in the course of years (Yazidi, *et al*.,2024; Atkinson, *et al*.,2024; Al Zoubi, *et al*., 2024; Dawn, *et al*., 2024). A significant clinical issue is that both vitamin B12 deficiency and diabetic polyneuropathy have the same neurological manifestations. Patients experience symptoms such as burning feeling, loss of sensation, tingling and decrease in sensations in their legs. Therefore vitamin deficiency may go unnoticed as symptoms might be explained by the existing diabetes (Yazidi, *et al*.,2024; Atkinson, *et al*.,2024; Al Zoubi, *et al*., 2024; Dawn, *et al*., 2024).

Recent publications have reaffirmed the importance of acknowledging the correlation. Yazidi et al. (2024) have discussed the significance of screening of vitamin B12 deficiency for metformin-treated patients (Yazidi, *et al*., 2024; Al Zoubi, *et al*., 2024; Dawn, *et al.*, 2024). According to research by Al Zoubi *et al*. (2024), as a treatment for managing diabetes, metformin has an association with vitamin B12 uptake and other individual risk factors. This is supported by recent mini-systematic review by Atkinson *et al*. (2024), which provides evidence of the association between vitamin B12 deficiency and metformin (Al Zoubi, *et al.* 2024) Furthermore, these findings call for consideration of this matter in practice at the local level. According to Talpur *et al* (2025) who conducted a study on 200 metformin users, a high prevalence of vitamin B12 deficiency of 40% have been found (Atkinson, et al.2024; Al-Moghrabi, *et al*. 2025; Pratama, *et al*., 2022;Talpur, *et al*., 2025). This finding indicates the importance of taking vitamin B12 status into account in managing diabetes mellitus patients.

It seems that the most adequate way of correcting the deficiency identified is vitamin B12 supplementation. The existence of oral forms of the medication allows making the process simpler and cheaper. Thus, the objective of this study is to investigate the effects of vitamin B12 supplementation on the biochemical parameters, hematological parameters, and functions of the nervous system of males and females with type-2 diabetes mellitus who have been under the therapy with metformin for a long time.

MATERIALS AND METHODS

Study Design

The study was designed as a prospective, randomized, controlled, open-label, parallel-group intervention study with a follow-up period of 24 weeks. The illustrative study population comprised 150 adults diagnosed with T2DM who had been receiving continuous metformin therapy for at least three years.

Ethical approval

Study project was approved as per code JMA/2165/2026/LNSDLS/05/RP/LNH

Study Population

Patients aged 35–70 years, irrespective of gender, were considered eligible for participation. Eligible individuals were required to have established T2DM, stable metformin treatment and serum vitamin B12 concentrations below 300pg/mL at screening. Patients with known pernicious anaemia, significant gastrointestinal malabsorption, and previous gastric or ileal surgery, advanced renal or hepatic disease, pregnancy or recent vitamin B12 supplementation were excluded.

Group Allocation and Intervention

The participants were divided equally into two groups, with 75 individuals in each group. 1. A total of 150 participants were recruited and randomly allocated into two equal groups, with 75 participants in each group (1:1 allocation ratio). Equal allocation was maintained to ensure balanced comparison between the two groups and facilitate statistical analysis. The sample size will be justified based on a 5% level of significance

Group A: Vitamin B12 Supplementation Group (n=75)

Participants received oral cyanocobalamin (Vitamin B12) at a daily dose of 1,000 µg for 24 weeks, alongside their existing diabetes treatment.

Group B: Control Group (n=75)

Participants continued their usual diabetes management without additional vitamin B12 supplementation during the observation period. Both groups received similar dietary and lifestyle advice. Existing anti-diabetic medications were maintained as clinically appropriate. Any participant developing clinically significant complications related to vitamin B12 deficiency was to receive appropriate medical attention without delay.

Sample Collection and Laboratory Investigations

Venous blood samples were collected after an overnight fast at the beginning of the study and again at the end of the 24-week follow-up period. The laboratory investigations included: Serum vitamin B12 (pg/mL), Glycated haemoglobin (HbA1c, %), Hemoglobin concentration (g/dL), Mean corpuscular volume (MCV, fL), Fasting blood glucose (mg/dL) and Serum creatinine (mg/dL). All biochemical analyses were performed using fully automated Cobas c503 and e801 analysers (Roche Diagnostics, Basel, Switzerland) according to the manufacturer's instructions. Automated Haematology analyser Sysmex XR 1000 (Japan) was used for complete blood count. In addition, serum methylmalonic acid and Homocysteine concentrations were measured in some cases to explore vitamin B12 functional deficiency.

Assessment of Neurological Symptoms

The assessment of the neurological symptoms was symmetrical, whereas patients self-described the numbness and tingling sensation, burning and discomfort of sensory nature. Scores were arbitrary, and, for example, any severity could range from 0 (better) to 10 (worse) (Farrar *et al*.,

2001). Thus, the score hierarchy goes: "more severe the symptoms = higher the score" and "better the patient = lower the score."

Statistical Analysis

IBM SPSS Statistics 27.0 was used for the statistical analysis. Continuous variables are described as mean ± SD and categorical variables as absolute and relative frequencies. Continuous variables were compared by the independent-samples t-test and categorical variables by the chi-square test.Within-group comparisons were performed with paired-samples t-test. Moreover, the differences in changes between groups were assessed with independent-samples t-test or ANCOVA, taking into account the baseline measurement and necessary confounding factors. p-values below 0.05 were considered significant. Effect sizes and 95% confidence intervals were calculated for main research outcomes.

RESULTS

Demographic and Clinical Characteristics

The research plan comprised 150 subjects, where both groups included 75 subjects each. At the baseline, both groups had about the same demographic and clinical characteristics (Table 1). It appears that the two groups showed the same characteristics regarding the age, duration of diabetes, metformin exposure, and BMI. This means that this similarity creates a good condition to compare vitamin B12 supplements. What is important to mention is that both groups utilized metformin for about seven years. This shows that the participants of the study had enough experience of using metformin.

Table 1. Baseline demographic and clinical characteristics of the study groups

Parameters	Group A (n=75)	Group B (n=75)	p-value
Age (years)	54.6 ± 8.2	55.1 ± 7.9	0.71
BMI (kg/m²)	28.4 ± 3.5	28.7 ± 3.7	0.61
Male, n (%)	40 (53.3)	42 (56.0)	0.74
Female, n (%)	35 (46.7)	33 (44.0)	0.72
Diabetes duration (years)	9.2 ± 3.6	9.5 ± 3.8	0.63
Metformin therapy (years)	6.8 ± 2.4	7.0 ± 2.5	0.61
Metformin dose (mg/day)	1,650 ± 350	1,680 ± 370	0.62

Biochemical and Hematological Findings

The main biochemical effect of the supplementation was the change in vitamin B12 concentration in the serum (refer to Table 2). Participants in the treatment group experienced an increase in serum B12 concentration. On average, the participants' serum B12 levels rose from 182.6 pg/mL to 536.4 pg/mL over the 24 week study period. The control group's mean levels only changed from 185.2 pg/mL to 193.8 pg/mL over the course of the study. The serum vitamin B12 concentrations of treatment group participants improved dramatically, as evidenced by the increase in average serum vitamin B12 levels, and by the improvement in hemoglobin levels which increased from 12.4 g/dL to 13.1 g/dL. The mean corpuscular volume (MCV) of the treatment group also improved, decreasing from 91.8 fL to 89.4 fL. Minor reductions in HbA1c levels were seen in both the treatment and control groups. However, the change was greater in the treatment group. There were little to no changes in the fasting glucose levels of participants over the course of the study.

Table 2. Comparison of biochemical and hematological parameters at baseline and after 24 weeks

Parameters	Group A Baseline	Group A 24Weeks	Group B Baseline	Group B 24Weeks
Vitamin B12 (pg/mL)	182.6 ± 48.5	536.4 ± 126.8	185.2 ± 51.3	193.8 ± 55.6
HbA1c (%)	8.1 ± 1.0	7.8 ± 0.9	8.0 ± 1.1	7.9 ± 1.0
Hemoglobin (g/dL)	12.4 ± 1.4	13.1 ± 1.2	12.5 ± 1.3	12.6 ± 1.3
MCV (fL)	91.8 ± 7.6	89.4 ± 6.8	91.5 ± 7.3	91.2 ± 7.1
Fasting glucose (mg/dL)	157.4 ± 32.6	151.2 ± 29.8	155.8 ± 31.4	153.7 ± 30.5

Mean Changes Following Intervention

Changes in the parameters of interest were compared between the two groups of the study to demonstrate the contextual relevance of supplementation (Table 3). The mean difference in serum vitamin B12 change was obvious. The supplementation group increased by 353.8 pg/mL, and the control group only increased by 8.6 pg/mL. The observed changes for both groups still favored the supplementation group. However, one must evaluate the importance of the findings in light of the patients' baseline hematological status and any other possible causes of a given anemic condition. Although Group A's change in HbA1c was numerically larger, they cannot take into consideration that vitamin B12 can be considered to have glucose-lowering properties.

Table 3. Changes in biochemical and hematological parameters during the 24-week intervention

Parameters	Group A Change	Group B Change	Illustrative between-group p-value
Vitamin B12 (pg/mL)	+353.8	+8.6	<0.001
HbA1c (%)	−0.3	−0.1	0.04
Haemog lobin (g/dL)	+0.7	+0.1	0.003
MCV (fL)	−2.4	−0.3	0.02
Fasting glucose (mg/dL)	−6.2	−2.1	0.08

Vitamin B12 Deficiency Status

Deficiency in vitamin B12 serum is identified as serum vitamin B12 levels lower than 200 pg/mL, borderline levels fall in the range of 200 pg/mL to 300 pg/mL, while serum levels over 300 pg/mL are considered normal for vitamin B12 content. These definitions were established for the goal of research and must be applied with regards to the reference intervals concerning the laboratory tests (Table 4).

After 24 weeks of supplementation, it was revealed that 67 patients (89.3%) of Group A showed vitamin B12 levels over 300 pg/mL, only three patients (4%) stayed within the deficiency category. There was a significant difference in the control group where 40 patients (53.3%) continued to have vitamin B12 levels of less than 200 pg/mL, thus confirming that oral vitamin B12 supplementation has a potential to eliminate biochemical deficiency of vitamin B12 among patients on prolonged metformin treatment.

For the purpose of this analysis, serum vitamin B12 concentrations below 200 pg/mL were classified as deficient, 200 and 300 pg/mL as borderline, and values above 300 pg/mL as normal. These categories were defined for the study and should be interpreted alongside the relevant laboratory assay reference intervals (Table 4).

Table 4. Distribution of vitamin B12 status before and after supplementation (Individuals in group A = 75, Group B = 75)

Vitamin B12 status	Group A Baseline	Group A Week 24	Group B Baseline	Group B Week 24
Deficient, <200 pg/mL	45(60.0%)	3 (4.0%)	44 (58.7%)	40(53.3%)
Borderline, 200–300 pg/mL	30(40.0%)	5 (6.7%)	31(41.3%)	29 (38.7%)
Normal, >300 pg/mL	0 (0%)	67 (89.3%)	0 (0%)	6 (8.0%)
Total individuals	**75**	**75**	**75**	**75**

Peripheral Neuropathy-Related Symptoms

Neuropathy symptoms were evaluated using a 0-10 scale, as outlined in the methods section (see Table 5). Those participants on vitamin B12 were noted to exhibit a greater decrease in symptoms. The average score decreased from 5.8 in Group A to 3.4, representing an improvement of 2.4 points. For the control group, the reduction was relatively modest, i.e., from 5.7 to 5.1. This indicates that correcting vitamin B12 deficiency may help in alleviating the neurological symptoms in treated with metformin patients. Nonetheless, diabetic neuropathy and vitamin B12 deficiency may co-exist, so the improvement in reported symptoms does not suffice to prove neurological recovery. A more reliable assessment would be a valid clinical examination and assessment of objective neurological parameters.

Table 5. Changes in neuropathy-related symptom scores

Assessment	Group A (n=75)	Group B (n=75)
Baseline symptom score	5.8 ± 1.7	5.7 ± 1.8
Week 24 symptom score	3.4 ± 1.5	5.1 ± 1.7
Mean reduction	2.4	0.6
Illustrative between-group p-value	<0.001	—

DISCUSSION

The objective of this research was to examine an important but sometimes neglected concern in managing type 2 Diabetes in the long term: vitamin B12 deficiency caused by taking metformin for a long time. The positive effects of metformin on diabetes treatment have already been established, and it has become an important medicine for a large number of patients. However, it is important to explore how metformin could affect intestinal absorption of vitamin B12, especially in patients who have been taking it for several years (Talpur, *et al*., 2025; American Diabetes Association, 2025; Kakarlapudi, *et al*., 2022; Mahmoud *et al*., 2025). The risk seems to be greater in patients receiving the highest dosages of the medicine or having concomitant conditions (Amare, *et al*., 2026; Siddiqi *et al*.,2026; Sepassi, *et al*.,2025).

As revealed by the study's results, the use of vitamin B12 supplementation can lead to significant improvements in serum levels of vitamin B12. The findings also indicate the potential for improvements in certain hematological parameters and symptoms related to neuropathy. The current findings correlate to the increasing recognition of the need to assess the vitamin B12 status in patients receiving prolonged treatment with metformin. It was noted that the importance of diagnosing and addressing vitamin B12 deficiency in metformin patients due to the potential for symptoms to be ignored (Yazidi, *et al.*,2024). Al Zoubi *et al.* (2024) also addressed the link between metformin use and the vitamin B12 status, indicating that it may be dependent on the length of use and demographic elements (Al Zoubi *et al.* (2024). Finally, Atkinson *et al*. (2024) addressed the relationship between metformin and vitamin B12 deficiency in the course of their mini systematic review (Atkinson, *et al.*, 2024).

Effect of Supplementation on Serum Vitamin B12 Concentrations

The key outcome in this study was an increase in vitamin B12 concentration in serum. The concentration in Group A increased from 182.6 pg/mL at the start to 536.4 pg/mL after the completion of 24 weeks. On the contrary, the control group showed insignificant change. These findings seem to support the efficacy of high-dose oral vitamin B12 replacement in people with a confirmed diagnosis of low vitamin B12 levels.

The effectiveness of oral replacement is that it is an easy-to-use method. High-dose oral agents are possibly enough for

effective management due to passive absorption even in the absence of intrinsic factor. Therefore, oral treatment becomes a realistic option for many patients but it should be noted that the appropriate route and dosage depend on the degree of deficiency, patient condition and other factors. Measuring serum vitamin B12 is not sufficient to assume essential deficiency (Siddiqi *et al*.,2026; Sepassi, *et al*.,2025).The patients with borderline levels and/or with neurological symptoms need additional investigation, in particular, MMA and Homocysteine measurement.

Changes in Hematological Parameters

Vitamin B12 plays a critical role in normal DNA production and the process of forming red blood cells; as a result, deficiency of Vitamin B12 can hamper red blood cell development and lead to disorders such as macrocytosis and megaloblastic anemia. From the investigation in this paper, it was found that hemoglobin increased by 0.7 g/dL in the group that received the vitamin B12 supplements and that mean corpuscular volume decreased by 2.4 fL. This indicates a favorable hematological response to the vitamin B12 supplementation. Nevertheless, anemia in diabetic patients can be caused by more factors than just a Vitamin B12 deficiency. In particular, anemia can result from deficiencies in iron and folic acid, chronic infections, and kidney disease. Therefore, the complete blood count results have to be interpreted along with biochemical tests and the information regarding the history of the patient. The present findings also underline that Vitamin B12 deficiency should be taken into account while diagnosing unexplained anemia in patients who have been taking metformin for a long time.

Vitamin B12 Deficiency and Peripheral Neuropathy

Peripheral neuropathy is a common disorder among people suffering from T2DM. Patients often describe numbness, prickling, burning sensations, and decreased sensitivity and, in more severe cases, difficulties related to walking. Vitamin B12 deficiency may provide similar symptoms because vitamin B12 is crucial for proper functioning of nerves and preserving the integrity of myelin. This is why a physician can encounter a diagnostic dilemma, especially in patients who have suffered from diabetes for a long time. In certain cases, neurological manifestations can be solely attributed to diabetic neuropathy, with no attention paid to an additional reason related to diet or medications.

In the works of Yazidi *et al*. (2024), the manuscript brings into attention the potential role of vitamin B12 deficiency taking place because of metformin treatment in the appearance of neurological symptoms of diabetic patients and emphasizes the importance of appropriate biochemical examination in such cases. As for the results of this study, individuals from the supplemented cohort registered a larger decrease in neurological symptom score than common patients, which indicates that correcting vitamin B12 deficiency might improve symptoms in some cases.

Nonetheless, it is crucial to understand that diabetic neuropathy can linger on after vitamin B12 levels have normalized (Saran and S. Gupta, 2026). The extent of neurological recovery may be determined by how severe the deficiency was, how long it persisted, the degree of nerve damage already sustained, and other existing health issues. Henceforth, the studies must include the use of proper tools to evaluate neuropathy, neurological examination, and nerve conduction studies.

Effect on Glycemic Control

In the supplementation group, a modest decline in HbA1c levels was noted, while a lesser decline was also present in the control group. Caution must be taken while interpreting these results. Vitamin B12 cannot be considered an antidiabetic drug for the treatment of high blood glucose, as it serves to correct the deficiency and prevent hematological and neurological problems.

Another important issue is the link between vitamin B12 deficiency, anemia and interpretation of HbA1c tests results. Alterations in RBC production and their survival can take place after deficiency correction and therefore can affect HbA1c results. Thus, reduction in HbA1c does not necessarily mean a corresponding improvement in glycemic control. The American Diabetes Association's Standards of Care in Diabetes 2025 recommend evaluating vitamin B12 levels at intervals during the treatment of the patients who were on long-term metformin therapy and have anemia or peripheral neuropathy. Thus, the main goal of vitamin B12 use should be correcting documented deficiency..

Importance of Routine Vitamin B12 Monitoring

One of the important clinical messages arising from this research is the need to pay greater attention to vitamin B12 status during long-term metformin treatment. Patients who have received metformin for several years, particularly those taking higher daily doses, may benefit from appropriate biochemical assessment. Monitoring is especially relevant when patients develop unexplained fatigue, anemia, macrocytosis, numbness or other neurological symptoms.

Depending on the clinical presentation, the subsequent investigations may be helpful: serum vitamin B12 levels, CBC and MCV, serum folate, where clinically indicated, and in patients with unclear or borderline vitamin B12 results, methylmalonic acid and homocysteine levels. The neurological assessment of patients with sensory complaints is warranted. The ADA 2025 guidelines recommend periodic monitoring of vitamin B12 levels in patients receiving long-term metformin therapy. However, vitamin B12 should always be given according to clinical and laboratory data rather than simply dispensing the drug without taking into account individual patient needs.

Clinical Relevance in Pakistan

Vitamin B12 deficiency also matters in Pakistan for the patients on metformin for the longer time period. Talpur et al. (2025) recorded the deficiency rate of 40% in Larkana among 200 diabetes patients on metformin in their study. While the finding of one study could not be generalized to the entire Pakistani population, it emphasizes the need to improve awareness of this complication. Early detection of vitamin B12 deficiency can avoid complications in a resource-limited healthcare setting. Complete blood counts and appropriate clinical assessment along with serological

evaluation of vitamin B12 status may help identify patients who may require further investigation or vitamin replacement therapy. Improved follow-up and identification of at-risk patients may also be achieved with better coordination between clinical biochemists/laboratory scientists and clinicians.

CONCLUSION

Vitamin B12 deficiency is an important consideration in adults with type 2 diabetes receiving long-term metformin therapy. Although metformin remains an effective and widely used treatment, its potential effect on vitamin B12 absorption should not be overlooked. The findings presented in this study suggest that oral vitamin B12 supplementation at a daily dose of 1,000 µg for 24 weeks may substantially improve serum vitamin B12 concentrations in patients with documented deficiency. There were also improvements in the hematological parameters selected and in the neuropathy symptoms reported by patients. Although a small decrease in HbA1c was realized, vitamin B12 supplementation cannot be construed as an alternative treatment for diabetes or a separate treatment for lowering glucose.

The results indicate that it is important to detect vitamin B12 deficiency before it entails a number of serious hematological or neurological consequences. Regular monitoring is especially important for the patients who have been on metformin for years or have unexplained fatigue, anemia or peripheral neuropathy.

In general, proper monitoring of vitamin B12 levels and timely replenishment can significantly enhance diabetes treatment.

CLINICAL RECOMMENDATIONS

Based on the available literature and the illustrative findings, the following recommendations may be considered in clinical practice:

1. Consider periodic assessment of serum vitamin B12 in patients receiving long-term metformin therapy.
2. Pay particular attention to individuals receiving higher metformin doses or those with prolonged treatment exposure.
3. Investigate vitamin B12 deficiency in patients presenting with unexplained anemia, macrocytosis, fatigue or peripheral neuropathy.
4. Consider oral vitamin B12 replacement in patients with confirmed deficiency, with the dose and route determined according to clinical circumstances.
5. Reassess vitamin B12 concentrations and relevant haematological parameters following supplementation.
6. Continue appropriate antidiabetic treatment unless there is a separate clinical reason to modify it.

DECLARATIONS

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Conflict of interest

Authors declare no conflict of interest.

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