

Evaluating Physician Knowledge, Attitudes, and Practices in Screening and Supplementation for Vitamin B12 Deficiency in Type 2 Diabetes Patients Treated with Metformin

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Background and Aim: Long-term metformin use in Type 2 Diabetes Mellitus (T2DM) patients is associated with Vitamin B12 deficiency. This study aims to evaluate physicians' knowledge, attitudes, and practices regarding Vitamin B12 screening and supplementation in this context.

Methods: A survey was administered to physicians across various specialties in government hospitals and primary care centers in Riyadh, Saudi Arabia, from January 2019 to January 2020. The survey assessed their knowledge, attitudes, and practices concerning Vitamin B12 deficiency screening and supplementation.

Results: Of the 402 participating physicians, 94.0% (378 respondents) demonstrated sufficient knowledge about Vitamin B12 deficiency. However, 26.1% believed that Vitamin B12 supplementation does not necessitate screening. 55.7% did not prescribe Vitamin B12 prophylactically, 41.5% omitted neurological examinations in patients presenting with neuropathy, and 22.4% were unaware of the recommended Vitamin B12 supplement dose. Only 49.8% routinely screened for Vitamin B12 deficiency in symptomatic patients. Physicians with more extended years of experience showed significantly better knowledge about Vitamin B12 screening and supplementation ($p < 0.001$).

Conclusion: While most physicians were knowledgeable about Vitamin B12 deficiency and supplementation, a substantial gap in translating this knowledge into practice was observed. There is a critical need for institutional oversight to ensure adherence to American Diabetes Association (ADA) guidelines for Vitamin B12 screening and supplementation in T2DM patients on long-term metformin therapy.

Keywords: knowledge, attitude, practice, vitamin B12 deficiency, Type 2 diabetes mellitus

Introduction

Diabetes Mellitus (DM) is a significant global health challenge, with a worldwide prevalence of 8.5%.^{1,2} In the Middle East, Saudi Arabia ranks second, and seventh globally, with a DM prevalence of 23.7% in the 30–70-year age group.^{3,4} Metformin, the first-line treatment for Type 2 Diabetes Mellitus (T2DM), is recommended at the time of diagnosis along with lifestyle modifications by various diabetes associations.^{4–10} It primarily functions by reducing hyperglycemia through suppression of hepatic gluconeogenesis, enhancing insulin sensitivity, and positively impacting cardiovascular morbidity and mortality.^{11,12}

However, a notable side effect of metformin is Vitamin B12 deficiency, which can lead to a range of complications including megaloblastic anemia, neuropathy, cognitive issues, and increased osteoporosis risk.^{10,13,14} Studies have

indicated that Vitamin B12 levels can decrease within six weeks to four months of initiating metformin treatment,^{5,13} with prevalence rates of deficiency in metformin-treated patients ranging from 5.8% to 52%,⁴ and other studies reporting rates from 3.3% to 6.9%.^{10,12,14,15} Long-term metformin use further escalates this risk, with deficiency rates ranging from 6.3% to 30% in periods spanning six weeks to six months.^{4,10–12} Additionally, higher doses and longer durations of metformin use have a direct correlation with reduced serum Vitamin B12 levels.^{8,10–12,14} The risk of developing Vitamin B12 deficiency due to metformin is also heightened with increasing age and dosage.^{7,8,16}

Recognizing this, the 2017 ADA guidelines recommend assessing all diabetic neuropathy patients for B12 deficiency as a potentially treatable cause. Routine assessment for neuropathy and Vitamin B12 deficiency symptoms in DM patients is advocated, using methods like the Toronto Clinical Scoring System (TCSS), neuropathic pain assessment, and vibration perception threshold tests.^{10–12,17,18} Timely detection and treatment of advanced Vitamin B12 deficiency in long-term metformin users could substantially reduce morbidity and healthcare costs.¹⁶ Despite this, there is a notable lack of studies examining physicians' knowledge, attitudes, and practices towards Vitamin B12 deficiency screening and supplementation in T2DM patients treated with metformin, particularly in Saudi Arabia and the broader Middle East region. This study aims to fill this gap by assessing the knowledge, attitude, and practice among Riyadh-based physicians regarding Vitamin B12 supplementation and deficiency screening, to inform the implementation of clinical practice guidelines for the screening, treatment, and prevention of Vitamin B12 deficiency in T2DM patients on metformin therapy.

Methods

Study Setting

This cross-sectional study employed a self-administered questionnaire to gather data from physicians of diverse specialties—including residents, specialists, fellows, and consultants—working in various government hospitals and primary care centers in Riyadh, Saudi Arabia. The survey was conducted between January 2019 and January 2020. Exclusion criteria for the study encompassed physicians employed in private hospitals and private primary care centers, as well as those who were unable to participate due to various reasons or who declined to complete the survey.

Sample Size

Sample size was calculated based on the formula $N = Z^2 \cdot P(1-P) / d^2$. Assuming 50% of physicians have knowledge about vitamin B12 screening and supplementation, and using 5% margin of error and 95% confidence level, the calculated sample size was 385 participants. The sample size was adjusted to 466 to compensate for the non-response rate of 20%.

Participants and Survey Instrument

In this cross-sectional study, all physicians available during the data collection period were included. Hard copies of the self-administered questionnaire were distributed to these physicians. The participants were requested to complete the anonymous survey, which was in English, to evaluate their fundamental background knowledge. As this was a novel area of study, the questionnaire was developed by the principal investigator, guided by the study's objectives and a review of relevant literature.

To ensure the questionnaire's content validity, it was reviewed by a panel comprising three diabetologists and one family physician, all experienced in diabetes clinical care and familiar with diabetes guidelines. They provided feedback on its appropriateness, accuracy, and relevance. The questionnaire underwent validation for internal consistency (Cronbach's alpha = 0.86), followed by necessary modifications. The estimated time for questionnaire completion was 10–15 minutes. Additionally, a pilot study with 20 participants was conducted to ascertain face validity; however, these results were not included in the final analysis.

The questionnaires were personally distributed to the participants, who provided verbal informed consent before participation. The survey was divided into four sections: the first section collected demographic information (age, gender, education level, specialty, institution, years of experience); the second section evaluated knowledge on metformin side

effects, high-risk populations, Vitamin B12 deficiency symptoms, supplementation routes, and guidelines (with correct answers scored as 1, and incorrect or “do not know” responses scored as 0, resulting in a total score range from 0 to 5); the third section assessed attitudes towards Vitamin B12 prophylaxis, screening, risk factors, associated neuropathy, and supplementation doses and routes; and the fourth section evaluated practices concerning Vitamin B12 deficiency screening, diagnosis, treatment, and neuropathy assessment. Knowledge was categorized as “sufficient” if participants correctly answered three or more knowledge questions, and “insufficient” if fewer than three questions were answered correctly.

Data Management and Analysis Plan

Data analysis was conducted using IBM SPSS Statistics, version 23.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequencies, percentages, means, and standard deviations, were employed to summarize both categorical and quantitative variables. The normality of the data distribution for these variables was assessed. For comparing mean values of quantitative variables, Student's *t*-test was utilized. The Chi-square test was applied to examine associations among categorical variables. Additionally, the Pearson correlation test was conducted to determine correlations between variables. To identify independent predictors of the outcome variable, multivariate regression analysis was performed. Statistical significance was established at a *p*-value of 0.05 or less.

Ethical Considerations

Ethical approval for this study was secured from the Institutional Review Board (IRB) committee of the College of Medicine at King Saud University Medical City, Riyadh, Saudi Arabia. Participants were provided with the questionnaire along with an explanation of the study's objectives. The IRB endorsed the procedure wherein completion of the questionnaire was considered as implied consent from the participants.

Results

Sample Characteristics

A total of 402 physicians participated in this study, yielding a response rate of 87%. Of these, 216 (53.7%) were male and 186 (46.3%) were female. The mean age of the participants was 31.1 years, with a standard deviation of 8.5 years and an age range of 24 to 65 years. The average years of professional experience among the participants was 5.5 years, with a standard deviation of 7.7 years and a range from 1 to 40 years. A significant proportion of the respondents (*n*=221, 55.3%) specialized in family medicine, with the majority (*n*=304, 75.6%) holding the position of residents. The demographic characteristics of the participants are detailed in [Table 1](#).

Physicians' Knowledge

Approximately 23% of the physicians underestimated the knowledge of Vitamin B12 deficiency as a side effect of metformin. A significant majority, 83.3%, correctly recognized that elderly patients are at an elevated risk for developing Vitamin B12 deficiency. Additionally, a substantial proportion of physicians (93.8%) accurately identified the correct route for Vitamin B12 supplementation. While the clinical presentation of Vitamin B12 deficiency was correctly known by 96.5% of the physicians, more than half (56.0%) were not able to correctly identify the cut-off level for Vitamin B12 deficiency, defined as less than 200 ng/mL. These findings are further detailed in [Table 2](#).

Physicians' Attitudes

The study revealed a significant agreement among physicians on several statements related to metformin use and Vitamin B12 deficiency. A notable majority agreed that assessing metformin side effects at each visit is crucial (78.1% agreement vs 6.7% disagreement, *p*<0.001). Furthermore, 52.2% concurred that a high dose of metformin increases the risk of Vitamin B12 deficiency, compared to 9.7% who disagreed (*p*<0.001). Additionally, a significant proportion of physicians recognized that prolonged metformin intake heightens Vitamin B12 deficiency risk (74.8% agreement vs 4.0% disagreement, *p*<0.001).

Table 1 Demographic Characteristics of 402 Surveyed Physicians

Demographic variables	Mean \pm SD (range)	N (%)
Age, in years	31.1 \pm 8.5 (24–65)	
Years of experience, in years	5.5 \pm 7.7 (1–40)	
Gender		
Male		216 (53.7%)
Female		186 (46.3%)
Specialty		
Internal Medicine		144 (35.8%)
Endocrine		9 (2.2%)
Diabetology		3 (0.7%)
Family Medicine		221 (55.0%)
Others		25 (6.2%)
Levels		
General Practitioner		9 (2.2%)
Resident		304 (75.6%)
Specialist / Fellow		35 (8.7%)
Consultant		54 (13.4%)
Years of experience		
< 5 years		291 (72.4%)
5–10 years		57 (14.2%)
11 years or more		54 (13.4%)

Table 2 Knowledge Questions and Responses (n=xx)

Questions	Yes N (%)	No N (%)
1. Vit B12 deficiency is a side effect of metformin	310 (77.1%)	92 (22.9%)
2. Elderly patients are at higher risk of developing Vit. B12 deficiency	335 (83.3%)	67 (16.7%)
3. Vit B12 symptoms include megaloblastic anemia, neuropathy and memory loss	388 (96.5%)	14 (3.5%)
4. The route of Vit. B12 supplementation are oral and intramuscular	377 (93.8%)	25 (6.2%)
5. Vit. B12 below 200 ng/mL is considered low	177 (44.0%)	225 (56.0%)

Physicians also largely agreed that patients with diabetes presenting neuropathy should be evaluated for Vitamin B12 deficiency (89.1% agreement vs 3.7% disagreement, $p < 0.001$), and that Vitamin B12 neuropathy is often misdiagnosed as diabetic neuropathy (66.7% agreement vs 5.5% disagreement, $p < 0.001$). However, opinions were more divided on whether routine Vitamin B12 screening should be conducted for all diabetic patients, with 42.0% agreeing and 31.1% disagreeing ($p = 0.013$).

Conversely, there was significant disagreement over several other attitudes. The majority disagreed that all T2DM patients should be prescribed Vitamin B complex irrespective of their anti-diabetic medications (59.5% disagreement vs 20.9% agreement, $p < 0.001$), and that there is no need for screening when prescribing Vitamin B12 supplementation (43.0% disagreement vs 26.6% agreement, $p < 0.001$). Similarly, 43.0% disagreed with the idea of universally prescribing Vitamin B12 supplements to patients on metformin treatment (vs 26.6% agreement, $p < 0.001$), and a substantial proportion disagreed with the practice of administering a 1200 μ g IM injection of Vitamin B12 annually without routine screening (59.7% disagreement vs 11.4% agreement, $p < 0.001$). These detailed findings are summarized in [Table 3](#).

Table 3 Responses to Attitude Questions (n=xx)

Questions	Agree / strongly agree N (%)	Neutral N (%)	Disagree / strongly disagree N (%)
1. All type 2 diabetic patients should be on Vit. B complex regardless of their antidiabetic medication	84 (20.9%)	79 (19.7%)	239 (59.5%)
2. It is important to ask about metformin side effect in each visit	314 (78.1)	61 (15.2%)	27 (6.7%)
3. High dose of metformin increases the risk of Vit. B12 deficiency	210 (52.2%)	153 (38.1%)	39 (9.7%)
4. Long duration of metformin increases the risk for Vit. B12 deficiency	301 (74.8%)	85 (21.1%)	16 (4.0%)
5. Diabetic patients presenting with neuropathy should be evaluated for Vit B12 deficiency	358 (89.1%)	29 (7.2%)	15 (3.7%)
6. Vit. B12 neuropathy is usually underdiagnosed and labeled wrongly as diabetic nephropathy	268 (66.7%)	112 (27.9%)	22 (5.5%)
7. Vit. B12 should be screened routinely for all diabetic patients	169 (42.0%)	108 (26.9%)	125 (31.1%)
8. Prescribing Vit. B12 supplementation for diabetic patients does not require screening	105 (26.1%)	95 (23.6%)	202 (50.2%)
9. Vit. B12 supplement should be given to all patients on metformin treatment	107 (26.6%)	122 (30.3%)	173 (43.0%)
10. Oral Vit. B12 is as effective as IM in B12 deficiency	134 (33.3%)	125 (31.1%)	143 (35.6%)
11. Instead of screening for Vit. B12 deficiency, you prescribe Vit. B12 1000 µg IM injection annually	46 (11.4%)	116 (28.6%)	240 (59.7%)
12. Vit. B12 supplement is over prescribed by physicians to diabetic patients	184 (45.8%)	141 (35.1%)	77 (19.2%)
13. Guidelines for Vit. B12 deficiency screening and supplementation in T2DM on metformin is needed	274 (68.2%)	102 (25.4%)	26 (6.5%)

Management Practices

Nearly half of the surveyed physicians (49.8%) reported routinely screening for Vitamin B12 deficiency in symptomatic patients, and 40.5% indicated they would repeat screening if previous levels were low. A significant majority (70.1%) performed routine patient screening, including detailed history taking, physical examination, and laboratory testing. The most commonly used laboratory test for assessing Vitamin B12 deficiency was serum vitamin B12 levels, as reported by 84.1% of the physicians.

In terms of prophylaxis, more than half of the physicians (55.7%) stated they do not routinely prescribe Vitamin B12 supplements. However, 43.6% do prescribe Vitamin B12 supplements under various conditions. When it comes to treatment post-metformin prescription, 18.4% of physicians would prescribe Vitamin B12 supplements if the patient showed symptoms, and 56.7% would do so if Vitamin B12 levels were low. Interestingly, 18.4% would still prescribe Vitamin B12 supplementation for symptomatic patients with normal Vitamin B12 levels, and 56.7% would conduct additional lab tests to confirm the diagnosis in such cases.

Regarding administration routes, the oral form was preferred by 55.7% of physicians, while 60.7% would switch to intramuscular injections for symptomatic patients despite prolonged oral supplementation. Half of the physicians (50.7%) reported discontinuing Vitamin B12 supplementation once the patient's Vitamin B12 levels normalized.

A notable proportion of physicians (41.5%) did not perform any neurological examination to assess neuropathy. The barriers preventing Vitamin B12 supplementation prescriptions included lack of awareness about the recommended dose, frequency, and route of administration (22.4%), belief in the ineffectiveness of Vitamin B12 supplementation (5%), and unawareness of the medication's availability (4.5%). These findings are further detailed in Table 4.

Comparison Between Physicians Who Have Knowledge versus Those Who Have No or Limited Knowledge and Their Demographics

In this study, a significant majority of the participants (94%) demonstrated sufficient knowledge regarding Vitamin B12 deficiency in metformin-treated Type 2 Diabetes Mellitus patients, as indicated by correctly answering three or more of the knowledge questions. The analysis revealed no statistically significant differences in knowledge levels when comparing across

Table 4 Responses to Questions on Practice (n=xx)

Questions	N (%)
1. You prescribed metformin to your patient, when do you usually screen for Vit. B12 deficiency?	
1–3 months	25 (6.2%)
4–6 months	107 (26.6%)
5 years	36 (9.0%)
When patient is symptomatic	200 (49.8%)
Never	33 (8.2%)
No response	1 (0.2%)
2. You repeat screening for Vit. B12 deficiency	
If previous level is low	163 (40.5%)
Annually	139 (34.6%)
Every 5 years	28 (7.0%)
Not needed	72 (17.9%)
3. You screen your patients for Vit. B12 deficiency by:	
History and Physical Examination	40 (10.0%)
Laboratory test	37 (9.2%)
All of the above	282 (70.1%)
I do not usually screen any patient	43 (10.7%)
4. What laboratory test you usually use to evaluate Vit. B12 deficiency?	
Serum Vit. B12	338 (84.1%)
Methylmalonic acid (MMA)	23 (5.7%)
Plasma total homocysteine (Hcy)	4 (1.0%)
Holotranscobalamin (HoloTC)	1 (0.2%)
I do not usually evaluate by laboratory test	36 (9.0%)
5. You usually prescribe Vit. B12 supplements prophylaxis	
Once you prescribe metformin	34 (8.5%)
If the patient is on high dose of metformin	18 (4.5%)
If the patient is on long duration of metformin	54 (13.4%)
If the patient is on high dose and long duration of metformin	69 (17.2%)
I do not prescribe it as a prophylaxis	224 (55.7%)
No response	3 (0.7%)
6. After prescribing metformin, you prescribe Vit. B12 supplement as treatment	
If patient is symptomatic	137 (34.1%)
If the level of Vit. B12 is low	205 (51.0%)
I do not usually prescribe it	60 (14.9%)
7. The level of your patient's plasma Vit. B12 is normal and he is symptomatic	
You will still give the Vit. B12 supplementation	74 (18.4%)
You will do other lab test to confirm	228 (56.7%)
I am not aware	100 (24.8%)
8. What form of Vit. B12 supplements do you usually prescribe?	
Oral	234 (55.7%)
IM	68 (16.9%)
Both	72 (17.9%)
I do not usually prescribe	38 (9.5%)
9. What neurologic examination you are using to assess neuropathy	
Toronto Clinical Scoring System (TCSS)	31 (7.7%)
The Douleur Neuropathique 4 (DN4)	19 (4.7%)
Vibration Perception Threshold (VPT)	84 (20.9%)
All of the above	101 (25.1%)
None of the above	167 (41.5%)

(Continued)

Table 4 (Continued).

Questions	N (%)
10. Your metformin-treated patients is having symptoms of Vit. B12 deficiency despite the long use of oral Vit. B12 supplementation	
You will continue the same management	45 (11.2%)
You will stop the metformin	39 (9.7%)
You will increase the dose of oral Vit. B12 supplement	50 (12.4%)
You will increase the frequency of oral Vit. B12 supplement	24 (6.0%)
You will change it to IM	244 (60.7%)
11. When do you usually discontinue Vit. B12 supplement	
If the symptoms disappear	46 (11.4%)
If there is no improvement	16 (4.0%)
After normalize the level of Vit. B12	204 (50.7%)
Patient should continue Vit. B12 supplementation on metformin	136 (33.8%)
12. What might prevent you from prescribing Vit/ B12 supplementation	
I do not believe that Vit. B12 supplementation is effective	20 (5.0%)
I am not aware of the recommended dose, frequency and route of administration	90 (22.4%)
I am not aware of the form available in the hospital	18 (4.5%)
Not available in our pharmacy	11 (2.7%)
Patient's unwillingness to take it	32 (8.0%)
I do not have problem with the prescription	231 (57.5%)

variables such as gender ($p=0.705$), medical specialty ($p=0.059$), affiliated institution ($p=0.564$), and level of training ($p=0.179$). However, a notable correlation was observed between years of experience and knowledge level; physicians with more extended practice experience exhibited a better understanding of Vitamin B12 screening and supplementation than their less experienced counterparts ($p<0.001$). These findings are elaborated in [Table 5](#).

Table 5 Comparison Between Respondents Who Have Knowledge versus Respondents Who Have No or Limited Knowledge (n=xx)

Demographic variables	Knowledge		All patients N (%)	P values
	With knowledge N (%)	Limited or without knowledge N (%)		
Gender				
Male	204 (94.4)	12 (5.6)	216	0.705
Female	174 (93.5)	12 (6.5)	186	
Specialties				
Internal Medicine	130 (90.3)	14 (9.7)	144	0.059
Endocrinology	9 (100.0)	–	9	
Diabetology	3 (100.0)	–	3	
Family Medicine	214 (96.8)	7 (3.2)	221	
Others	22 (88.0)	3 (12.0)	25	
Institutions				
University Hospitals	108 (97.3)	3 (2.7)	111	0.564
King Faisal Hospital	11 (9.7)	1 (8.3)	12	
National Guard Hospital	41 (91.1)	4 (8.9)	45	

(Continued)

Table 5 (Continued).

Demographic variables	Knowledge		All patients N (%)	P values
	With knowledge N (%)	Limited or without knowledge N (%)		
Military Hospitals	62 (91.2)	6 (8.8)	68	
Ministry of Health	141 (94.0)	9 (6.0)	150	
Primary Care Centers	15 (93.8)	1 (6.3)	16	
Levels				0.179
General practitioner	9 (100.0)	–	9	
Resident	283 (93.1)	21 (6.9)	304	
Specialist / Fellow	32 (91.4)	3 (8.6)	35	
Consultant	54 (100.0)	–	54	
Age in years, mean (SD)	27.9 ± 3.0	31.3 ± 8.7		0.056
Years of experience, mean (SD)	2.6 ± 2.4	5.6 ± 7.9		<0.001

Discussion

This study aimed to evaluate the knowledge, attitude, and practice of physicians in Riyadh regarding Vitamin B12 supplementation and deficiency screening in Type 2 Diabetes Mellitus (T2DM) patients treated with metformin. The prolonged use of metformin is known to cause Vitamin B12 deficiency, leading to various hematopoietic, neuropathic, and metabolic complications.^{10,13,15} Such knowledge is essential for physicians to effectively incorporate into their clinical practice.

Our findings revealed that a substantial majority (94.0%) of respondents possess adequate knowledge about Vitamin B12 deficiency. Despite this, a notable proportion (26.1%) believed that Vitamin B12 supplementation does not necessitate prior screening. Additionally, 55.7% do not prescribe Vitamin B12 prophylactically, and 41.5% do not conduct neurological examinations in patients presenting with neuropathy. A significant minority (22.4%) were unaware of the recommended dosage for Vitamin B12 supplementation. Only about half (49.8%) routinely screen for Vitamin B12 deficiency in symptomatic patients. Notably, respondents with longer years of experience demonstrated a better understanding of Vitamin B12 screening and supplementation compared to those with less experience.

In this study, a significant majority (94.0%) of the respondents demonstrated awareness of Vitamin B12 deficiency associated with long-term metformin use, surpassing the 44.0% awareness reported by Alshammmary et al in 2019 and other similar studies.^{19–21} Notably, our cohort included a larger proportion of less experienced physicians (72.4% with <5 years of experience), contrasting with previous studies. We observed that physicians with more extensive experience exhibited superior knowledge of Vitamin B12 screening and supplementation, despite a smaller sample size of respondents with ≥5 years of experience compared to those with <5 years. This finding underscores the importance of experience in the effective management of T2DM patients on metformin, highlighting a critical need for targeted educational initiatives for younger and less experienced doctors to improve their diagnostic, screening, and management skills in Vitamin B12 deficiency.

Furthermore, 74.8% of our respondents acknowledged the increased risk of Vitamin B12 deficiency with long-term metformin use, and 68.2% recognized the necessity for guidelines on Vitamin B12 deficiency screening and supplementation in T2DM patients treated with metformin. However, less than half (42.0%) routinely screen for Vitamin B12 deficiency in their diabetic patients on metformin, a finding that aligns with the limited awareness of ADA recommendations reported by Alshammmary et al in 2019, where only 44.0% of surveyed physicians were aware of these guidelines.¹⁹ This gap between knowledge and practice, especially in the context of the ADA's 2012 recommendations for screening and supplementation to reduce morbidity and healthcare costs,^{10–12,16–18} highlights a substantial area for improvement in clinical practice.

The findings of this study present a perplexing scenario: while a significant proportion of respondents professed knowledge about Vitamin B12 screening and supplementation, there appears to be a notable disconnect in translating this knowledge into practice, especially in managing T2DM patients on long-term metformin therapy. For instance, although 77.1% acknowledged Vitamin B12 deficiency as a metformin side effect, and that prolonged metformin use increases this risk, only 44.0% were aware that a Vitamin B12 level below 200 ng/mL is considered deficient. Moreover, a concerning number of physicians suggested that prescribing Vitamin B12 supplements for diabetic patients does not necessitate prior screening. This discrepancy evidences a substantial gap between knowledge, attitude, and practice among physicians regarding Vitamin B12 deficiency screening and supplementation.

Contrasting with the ADA's 2012 recommendation for assessing neuropathy and Vitamin B12 deficiency symptoms using standard neurological examinations and the TCSS scoring system,^{10–12,17,18} a significant portion of our respondents reported not performing any neurological examination for neuropathy assessment. This failure to adhere to recommended practices points to inadequate and suboptimal management of T2DM patients on long-term metformin therapy. It underscores the need for policy intervention to establish comprehensive guidelines for Vitamin B12 supplementation and the management of Vitamin B12 deficiency in T2DM patients on metformin.

However, this study is limited by its survey-based nature. Survey research is inherently subject to variations in respondents' understanding, interpretation, and potential biases. This limitation was evident in the contrasting responses regarding knowledge and practice, where some respondents indicated awareness but did not apply it clinically. Despite these limitations, the survey effectively highlighted current practices in Vitamin B12 deficiency screening and supplementation among physicians treating T2DM patients on long-term metformin therapy.

Conclusion

This study reveals a striking disparity among physicians: while many possess adequate knowledge about Vitamin B12 deficiency and its supplementation, a substantial number exhibit an inappropriate attitude and struggle to translate this knowledge into clinical practice. This gap underscores an urgent need for the establishment of comprehensive guidelines addressing Vitamin B12 supplementation and the management of its deficiency in Type 2 Diabetes Mellitus (T2DM) patients undergoing metformin therapy. The implementation of such guidelines is anticipated not only to enhance management protocols but also to potentially reduce morbidity and mortality associated with this condition. Therefore, it is imperative to prioritize the development and dissemination of these guidelines to bridge the current knowledge-practice gap and optimize patient outcomes.

Disclosure

The authors report no conflicts of interest in this work.

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