

Over-the-counter supplements in endocrine practice: prevalence, influencing factors, and potential consequences for diagnosis

Emilia Aioanei¹, Marian Pop^{2,3*}, Raluca Pop^{4,5}

1. School of Medicine, George Emil Palade University of Medicine, Pharmacy, Science, and Technology of Targu Mures, Romania
2. Radiology Department, George Emil Palade University of Medicine, Pharmacy, Science, and Technology of Targu Mures, Romania
3. Radiology and Medical Imaging Department, Emergency County Clinical Hospital of Targu Mures, Romania
4. Endocrinology Department, George Emil Palade University of Medicine, Pharmacy, Science, and Technology of Targu Mures, Romania
5. Endocrinology Department, Mures County Clinical Hospital, Romania

ABSTRACT

Background: Dietary supplement use has increased substantially in recent decades, driven by wellness culture, disease prevention, and interest in healthy ageing. In endocrinology, supplements may interfere with hormonal assays or alter the absorption of prescribed therapies. This study evaluated the prevalence of over-the-counter dietary supplement use, associated factors, consumption patterns, and implications for medical practice among Romanian adults with and without endocrine disorders.

Methods: This cross-sectional study included 301 adults aged 18–65 years, recruited from an endocrinology clinic and a general practitioner's practice in Târgu Mureș and Fălticeni, Romania. Participants completed a structured questionnaire assessing demographics, clinical characteristics, supplement use during the previous six months, reasons for use, perceptions of safety and efficacy, purchasing behavior, and label-checking habits. Statistical analyses were performed using SPSS and GraphPad Prism, with $p < 0.05$ considered statistically significant.

Results: Most participants were women (91.7%), with a mean age of 47.7 ± 13.5 years; 69.1% had endocrine disorders. Only 15.9% reported no supplement use, while participants with endocrine disorders had significantly higher consumption rates. Most respondents used supplements following medical recommendations (69.4%) and purchased them from pharmacies (90.7%). Health promotion was the main reason for use (65.1%), followed by energy and immune support (32.2%). Vitamin D, vitamin C, magnesium, and calcium were the most commonly used products. Overall, 72.4% consumed at least one supplement daily, and 23.3% used more than three products per day.

Conclusions: OTC dietary supplement use was highly prevalent, especially among individuals with endocrine disorders. Given the potential effects on diagnostic testing and treatment efficacy, supplement use should be systematically assessed during endocrine consultations.

Keywords: assay interference, dietary supplements, endocrinology, preanalytical factors

Received: 26 May 2026; Accepted: 23 June 2026; Published: 29 June 2026.

INTRODUCTION

Dietary supplement (DS) use has increased consistently over recent decades, largely reflecting the rise of wellness culture, greater emphasis on disease prevention, and growing interest in healthy ageing. These products, including vitamins, minerals, botanical extracts, amino acids, fatty acids, and other compounds, are typically available as capsules, tablets, powders, or liquids. This pattern is particularly relevant to endocrine practice, as many patients use supplements without disclosing this to their physicians and, in some cases, rely on them instead of established, evidence-based therapies[1]. A

similar increase has been observed in Romania, with a projected annual growth of 10.6% over the next few years[2]. Recent studies on over the counter (OTC) DS use among active Romanian adults have reported a high prevalence of consumption, especially of vitamins and protein products[3,4]. The availability of these products in pharmacies, drugstores, supermarkets, and online has contributed to their increased use, while reports indicate that they are also commonly recommended by healthcare professionals[5].

Beyond questions of efficacy and safety, patients with endocrine disorders may also be exposed to the risk of

* Corresponding author: Marian Pop, Radiology Department, George Emil Palade University of Medicine, Pharmacy, Science, and Technology of Targu Mures, Romania. E-mail: marian.pop@umfst.ro

interference with laboratory assays, for example, between biotin and thyroid hormone tests, or with the absorption of certain medications, as calcium and iron supplements can interfere with thyroid hormone replacement therapy[6,7].

Considering the paucity of reports on DS consumption in Romania, especially in specific populations, the aim of this study was to evaluate the prevalence of DS use, potential contributing factors, and possible consequences for clinical practice in patients with endocrine disorders.

METHODS

A cross-sectional study was conducted among participants recruited from an endocrinology clinic and a general practitioner's practice. The two study sites were in different Romanian cities: Târgu Mureș, in Transylvania, and Fălticeni, in Moldavia. Eligible participants were adults aged 18–65 years who agreed to take part in the study.

Data was collected using a structured questionnaire comprising three sections: general information, clinical data, and dietary supplement use. The first section recorded demographic and lifestyle characteristics, including age, sex, place of residence, highest educational institution attended, marital status, income, sleep duration, and smoking status. The clinical section included height and weight, type of endocrine disorder, and participants' self-rated health status.

The final section focused on dietary supplement use during the previous six months. Participants were asked about the frequency and purpose of supplementation, including use for energy, weight loss, or general health improvement. Additional questions explored participants' beliefs regarding the safety and efficacy of dietary supplements, as well as their sources of recommendation, information, and purchase. Participants were also asked whether they checked ingredient labels. The questionnaire included a list of commonly used supplements, such as calcium, magnesium, vitamin D, vitamin C, iron, probiotics, and omega-3 fatty acids. For each supplement, respondents indicated their frequency of use over the previous six months and selected the amount of money spent on these products, expressed in EUR (conversion rate: 1 EUR = 5 RON).

The study was approved by the local ethics committee, and all participants provided written informed consent before evaluation (decision no. 13518/23.09.2024, Mures County Hospital Ethics Committee).

Statistical analysis. Data was managed using Microsoft Excel (Microsoft Corporation, Redmond, WA, USA). Statistical analyses were performed with IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA), and GraphPad Prism version 8.2 (GraphPad Software, Inc., San Diego, CA, USA). Normality was assessed using the Kolmogorov–Smirnov test. The Mann–Whitney test was used

to compare central tendencies, while chi-square tests and their variants were applied to assess associations between categorical variables, as appropriate. Two-sided *p*-values below 0.05 were considered statistically significant.

RESULTS

The study included 301 participants, most of whom were women (276, 91.7%), with a mean age of 47.7 ± 13.5 years. Participants were divided into two groups according to the presence ($n=208$, 69.1%) or absence ($n=92$, 30.9%) of a diagnosed endocrine disorder. Regarding location, 171 participants (56.8%) were from Târgu Mureș and 130 (43.2%) were from Fălticeni. The general characteristics of the study groups are presented in Table 1.

Regarding weight-related characteristics, participants with endocrine disorders were more likely to be overweight or obese (OR=2.19, 95% CI 1.33–2.62, $p=0.002$), to have abdominal obesity (OR=2.09, 95% CI 1.96–4.10, $p=0.025$), and to have an increased waist-to-height ratio (OR=2.05, 95% CI 1.05–3.99, $p=0.027$).

The analysis of dietary supplement use showed that only 15.9% ($n=48$) of participants did not take any supplements. Participants with an endocrine disorder were more likely to report higher consumption rates ($\tau\beta=0.193$, $p<0.001$), but there were no significant between-group differences in expenditure; 29.2% ($n=88$) spent more than 40 EUR per month on these products. Most participants reported taking OTC supplements based on physicians' recommendations (69.4%), particularly those with an endocrine disorder ($p<0.001$), and purchasing them from pharmacies (90.7%, $n=273$). A total of 70 participants (23.3%) consumed more than three DS per day. OTC users were asked to indicate their reasons for using these products. The most frequently reported reason was health promotion, cited by 196 participants (65.1%). The next most common reasons were increasing energy and supporting immunity, reported by 97 participants (32.2%).

Vitamin D (69.4%), vitamin C (53.8%), magnesium (52.1%), and calcium (44.1%) were the most frequently used OTC supplements, while iron was consumed by 25.3% of participants (Table 2). Most participants ($n=218$, 72.4%) consumed at least one supplement per day, with a strong association between the presence of an endocrine disorder and frequency of consumption (OR=2.5, 95% CI 1.5–4.1, $p<0.001$). In logistic regression analysis, female sex was the only variable associated with frequency of consumption (OR=2.49, 95% CI 1.02–6.10, $p=0.046$).

Regarding perceived efficacy and safety, most participants considered OTC supplements both safe ($n=232$, 77.1%) and effective ($n=226$, 75.1%), irrespective of the presence of an endocrine disorder. At the same time, only 164 participants (54.5%) checked the composition every time, while 35 (11.6%) never did so.

Table 1- Characteristics of the study group

		All participants	With endocrine dysfunction	Without endocrine dysfunction	p-value
Group size		301 (100.0%)	208 (69.1%)	93 (30.9%)	-
Age		47.71 ± 13.54	50.6 ±13.2	41.1 ±11.9	< 0.001
Sex	Female	276 (91.7%)	196	80	0.018
	Male	25 (8.3%)	12	13	
Residence	Urban	177 (58.8%)	133	44	0.005
	Rural	124 (41.2%)	75	49	
Education	Bachelor degree	107 (35.5%)	61	46	0.011
	Higher secondary	120 (39.9%)	92	28	
	Lower secondary	23 (7.6%)	19	4	
	Other	50 (16.6%)	35	15	
	No studies	1 (0.3%)	1	0	
Net income (EUR)	<200	41 (13.6%)	27	14	0.014
	201-500	72 (23.9%)	56	16	
	501-1,000	120 (39.9%)	89	31	
	1,001-2,000	58 (19.3%)	31	27	
	>2,000	10 (3.3%)	5	5	
Sleep duration	<7 hours	152 (50.5%)	113	39	0.108
	7-9 hours	141 (46.8%)	89	52	
	>9 hours	8 (2.7%)	6	2	
Smoking	Yes	49 (16.3%)	39	10	0.055

Table 2-The main supplements consumed by the participants (n=301)

Supplement	Consumption	n, % of total	With endocrine dysfunction*	Without endocrine dysfunction*	p-value
Calcium	Yes	133 (44.1%)	95 (71.4%)	38 (28.6%)	0.028
	No	168 (55.8%)	113 (67.2%)	55 (32.8%)	
Magnesium	Yes	157 (52.1%)	111 (70.7%)	46 (29.3%)	0.101
	No	144 (47.8%)	97 (67.3%)	47 (32.7%)	
Vitamin D	Yes	209 (69.4%)	159 (76.1%)	50 (23.9%)	< 0.001
	No	92 (30.6%)	49 (53.2%)	43 (46.8%)	
Vitamin C	Yes	162 (53.8%)	116 (71.6%)	46 (28.4%)	0.508
	No	139 (46.2%)	92 (66.2%)	47 (33.8%)	
Iron	Yes	76 (25.3%)	54 (71.0%)	22 (29.0%)	0.597
	No	225 (74.8%)	154 (68.4%)	71 (31.6%)	
Probiotics	Yes	85 (28.3%)	51 (60.0%)	34 (40.0%)	0.262
	No	216 (71.6%)	145 (67.1%)	71 (32.9%)	
Omega acids	Yes	89 (29.6%)	57 (64.0%)	32 (36.0%)	0.275
	No	212 (70.4%)	151 (71.2%)	61 (28.8%)	

* n, % of the corresponding consumption category (Yes / No).

DISCUSSION

The current study evaluated the prevalence of OTC dietary supplement consumption among individuals with endocrine disorders and found a high level of use, mostly following physicians’ recommendations. This information is relevant not only to endocrine practice but also to laboratory medicine, especially given the limited number of similar studies available [3–5] for Romania. At the same time, previous studies worldwide have proven similar results, with high and increasing consumption rates and a gender difference regarding frequency and type of supplements used. The reasons for consumption were also similar to those reported here – health promotion,

immunity [8–11]. A market analysis report [2] supports this finding, as it predicted an increase in supplement use after the COVID-19 pandemic. The report estimated an increase in supplement expenditure, with an annual average of 35 EUR per capita. Our results are consistent with this trend, as many participants reported expenditures above 20 EUR per month. While Romania’s GDP per capita increased from around 7,550 EUR in 2010 to more than 18,400 EUR in 2024, the average annual per capita expenditure allocated to supplements also increased substantially, from 15.16 EUR in 2010 to 66.65 EUR in 2024 [12]. These findings are similar to those reported in other European and global markets [8–11,13–15], with recent studies yielding percentages between 40-65%

percent of the population using DS. European Directive 2002/46/EC defines food supplements as products intended to complement the diet and to be consumed in small, measured doses [16]. Unlike medicinal products, food supplements do not require a medical prescription or premarketing clinical trials demonstrating efficacy. This regulatory distinction may contribute to a broader public perception of safety, further reinforced by digital marketing strategies and influencer endorsements, and may encourage the mistaken assumption that “natural” is synonymous with “safe”. This pattern was also visible in the present study, as most participants considered OTC supplements both safe and effective, while approximately one tenth never checked their composition. The extent and quality of scientific evidence available for different supplement ingredients vary considerably [17]. Moreover, these products can be advertised freely through multiple communication channels, which may further increase the propensity for consumption [18]. At the same time, evidence supports beneficial effects for some supplements in selected disorders, such as polycystic ovary syndrome [19,20].

The relevance of these findings for endocrine practice should be emphasised. Nutritional assessment is part of routine clinical practice, and although web-based tools are available, they may not capture the entire picture because dietary supplements are not usually included in their item lists [21]. Given the high prevalence and diversity of OTC dietary supplement use, supplement intake should be carefully assessed during consultations, as it may have consequences for both diagnosis and management.

Endocrine diagnoses rely heavily on hormonal assays, and increasing attention has been paid in recent years to factors that may interfere with these diagnostic tools [6,22]. Given the relatively limited control over OTC dietary supplements, there is also a possibility that some ingredients may not be declared on the label, as previously reported in cases associated with thyrotoxicosis or liver toxicity [23–25]. In addition, supplement use may influence the absorption of certain medications. For example, both calcium and iron supplements can reduce thyroid hormone absorption; therefore, separating supplement and thyroid hormone administration by several hours is recommended [7].

On average, the preanalytical phase accounts for approximately half of the total process from the patient encounter to the analytical result. This phase includes test indication, patient information and identification, sample collection followed by transport, and storage up to centrifugation and sample distribution [26]. Drugs and various other substances can interfere with laboratory results and should be considered preanalytical factors, especially when implausible or clinically discordant results are obtained. Among these, biotin interference with immuno-

assays has been widely recognized and is increasingly addressed in laboratory guidance and regulatory communications [6]. Biotin interference can affect, among others, thyroid function tests and troponin assays. It may produce unexpectedly high or low test results, creating uncertainty for both clinicians and laboratory professionals [27]. Biotin is found in standalone dietary supplements, in B-complex vitamin formulations, and in some multivitamin/mineral products [28]. In endocrine practice, this may create major differential diagnostic difficulties, particularly by mimicking Graves’ disease in clinically euthyroid patients. Biotin interference should therefore be suspected when there is a discrepancy between the clinical presentation and laboratory findings. Clarification may be achieved by repeating the tests after biotin discontinuation or by using an alternative analytical platform that is not affected, or is less affected, by biotin interference [29].

There is limited information regarding dietary supplement use and potential interference with laboratory assays beyond biotin. Given the high prevalence of DS consumption reported in this study, with one quarter of the sample reporting the use of more than three supplements per day, the risk of potential interference may be increased. Moreover, beyond the commonly recommended supplements prescribed or suggested by physicians, the diversity of unrestricted OTC products available on the market may further increase this risk. Another emerging problem is misleading or incomplete labelling, which may contribute to unexpected or paradoxical laboratory results [30].

Considering the high prevalence of thyroid disorders in the general population and the increasing consumption of OTC supplements, assay interference should be considered whenever laboratory results do not match the clinical picture [27].

Beyond biotin, other dietary supplements, especially those recommended by physicians, may also influence laboratory results, particularly in the case of iron and calcium supplementation. Calcium panel evaluation, which includes calcium, phosphate, magnesium, vitamin D, parathyroid hormone (PTH), and kidney function, is a cornerstone of osteoporosis management; DS use may affect several of these parameters. Because the most frequently used DS in the present study were vitamin D and vitamin C, followed by calcium and magnesium, their effects on calcium panel components should be considered. For example, high vitamin C concentrations may interfere with laboratory testing, causing falsely elevated or falsely reduced results for glucose, creatinine, uric acid, cholesterol, and faecal occult blood, depending on the assay method used [31]. Vitamin D, one of the most commonly used supplements worldwide and also widely recommended by scientific societies, directly affects calcium and phosphate by increasing their absorption and inhibiting PTH secretion [32–34]. Similarly, calcium and magnesium supplements

can transiently increase their circulating levels and may also influence PTH concentrations, as increased calcium and magnesium levels inhibit PTH secretion [35,36].

Although consumption of iron, probiotics, and omega-3 fatty acids was not high in the present study, these DS may also influence laboratory processes. Recent iron supplementation may mask iron-deficiency anemia or confound the diagnosis of haemochromatosis [37], probiotics may interfere with lipid and glucose metabolism [38], and omega-3 fatty acids may lower platelet count [39]. It is worth noting that, among the supplements discussed, only biotin and vitamin C cause direct assay interference, while the others modify biomarkers through their biological effects.

Study limitations

First, although the sample was diverse, it was not representative of the entire population. Selection bias may also have occurred because all participants were recruited among individuals seeking medical care. The use of two locations, especially the general practitioner's office in Moldavia, may have reduced this bias. At the same time, given the increase in the dietary supplement market in recent years, particularly after the COVID-19 pandemic, consumption habits in the general population may not differ substantially from those reported in this study. However, one important difference may be that participants in this study often consumed DS on physicians' recommendations. Second, there were between-group differences that may have influenced the analysis; however, age did not significantly influence dietary supplement consumption, and sex has already been recognized as an influencing factor in previous studies[8–10]. Third, although potential interfering effects of dietary supplements on laboratory results were discussed, they were not formally assessed because of the study design. The present results nevertheless suggest that further research is needed, given the diversity of DS available.

CONCLUSIONS

OTC dietary supplements are widely used by individuals with and without endocrine disorders, most often following physicians' recommendations and usually purchased from pharmacies. Participants also reported a high level of confidence in their safety and efficacy. Future studies should further analyse the potential consequences of supplement use for the diagnosis and management of endocrine disorders, particularly regarding possible preanalytical confounding and interference with drug absorption.

ABBREVIATIONS

DS – dietary supplements

OTC – over the counter

PTH – parathyroid hormone

ACKNOWLEDGEMENT

None.

AUTHORS' CONTRIBUTION

EA – conceptualization, methodology, formal analysis, writing (original draft).

MP – conceptualization, methodology, formal analysis, writing (review & editing), visualization, supervision.

RP – conceptualization, methodology, formal analysis, writing (review & editing, visualization, supervision.

All authors have read and approved the final version of the manuscript.

CONFLICT OF INTEREST

None to declare.

Publisher's Note: The Editorial Office stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Copyright: © 2026 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

REFERENCES

1. Tejera-Pérez C. Between benefit and risk: The role of dietary supplements in endocrinology. *Endocrinol Diabetes Nutr* 2026;73:501711. DOI:10.1016/j.endien.2026.501711
2. Romania Dietary Supplements Market Size Report, 2030 n.d. <https://www.grandviewresearch.com/industry-analysis/romania-dietary-supplements-market-report> (accessed May 19, 2026).
3. Fagaras PS, Teodorescu SV, Bacarea A, Petrea RG, Ursanu AI, Cozmei G, et al. Aspects Regarding the Consumption of Dietary Supplements among the Active Population in Romania. *International Journal of Environmental Research and Public Health*. 2023;20:850. DOI:10.3390/ijerph20010850
4. Stoia M, Oancea S. Herbal dietary supplements consumption in Romania from the perspective of public health and education. *Acta Medica Transilvanica*. 2013;18:216.
5. Vesa CM, Tit DM, Babes EE, Bungau G, Radu AF, Moleriu RD. Use of Botanical Supplements Among Romanian Individuals with Diabetes: Results from an Online Study on Prevalence, Practices, and Glycemic Control. *Nutrients*. 2025;17:2440. DOI:10.3390/nu17152440
6. Ghazal K, Brabant S, Prie D, Piketty ML. Hormone Immunoassay Interference: A 2021 Update. *Ann Lab Med*. 2022;42:3-23. DOI:10.3343/alm.2022.42.1.3
7. Colonnello E, Graziani A, Rossetti R, Voltan G, Masi D, Lubrano C, et al. The Chronobiology of Hormone Administration: "Doctor, What Time Should I Take My Medication?". *Endocr Rev*. 2025;46:670-89. DOI:10.1210/endrev/bnaf013
8. Beitz R, Mensink GBM, Hintzpeter B, Fischer B, Erbersdobler HF. Do users of dietary supplements differ from nonusers in their food consumption? *Eur J Epidemiol* 2004;19:335-41. DOI:10.1023/B:EJEP.0000024698.76843.3b

9. Greger JL. Dietary supplement use: Consumer characteristics and interests. *Journal of Nutrition*. 2001;131. DOI:10.1093/jn/131.4.1339S
10. McNaughton SA, Mishra GD, Paul AA, Prynne CJ, Wadsworth MEJ. Supplement Use Is Associated with Health Status and Health-Related Behaviors in the 1946 British Birth Cohort. *J Nutr*. 2005;135:1782-9. DOI:10.1093/jn/135.7.1782
11. Bates B, Lennox A, Prentice A, Bates C, Page P, Nicholson S, et al. National Diet and Nutrition Survey: Headline Results from Years 1, 2, 3 and 4 (combined) of the Rolling Programme (2008/2009–2011/2012). *Public Health England*; 2014.
12. Kozilek T-W, Sorana V, Iulia P. Measuring Welfare in Romania: Alternative and Complementary Measures to Gross Domestic Product. *Regional Formation and Development Studies*. 2022;22:68-76. DOI:10.15181/rfds.v22i2.1478
13. Food supplements trends in Europe: focus on France, Italy and Germany in 2025 - Elitepharm Laboratoires n.d. <https://elitepharm.fr/en/news/food-supplements-trends-europe/> (accessed June 21, 2026).
14. Chhabra N, Shiriskar J, Srinivasan G. Current and Future Market of the Dietary Supplements and Nutraceuticals in the Global Economy. *Dietary Supplements and Nutraceuticals*. 2025:965-1012. DOI:10.1007/978-981-96-8622-3_29
15. Starek M, Błasiak M, Dąbrowska M. Insights into dietary supplements as popular product supporting the diet. *Naunyn Schmiedeberg's Arch Pharmacol*. 2025;399:7711. DOI:10.1007/s00210-025-04889-z
16. Directive- 2002/46- EN- EUR-Lex n.d. <https://eur-lex.europa.eu/eli/dir/2002/46/oj/eng> (accessed May 19, 2026).
17. Background Information: Dietary Supplements - Consumer n.d. <https://ods.od.nih.gov/factsheets/DietarySupplements-Consumer/> (accessed May 19, 2026).
18. Sirico F, Miressi S, Castaldo C, Spera R, Montagnani S, Di Meglio F, et al. Habits and beliefs related to food supplements: Results of a survey among Italian students of different education fields and levels. *PLoS One* 2018;13:e0191424. DOI:10.1371/journal.pone.0191424
19. Zhao G, Fan Y, Li R, Huang Y, Li W, Zhao Y, et al. The effectiveness of nutritional supplements in improving polycystic ovary syndrome in women: a systematic review and network meta-analysis. *Reprod Biol Endocrinol*. 2025;23. DOI:10.1186/s12958-025-01409-9
20. Teede HJ, Khomami MB, Morman R, Laven JSE, Joham AE, Costello MF, et al. Polyendocrine metabolic ovarian syndrome, the new name for polycystic ovary syndrome: a multistep global consensus process. *Lancet*. 2026;407:2329-39. DOI:10.1016/S0140-6736(26)00717-8
21. Pop RM, Pop M, Dogaru G, Bacarea VC. A web-based nutritional assessment tool. *Studies in Informatics and Control*. 2013;22:307-14. DOI:10.24846/v22i3y201307
22. Dobreanu M, Fodor A, Bacărea A. Impact of preanalytical variables on the quality of laboratory results. *Rev Rom Med Lab*. 2006;4(3):63-72.
23. Iłowiecka K, Maślej M, Czajka M, Pawłowski A, Więckowski P, Styk T, et al. Lifestyle, Eating Habits, and Health Behaviors Among Dietary Supplement Users in Three European Countries. *Front Public Health*. 2022;10:892233. DOI:10.3389/fpubh.2022.892233
24. Tan CSS, Lee SWH. Warfarin and food, herbal or dietary supplement interactions: A systematic review. *Br J Clin Pharmacol*. 2021;87:352-74. DOI:10.1111/bcp.14404
25. Rivero-Pino F, Casanova AG. Hepatotoxicity due to dietary supplements: state-of-the-art, gaps and perspectives. *Crit Rev Toxicol*. 2023;53:601-10. DOI:10.1080/10408444.2023.2282415
26. Nordin N, Ab Rahim SN, Wan Omar WFA, Zulkarnain S, Sinha S, Kumar S, et al. Preanalytical Errors in Clinical Laboratory Testing at a Glance: Source and Control Measures. *Cureus*. 2024;16(3):e57243. DOI:10.7759/cureus.57243
27. Yousif AA, Ahmed NS, Mohamed E, Abdemagid S, Mustafa O, Mohamed A, et al. An Overview of Biotin Interference Impact on Immunoassays. *Cyprus Journal of Medical Sciences*. 2025;10:162-8. DOI:10.4274/cjms.2025.2024-71
28. Rosner I, Rogers E, Maddrey A, Goldberg DM. Clinically Significant Lab Errors due to Vitamin B7 (Biotin) Supplementation: A Case Report Following a Recent FDA Warning. *Cureus*. 2019;11(8):e5470. DOI:10.7759/cureus.5470
29. Keppel MH, Cadamuro J, Haschke-Becher E, Oberkofler H, Felder TK, Lippi G, et al. Errors within the total laboratory testing process, from test selection to medical decision-making - A review of causes, consequences, surveillance and solutions. *Biochem Med (Zagreb)*. 2020;30:215-33. DOI:10.11613/BM.2020.020502
30. Kyung KH, Hee YJ, Ram HA, Kang H-C. Spurious thyroid function test results due to interference: Consider concealed biotin in health supplements. *Endocrine Abstracts*. 2020;70:AEP905 DOI:10.1530/endoabs.70.AEP905
31. Dimeski G, Badrick T, John AS. Ion Selective Electrodes (ISEs) and interferences-A review. *Clinica Chimica Acta*. 2010;411:309-17. DOI:10.1016/j.cca.2009.12.005
32. Holick MF. Vitamin D deficiency. *N Engl J Med*. 2007;357:266-81. DOI:10.1056/NEJMr070553
33. Carter GD. 25-Hydroxyvitamin D assays: the quest for accuracy. *Clin Chem*. 2009;55:1300-2. DOI:10.1373/clinchem.2009.125906
34. Farrell CJ, Herrmann M. Determination of vitamin D and its metabolites. *Best Pract Res Clin Endocrinol Metab*. 2013;27:675-88. DOI:10.1016/j.beem.2013.06.001
35. Bolland MJ, Grey A, Avenell A, Gamble GD, Reid IR. Calcium supplements with or without vitamin D and risk of cardiovascular events: reanalysis of the Women's Health Initiative limited access dataset and meta-analysis. *BMJ*. 2011;342. DOI:10.1136/bmj.d2040
36. Dai Q, Zhu X, Manson JAE, Song Y, Li X, Franke AA, et al. Magnesium status and supplementation influence Vitamin D status and metabolism: Results from a randomized trial. *American Journal of Clinical Nutrition*. 2018;108:1249-58. DOI:10.1093/ajcn/nqy274
37. Camaschella C. Iron-deficiency anemia. *N Engl J Med*. 2015;372:1832-43. DOI:10.1056/NEJMr1401038
38. Plaza-Diaz J, Ruiz-Ojeda FJ, Gil-Campos M, Gil A. Mechanisms of Action of Probiotics. *Advances in Nutrition*. 2019;10:S49-66. DOI:10.1093/advances/nmy063
39. Kander T, Lindblom E, Schött U. Dose-response effects of omega-3 on platelet aggregation: an observational study. *J Int Med Res*. 2018;46:5074. DOI:10.1177/0300060518789817