

## ORIGINAL ARTICLE

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# Prescription of nutraceuticals in a gastroenterology outpatient clinic in Belo Horizonte

GABRIELA VITORIA APARECIDA MARQUES COSTA<sup>1</sup> , THIAGO LACERDA BITENCOURT DE FARIA<sup>1</sup> ,  
JÓSI FERNANDES DE CASTRO RODRIGUES<sup>1</sup> , LUIZ ALEXANDRE VIANA MAGNO<sup>1</sup> .

<sup>1</sup> FACULDADE DE CIÊNCIAS MÉDICAS DE MINAS GERAIS, BELO HORIZONTE, MG, BRAZIL.

CORRESPONDING AUTHOR: LUIZ.MAGNO@CIENCIASMEDICASMG.EDU.BR

## ABSTRACT

**Introduction:** Nutraceuticals are compounds derived from natural foods that have gained recognition as potential health promoters. However, the lack of knowledge about their prescription profile in specialized outpatient care settings hinders an in-depth understanding of how these products are integrated into clinical management. **Objective:** To describe the prescription of nutraceuticals among adults diagnosed with liver disease or dyspepsia treated at a gastroenterology clinic in Belo Horizonte, Brazil. **Methods:** The study was conducted as a cross-sectional, retrospective, single-center analysis of medical records from all first outpatient appointments between August 2022 and September 2023. **Results:** Of the 688 consultations investigated, 141 patients were eligible for the study, with the majority diagnosed with dyspepsia (68.1%) and the rest with liver disease (31.9%). Most included patients were female (63.1%), with an average age of 58.7 years, and systemic arterial hypertension was the most common comorbidity (52.5%). Nutraceuticals were prescribed in 26.2% of cases, with 28.9% of patients with liver disease and 25% with dyspepsia. Vitamin D was the most frequently prescribed nutraceutical (11.3%), followed by psyllium (5%). The study identified significant differences in nutraceutical prescriptions according to diagnosis. **Conclusion:** Nutraceuticals were prescribed to about a quarter of the patients seen, particularly vitamin D and psyllium, with thiamine being prescribed more frequently to patients with liver disease. These findings reinforce the relevance of the topic and indicate the need for future studies to evaluate the efficacy and safety of these clinical practices.

**Keywords:** Dyspepsia, Liver Diseases, Nutraceuticals, Prescriptions.

## INTRODUCTION

The intersection of nutrition and pharmacology represents an emerging frontier in preventive and therapeutic medicine (1). Nutraceuticals are defined as functional foods, that is, bioactive compounds designed to complement a diet that may not provide all essential nutrients (2). Nutraceuticals are a class of nutritional supplements encompassing several categories, including probiotics, prebiotics, dietary fibers, polyunsaturated fatty acids, and vitamins (3,4). In Brazil, these products are regulated by the National Health Surveillance Agency (ANVISA).

Many nutraceutical products have been reported to benefit both functional and structural gastrointestinal disorders. Several clinical trials and systematic reviews have reported improvements in liver function (5), constipation (6), dyspepsia (7), gastroesophageal reflux disease (8), and even malignant neoplasms (9). Nutraceuticals modulate oxidative stress (10), inflammation (11), and metabolic processes (12). This ability to influence intricate mechanisms underlying gastrointestinal etiopathogenesis highlights the multifaceted therapeutic value of nutraceuticals.

Although the scientific literature has demonstrated the potential benefits of nutraceuticals in the prevention and management of various chronic conditions, findings remain heterogeneous due to variability in methodological designs, small sample sizes, and short follow-up periods (13). Furthermore, most studies focus on experimental trials or reviews, with a scarcity of observational studies describing real-world clinical practice in healthcare services. This gap limits the understanding of how nutraceuticals are prescribed in outpatient settings, particularly within Brazil's Unified Health System (SUS). Therefore, the present study aims to describe the prescription of nutraceuticals among adults diagnosed with liver disease or dyspepsia treated at a gastroenterology outpatient clinic in Belo Horizonte, Brazil.

## METHODS

### Study Design

This is a single-center, descriptive, cross-sectional study based on the analysis of medical records from patients treated at a gastroenterology outpatient clinic within SUS in Belo Horizonte, Minas Gerais, Brazil. The study was approved by the Research Ethics Committee of the *Faculdade de Ciências Médicas de Minas Gerais* (CAAE: 67124822.0.0000.5134). As this was a retrospective study using secondary data, a waiver of the informed consent requirement was obtained.

### Sample

The sample consisted of all patients referred through SUS who were seen between August 1, 2022, and September 27, 2023, and met the following inclusion criteria: age over 18 years; first consultation; and diagnosis of hepatic disorders (alcoholic liver disease, toxic liver disease, hepatic failure not elsewhere classified, chronic hepatitis not elsewhere classified, hepatic fibrosis and cirrhosis, other inflammatory liver diseases, other liver diseases, or liver disorders in diseases classified elsewhere) or dyspepsia. No exclusion criteria were applied, as the study aimed to comprehensively describe the profile of nutraceutical prescriptions in an outpatient SUS setting.

### Instruments and Procedures

Eligible patients were evaluated based on their medical history through review of all medical records generated within the institution. The database contains detailed records of each outpatient consultation, including a structured anamnesis form developed by the institution to address the specificities of gastroenterology.

### Variables

Data collected included patient identification details (medical record number, age, sex), lifestyle habits (alcohol consumption, smoking), comorbidities

(systemic arterial hypertension, type 2 diabetes mellitus, dyslipidemia, cirrhosis, hypothyroidism, portal hypertension, gastroesophageal reflux disease, hepatic steatosis), and the presence and type of nutraceutical prescription recorded at each visit.

### Statistical Analysis

Data extracted from medical records were tabulated using Google Sheets. Analyses were performed using Jamovi software, version 2.3.28.0. Categorical variables were expressed as absolute numbers and percentages. Numerical variables were presented as means  $\pm$  standard deviations and tested for normality using the Shapiro–Wilk test. Comparisons between proportions were conducted using the chi-square test. For comparisons of quantitative variables with normal and non-normal distributions, the Student's t-test and the Mann–Whitney U test were used, respectively. A significance level of 0.05 was adopted.

## RESULTS

During the study period, a total of 688 consultations were conducted, of which 269 were first visits. Among these, 141 patients met the eligibility criteria and had their medical records reviewed. The sample comprised 31.9% ( $n = 45$ ) of patients with a primary diagnosis of liver disease and 68.1% ( $n = 96$ ) with dyspepsia (Table 1). In the liver disease group, the most common diagnoses were hepatic fibrosis and cirrhosis, followed by other liver diseases. There were no cases of toxic liver disease, chronic hepatitis not elsewhere classified, or other inflammatory liver diseases. Overall, most patients were female (63.1%), with a mean age of  $58.7 \pm 12.5$  years. The proportion of women was significantly higher in the dyspepsia group compared to the liver disease group ( $p = 0.006$ ).

Regarding lifestyle habits, alcohol consumption was most prevalent (40.6%), followed by smoking

(35.7%). Nutraceuticals were prescribed in 26.2% of cases, more frequently in the liver disease group (28.9%) than in the dyspepsia group (25.0%), although this difference was not statistically significant ( $p = 0.625$ ).

The distribution of nutraceutical prescriptions by main diagnosis revealed distinct patterns of use between the groups (Table 2). Overall, vitamin D was the most frequently prescribed nutraceutical in both groups, with a slightly higher prevalence in patients with dyspepsia (12.5% vs. 8.9%). Psyllium, the second most prescribed nutraceutical, was used by 5.0% of patients, with statistically similar proportions between those with liver disease (2.2%) and dyspepsia (6.3%). However, a notable finding was the prescription of vitamin B1 (thiamine), which was significantly more frequent in the liver disease group (11.1%) compared to the dyspepsia group (1.0%). The data also showed low prescription rates for other nutraceuticals—such as vitamin B12, vitamin B9, iron, omega-3, probiotics, flaxseed oil, passiflora, prebiotics, and multivitamins—ranging from 0.7% to 3.5%, with no statistically significant differences between groups.

**TABLE 1:** Characteristics of patients treated at a public gastroenterology outpatient clinic according to diagnoses of liver disease and dyspepsia, from August 2022 to September 2023.

|                                          | Total<br>(n = 141) | Liver disease<br>45 (31.9%) | Dyspepsia<br>96 (68.1%) | p-value <sup>a</sup> |
|------------------------------------------|--------------------|-----------------------------|-------------------------|----------------------|
| <b>Female sex, n (%)</b>                 | 89 (63.1%)         | 21 (46.7%)                  | 68 (70.8%)              | 0.006 <sup>x</sup>   |
| <b>Age (years), mean ± SD</b>            | 58.7 ± 12.5        | 59.5 ± 10.9                 | 58.4 ± 12.9             | 0.613 <sup>t</sup>   |
| <b>Age group (years), n (%)</b>          |                    |                             |                         | 0.279 <sup>x</sup>   |
| 18-29                                    | 2 (1.4%)           | 0 (0.0%)                    | 2 (2.1%)                |                      |
| 30-39                                    | 3 (2.1%)           | 1 (2.2%)                    | 2 (2.1%)                |                      |
| 40-49                                    | 29 (20.6%)         | 6 (13.3%)                   | 23 (24.0%)              |                      |
| 50-59                                    | 36 (25.5%)         | 15 (33.3%)                  | 21 (21.9%)              |                      |
| 60-69                                    | 45 (31.9%)         | 18 (40.0%)                  | 27 (28.1%)              |                      |
| 70-79                                    | 21 (14.9%)         | 4 (8.9%)                    | 17 (17.7%)              |                      |
| 80-89                                    | 5 (3.5%)           | 1 (2.2%)                    | 4 (4.2%)                |                      |
| <b>Alcohol consumption, n (%)</b>        | 54 (40.6%)         | 23 (51.1%)                  | 31 (35.2%)              | 0.078 <sup>x</sup>   |
| <b>Smoking habit, n (%)</b>              | 45 (35.7%)         | 17 (42.5%)                  | 28 (32.6%)              | 0.278 <sup>x</sup>   |
| <b>Primary diagnosis, n (%)</b>          |                    |                             |                         | -                    |
| Alcoholic liver disease                  | 13 (9.2%)          | 13 (9.2%)                   | -                       |                      |
| Hepatic fibrosis/cirrhosis               | 16 (11.3%)         | 16 (11.3%)                  | -                       |                      |
| Other liver diseases                     | 16 (11.3%)         | 16 (11.3%)                  | -                       |                      |
| Dyspepsia                                | 96 (68.1%)         | -                           | 96 (68.1%)              |                      |
| <b>Nutraceutical prescription, n (%)</b> | 37 (26.2%)         | 13 (28.9%)                  | 24 (25.0%)              | 0.625 <sup>x</sup>   |

<sup>a</sup> The *p*-value represents the comparison between liver disease (alcoholic liver disease, hepatic fibrosis and cirrhosis, and other liver disorders) and dyspepsia; <sup>t</sup> Student's *t*-test; <sup>χ</sup> Chi-square test; SD: standard deviation. Dichotomous variables were presented considering only the category of interest (e.g., female sex and presence of the characteristic = "yes").

**TABLE 2:** Nutraceuticals prescribed at a public gastroenterology outpatient clinic, by diagnosis of liver disease or dyspepsia, from August 2022 to September 2023.

|                              | Total      | Liver disease | Dyspepsia  | p -value a |
|------------------------------|------------|---------------|------------|------------|
| Vitamin D                    | 16 (11.3%) | 4 (8.9%)      | 12 (12.5%) | 0.529      |
| Psyllium                     | 7 (5.0%)   | 1 (2.2%)      | 6 (6.3%)   | 0.305      |
| Vitamin B1 (thiamine)        | 6 (4.3%)   | 5 (11.1%)     | 1 (1.0%)   | 0.006      |
| Vitamin B12 (cyanocobalamin) | 5 (3.5%)   | 2 (4.4%)      | 3 (3.1%)   | 0.693      |
| Vitamin B9 (folic acid)      | 3 (2.1%)   | 1 (2.2%)      | 2 (2.1%)   | 0.096      |
| Iron                         | 3 (2.1%)   | 2 (4.4%)      | 1 (1.0%)   | 0.192      |
| Omega-3                      | 2 (1.4%)   | 0 (0.0%)      | 2 (2.1%)   | 0.329      |
| Probiotics                   | 2 (1.4%)   | 0 (0.0%)      | 2 (2.1%)   | 0.329      |
| Flaxseed oil                 | 1 (0.7%)   | 0 (0.0%)      | 1 (1.0%)   | 0.492      |
| Passiflora extract           | 1 (0.7%)   | 1 (2.2%)      | 0 (0.0%)   | 0.143      |
| Prebiotics                   | 1 (0.7%)   | 0 (0.0%)      | 1 (1.0%)   | 0.492      |
| Multivitamin supplement      | 1 (0.7%)   | 0 (0.0%)      | 1 (1.0%)   | 0.492      |

a The *p*-value represents the comparison between liver diseases (alcoholic liver disease, hepatic fibrosis and cirrhosis, and other liver disorders) and dyspepsia, obtained using the chi-square test.

Nutraceutical prescriptions showed a significant association with certain comorbidities (Table 3). Systemic arterial hypertension (SAH) emerged as the most prevalent comorbidity, affecting 52.5% of patients. Within this group, nutraceutical prescriptions were significantly more frequent among those with dyspepsia ( $p = 0.009$ ). Type 2 diabetes mellitus (T2DM) was present in 22.7% of patients and did not influence nutraceutical prescription patterns. Conversely, among patients with liver disease, those with cirrhosis and portal hypertension received nutraceutical prescriptions more frequently. For other comorbidities, such as dyslipidemia, hypothyroidism, portal hypertension, and gastroesophageal reflux disease (GERD), no significant differences in nutraceutical prescriptions were observed between the liver disease and dyspepsia groups.

**TABLE 3.** Association between nutraceutical prescription and major comorbidities among patients with liver disease and dyspepsia treated at a public gastroenterology outpatient clinic, from August 2022 to September 2023.

|                   | Total       | No nutraceutical prescription |            |            | With nutraceutical prescription |           |            | p <sup>1</sup> | p <sup>2</sup> |
|-------------------|-------------|-------------------------------|------------|------------|---------------------------------|-----------|------------|----------------|----------------|
|                   | Total (141) | Total (104)                   | LD (32)    | Dys p (72) | Tot al (37)                     | L D (13)  | Dys p (24) | -              | -              |
| SAH               | 74 (52.5%)  | 52 (50.0%)                    | 15 (46.9%) | 37 (51.4%) | 22 (59.5%)                      | 4 (30.8%) | 18 (75.0%) | 0.671          | 0.009          |
| T2DM              | 32 (22.7%)  | 24 (23.1%)                    | 5 (15.6%)  | 19 (26.4%) | 8 (21.6%)                       | 5 (38.5%) | 3 (12.5%)  | 0.229          | 0.067          |
| Dyslipidemia      | 28 (19.9%)  | 23 (22.1%)                    | 6 (18.8%)  | 17 (23.6%) | 5 (13.5%)                       | 2 (15.4%) | 3 (12.5%)  | 0.581          | 0.806          |
| Cirrhosis         | 18 (12.8%)  | 10 (9.6%)                     | 10 (31.3%) | 0 (0.0%)   | 8 (21.6%)                       | 8 (61.5%) | 0 (0.0%)   | <0.001         | <0.001         |
| HT                | 14 (9.9%)   | 7 (6.7%)                      | 4 (12.5%)  | 3 (4.2%)   | 7 (18.9%)                       | 3 (23.1%) | 4 (16.7%)  | 0.117          | 0.635          |
| PH                | 12 (8.5%)   | 7 (6.7%)                      | 7 (21.9%)  | 0 (0.0%)   | 5 (13.5%)                       | 5 (38.5%) | 0 (0.0%)   | <0.001         | 0.001          |
| GERD              | 12 (8.5%)   | 11 (10.6%)                    | 0 (0.0%)   | 11 (15.3%) | 1 (2.7%)                        | 0 (0.0%)  | 1 (4.2%)   | 0.019          | 0.456          |
| Hepatic steatosis | 6 (4.3%)    | 6 (5.8%)                      | 6 (18.8%)  | 0 (0.0%)   | 0 (0.0%)                        | 0 (0.0%)  | 0 (0.0%)   | <0.001         | -              |

a The *p*-value represents the comparison between patients who did or did not receive a nutraceutical prescription for liver diseases (p1) or dyspepsia (p2), obtained using the chi-square test. LD: liver diseases; Dysp: dyspepsia; SAH: systemic arterial hypertension; T2DM: type 2 diabetes mellitus; HT: hypothyroidism; PH: portal hypertension; GERD: gastroesophageal reflux disease.

## DISCUSSION

This study provides a description of the clinical characteristics and trends in nutraceutical prescriptions among patients with liver disease and dyspepsia. These conditions are pathophysiologically complex and often require complementary therapeutic strategies to supplement conventional pharmacotherapy, such as the use of nutraceuticals. We observed that

26.2% of patients included in the study received nutraceutical prescriptions. Previous studies have also investigated the prescription and use of nutraceuticals in gastrointestinal disorders, albeit with heterogeneous approaches. In patients with non-alcoholic fatty liver disease, systematic reviews have reported utilization rates ranging from 20% for omega-3 supplements to approximately 26% for vitamin D (14). Other studies have demonstrated the benefits of psyllium in chronic constipation associated with type 2 diabetes mellitus (15) and of probiotics in liver disease (16). In cases of functional dyspepsia, case-control studies suggest an association between vitamin D deficiency and increased symptom severity (17).

Despite these findings, direct comparison with our results is limited by significant methodological differences. Most existing studies focus on specific populations or controlled interventions, whereas the present study describes prescriptions recorded in routine clinical practice within a public outpatient setting. Furthermore, varia-

tions in the definitions of “nutraceuticals,” evaluated outcomes, and follow-up durations make quantitative comparisons difficult to establish. Therefore, our results should be interpreted as complementary, providing a real-world perspective on prescription patterns within a public healthcare system.

We found that vitamin D was the most frequently prescribed nutraceutical. Evidence suggests a link between low vitamin D levels and gastrointestinal disorders, particularly dyspeptic symptoms (17). For instance, vitamin D deficiency may weaken the pyloric sphincter, allowing the reflux of intestinal contents into the stomach and exacerbating symptoms in these patients (18,19). Vitamin D supplementation may also alleviate symptoms of inflammatory bowel disease by inhibiting T-cell responses and regulating the gut microbiota. Supplementation has been shown to promote beneficial effects, such as maintaining intestinal barrier integrity and modulating the microbiota, which may contribute to the prevention and reduction of disease severity (20,21).

Nutraceutical prescriptions exhibited distinct trends when comparing the liver disease and dyspepsia groups. Vitamin D and psyllium, a fiber commonly used to promote digestive health, were prescribed in comparable proportions between the two groups. However, a significantly higher prescription rate of vitamin B1 (thiamine) was observed among patients with liver disease (11.1%) compared to those with dyspepsia (1.0%). This finding suggests a potential emphasis on addressing liver-related conditions through thiamine supplementation. It is well established that in patients with chronic liver disease, the transport of vitamin B1 across the intestinal mucosa is impaired (22), which may lead to a range of clinical manifestations, including severe neurological complications such as limb pain, weakness, and sensory disturbances (23). From a gastrointestinal

perspective, patients may present with loss of appetite, nausea, vomiting, and constipation. High-dose thiamine therapy may prevent the development of hepatic steatosis by enhancing hepatic carbohydrate and fatty acid oxidation.

The rate of nutraceutical prescription among patients with cirrhosis and portal hypertension was also notable. A recent systematic review referenced 12 phase III and IV clinical trials investigating potential nutraceuticals for the treatment of non-alcoholic fatty liver disease, highlighting omega-3 (20%) and vitamin D (26.7%) as the most frequently studied agents (14). Although promising evidence exists regarding the use of silymarin, coenzyme Q10, berberine, and curcumin in managing liver diseases (24,25), none of these nutraceuticals were commonly prescribed in this outpatient setting. The absence of nutraceutical prescriptions for patients with liver disease and hepatic steatosis is intriguing. We interpret these findings cautiously, even considering clinical evidence supporting nutraceutical efficacy in this specific subgroup (24).

There is currently insufficient robust evidence to justify the routine prescription of nutraceuticals. Previous randomized controlled trials investigating nutraceuticals are often limited by small sample sizes and short follow-up periods (24). For plant-derived extracts, the lack of standardization and the potential presence of contaminants may confound study outcomes. Moreover, the benefits observed in hepatic biomarkers following nutraceutical use, when compared to traditional pharmacological agents, are generally modest.

Dyspepsia was more prevalent among women, consistent with previous research indicating a significantly higher prevalence of this condition in females under 60 years of age (20). This demographic pattern aligns with the profile observed in our study. Systemic arterial hypertension and dyspepsia were the most

common comorbidities among patients, reflecting the global trend of chronic non-communicable diseases that currently dominate the public health landscape (9). The high prevalence of alcohol consumption (40.6%) and smoking (35.7%) is also noteworthy, underscoring the importance of evaluating behavioral risk factors in the clinical management of patients with liver-related and gastrointestinal disorders (21). This finding is particularly relevant, as alcohol intake disrupts the metabolism of essential vitamins and minerals, such as folic acid, thiamine, and other micronutrients (24).

Given the increasing inclination of both patients and healthcare professionals to seek therapeutic alternatives with fewer adverse effects compared to conventional pharmacotherapy, examining how nutraceuticals are prescribed within a gastroenterology outpatient clinic provides valuable insights. Such analysis offers an opportunity to guide future investigations aimed at determining the true therapeutic value of these supplements in clinical practice. Nevertheless, nutraceuticals are not inherently safe for all patients (26). The potential for adverse drug-supplement interactions and nutraceutical-related side effects must not be overlooked, emphasizing the need for careful clinical evaluation before recommending their use.

This study presents some limitations. As it was conducted at a single center, the generalizability of the findings may be limited. Moreover, due to its retrospective design, the results are

dependent on the accuracy and completeness of medical records, and the lack of patient-reported information regarding the use of non-prescribed nutraceuticals. Future studies should aim to explore the determinants that influence nutraceutical prescribing behavior and assess how these decisions affect patient prognosis and long-term outcomes.

## CONCLUSION

While the use of nutraceuticals is well integrated into clinical practice for gastrointestinal disorders, encompassing approximately one-quarter of patients diagnosed with liver disease or dyspepsia, their prescription patterns remain heterogeneous. Vitamin D emerged as the most frequently prescribed nutraceutical. These findings contribute to a better characterization of prescription trends within a public gastroenterology outpatient service and underscore the need for further research to evaluate the clinical effectiveness and safety of these supplements.

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