Ethnobotanical survey of *Artemisia vulgaris* and *Laurus nobilis* in the Treatment of Microbial Gastroenteritis in Northwestern Tunisia

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Research

Abstract

Background: Microbial gastroenteritis remains a major public health concern, particularly in regions where hygiene conditions and access to healthcare are limited. Alongside conventional treatments, medicinal plants are widely used in traditional medicine to manage gastrointestinal infections. However, community knowledge, perceptions, and practices regarding their use remain insufficiently documented. Understanding these aspects is essential to support the rational integration of traditional remedies into modern healthcare.

Methods: A cross-sectional ethnobotanical survey was conducted among 100 participants from diverse socio-professional backgrounds. Data were collected using a structured questionnaire covering sociodemographic characteristics, awareness of microbial gastroenteritis, perceived causes and symptoms, treatment preferences, and knowledge of medicinal plants used for gastrointestinal disorders. Descriptive analysis was performed to identify trends in perceptions and practices related to plant-based therapies.

Results: The study population was predominantly female (72%), with a mean age of 32.5 years. Awareness of microbial gastroenteritis was high (94%), with poor hygiene and bacterial contamination identified as the main causes. Diarrhea, abdominal pain, and vomiting were the most frequently reported symptoms. Medicinal plants were the preferred treatment option for 52% of respondents, while 24% combined herbal remedies with antibiotics. Nearly half of the participants had previously experienced microbial gastroenteritis, with a higher prevalence among women. Most respondents perceived medicinal plants as effective and safe, as 91% reported no adverse effects. *Artemisia vulgaris* and *Laurus nobilis* were the most recognized species (89%), and infusion was the most common preparation method (86.6%).

Conclusion: The findings reveal a strong reliance on medicinal plants for managing microbial gastroenteritis and generally positive perceptions of their efficacy and safety. These results emphasize the need for further pharmacological and clinical studies to validate the therapeutic potential of commonly used plants and support their integration into evidence-based medical practice.

Keywords: Ethnobotanical survey; Medicinal plants; Microbial gastroenteritis; Traditional medicine; *Artemisia vulgaris*; *Laurus nobilis*

Background

Gastrointestinal infections, particularly microbial gastroenteritis, continue to represent a significant public health burden worldwide, affecting millions annually and contributing to high rates of morbidity and mortality, especially among vulnerable groups such as children and immunocompromised individuals (Rananinghe and Fhogartaigh, 2021; Lee and Yoon 2021; CDC, 2022).

These infections are primarily caused by food and waterborne pathogens, including *Escherichia coli, Salmonella spp., Shigella spp., and Campylobacter spp.,* which are transmitted mainly via the fecal-oral route (Al-Seghayer and Al-Sarraj 2021; Fleckenstein *et al.* 2021; CDC, 2022; Paul, 2024).While antimicrobial therapy remains the mainstay for treating moderate to severe cases, the increasing prevalence of antimicrobial resistance (AMR) among enteric pathogens is undermining treatment efficacy and prompting the urgent need for novel, safe, and accessible therapeutic alternatives (Angelini 2024; Plaatjie *et al.* 2024; AL-Azzawi *et al.* 2024).

In this context, medicinal plants have emerged as promising sources of antimicrobial and anti-inflammatory agents. Rich in bioactive phytochemicals such as flavonoids, terpenoids, and essential oils, many plants have demonstrated efficacy against gastrointestinal pathogens in both traditional and pharmacological contexts. The World Health Organization (WHO) estimates that around 80% of the global population relies on herbal medicine as a primary form of healthcare, particularly in low- and middle-income countries, where affordability, accessibility, and cultural familiarity support their widespread use (Ghosh *et al.* 2023; Plaatjie *et al.* 2024; El-Saadony *et al.* 2025; Nurunnabi 2025).

Among the plants commonly employed in traditional medicine to treat digestive ailments, *Artemisia vulgaris* L. and *Laurus nobilis L.* are notable for their reputed digestive, antiseptic, and carminative properties. Both species are typically administered in the form of infusions or decoctions to alleviate symptoms such as diarrhea, abdominal cramps, bloating, and intestinal infections (Abiri et *al.* 2018; Parveen and Some 2021; Al-Mijalli *et al.* 2022; Sharma and Adhikari 2023; Jaradat *et al.* 2024). These two species were specifically selected for this study because they are the most frequently cited by local informants in northwestern Tunisia (Béja and Jendouba) for the treatment of gastrointestinal disorders. Their selection is further supported by their wide availability, strong cultural embeddedness in local traditional medicine, and previous reports in the literature highlighting their antimicrobial and digestive properties. Together, these ethnobotanical and scientific considerations justify their focused investigation in the present survey. Recent experimental studies have confirmed the antimicrobial effects of essential oils and crude extracts derived from these plants against several clinically relevant gastrointestinal pathogens, thus reinforcing their therapeutic potential (Sharma and Adhikari 2023; Jaradat et *al.* 2024).

Despite this growing scientific interest, ethnobotanical knowledge concerning the use of *A. vulgaris* and *L. nobilis* for gastrointestinal infections remains under-documented in North African contexts. Traditional knowledge, including local practices, modes of preparation, perceived efficacy, and cultural significance, provides a critical foundation for the identification of promising therapeutic leads and for the development of integrative healthcare approaches (Kendi 2024; Raja *et al.* 2014). Documenting such knowledge is essential not only for preserving biocultural heritage but also for informing pharmacological research and guiding policy in phytomedicine and public health. The present study aims to explore the traditional uses, perceptions, and preparation methods of *A. vulgaris* and *L. nobilis* for the treatment of microbial gastroenteritis in selected regions of Tunisia. By combining ethnobotanical survey data with current pharmacological insights, this work contributes to the valorization of traditional pharmacopoeia and supports future research aimed at the scientific validation and safe integration of plant-based therapies into evidence-based medical practice. Therefore, the present study aims to document and analyze traditional knowledge related to the use of *A. vulgaris* and *L. nobilis* in the treatment of microbial gastroenteritis in northwestern Tunisia, with particular emphasis on usage patterns, preparation methods, and perceived efficacy across different socio-demographic groups.

Materials and Methods

Ethnobotanical Survey

An ethnobotanical survey was conducted from March to May 2025 in the governorates of Jendouba and Béja. These regions were selected due to their rich biodiversity and the preservation of traditional medicinal practices. A total of 100 informants participated in the study, representing three main groups: (i) healthcare professionals (doctors, pharmacists, and herbalists); (ii) the general public (patients and consumers of medicinal plants); and (iii) students (with a particular interest in alternative medicine or health-related fields). Participants were recruited using a purposive sampling strategy to ensure the inclusion of individuals with relevant knowledge or experience in traditional medicine, while maintaining diversity in age, gender, and

occupation. Inclusion criteria required participants to be adults (≥18 years) and willing to provide verbal informed consent. The survey was conducted in the local language (Arabic) to facilitate clear communication and accurate data collection.

Data were collected through direct, face-to-face interviews using printed questionnaires, a method that enabled closer interaction with participants and enhanced both engagement and comprehension of the questions. The questionnaire was specifically designed by the authors for this study, considering participants' profiles and standard ethnobotanical survey practices. A pilot test was conducted with a small group of informants to ensure the clarity and comprehensibility of the questions.

The questionnaire was structured into five main sections, each designed to collect specific and complementary information according to respondents' profiles. Voucher specimens of *Artemisia vulgaris* (ISBB-AV2025-08) and *Laurus nobilis* (ISBB-LN2025-14) were collected during the study and deposited at the Herbarium of the Higher Institute of Beja (ISBB), University of Jendouba. These specimens were collected to ensure accurate taxonomic identification, provide a permanent reference for future research, and serve as verifiable records of the plant materials used in the ethnobotanical survey.

Section 1: Sociodemographic Data
This section collects general information about respondents, including age, sex, profession (healthcare professionals, general public, students), and level of education.

Section 2: Knowledge of Microbial Gastroenteritis
This section assesses participants' knowledge of microbial gastroenteritis, its causes, symptoms, and their personal experience with this condition.

Section 3: Treatment Habits and Use of Medicinal Plants
This section explores the practices adopted by respondents for treating gastroenteritis, their familiarity with medicinal plants, particularly *A. vulgaris* and *L. nobilis*, and their frequency of use.

Section 4: Perception of Effectiveness and Safety of Medicinal Plant
This section analyzes participants' opinions on the perceived effectiveness of medicinal plants, expected benefits, possible side effects, and their willingness to use these remedies in case of digestive infection.

Section 5: Opinions of Healthcare Professionals
This final section was specifically for healthcare professionals. It collects their views on the use of medicinal plants in treating digestive disorders, their potential integration into modern medical practice, and any associated limitations or reservations regarding natural treatments.

Statistical analysis
Statistical analyses were performed using SPSS version 20. Categorical variables, including the frequency of use of *Artemisia vulgaris* and *Laurus nobilis* across socio-demographic groups (age, gender, education, and profession), were analyzed using Pearson's Chi-square test or Fisher's exact test, as appropriate. Continuous variables, when applicable, were summarized as means ± standard deviation, with 95% confidence intervals calculated. Statistical significance was set at $p < 0.05$. All results are reported in the Results section, with relevant test statistics and p-values provided for each comparison.

Results and Discussion

Sociodemographic profile of respondents
The survey sample comprised 100 participants from various socio-professional backgrounds. The socio-demographic characteristics of the respondents are summarized in Table 1. Women constituted the majority of respondents, accounting for 72.0% of the sample, with a sex ratio of 0.38 (male/female). Almost half of the participants (49.0%) were between 20 and 40 years of age, with a mean age of 32.5 years). Regarding socio-professional status, the general public represented the largest group (55%), followed by students (27%) (Figure 1). This demographic diversity provides a comprehensive basis for assessing participants' knowledge, practices, and perceptions concerning the use of medicinal plants in the management of digestive disorders.

Table 1. Socio-demographic characteristics of the respondents

Variable	Category	Percentage (%)
Sex	Female	72.0
	Male	28.0
Age (years)	20–40	49.0
	Other age groups	51.0
Socio-professional status	General public	55.0
	Students	27.0

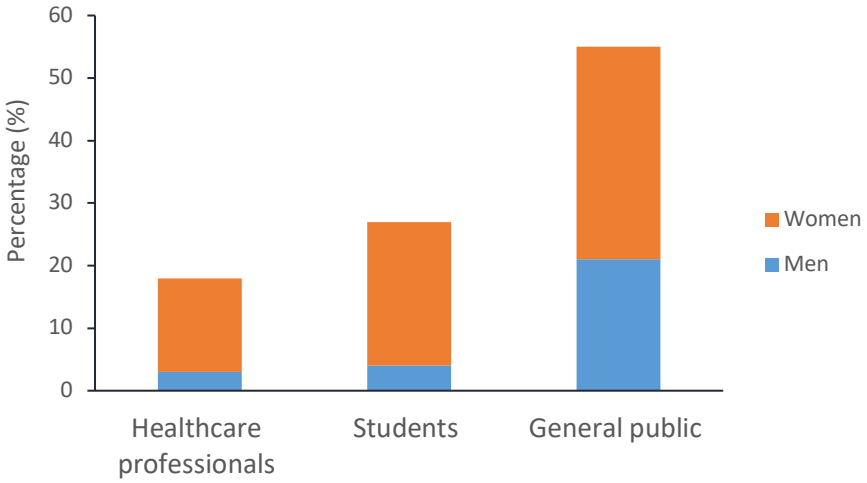

Figure 1. Sociodemographic profile of participants: profession

Knowledge of Microbial Gastroenteritis and Its Causes

A large proportion of respondents (94%) reported being familiar with microbial gastroenteritis, indicating a high level of awareness among the surveyed population (Figure 2). The most frequently cited etiology was a combination of bacterial contamination and poor hygiene practices (24%), followed by poor hygiene alone (23%) and bacterial contamination alone (19%). These findings suggest that most individuals associate the onset of microbial gastroenteritis with environmental contamination factors, particularly those related to inadequate hygiene practices.

This perception is consistent with scientific literature, which identifies the main etiological agents of microbial gastroenteritis as *Escherichia coli*, *Salmonella spp*., *Shigella spp*., and *Campylobacter spp*. (Uddin *et al.* 2021; Ramatla *et al.* 2022). These pathogens are typically transmitted via the fecal-oral route, primarily through ingestion of contaminated food or water or contact with contaminated surfaces. Poor personal, domestic, and food hygiene remains a major risk factor for the spread of these pathogens. According to the Centers for Disease Control and Prevention (CDC, 2022), preventive measures such as regular handwashing, thorough cooking of food, and access to clean drinking water are essential to reduce the incidence of these diseases.

Symptoms of Gastroenteritis

Survey results show that diarrhea is the most commonly reported symptom of microbial gastroenteritis. It appeared alone in 12% of cases and in combination with other symptoms in 13% of cases. Abdominal pain ranked second, affecting around 7% of participants. Vomiting was less frequently observed in isolation (3%) but increased to 9% when associated with abdominal pain (Figure 3). Dehydration was less common but considered a serious complication, reported in 1–3% of affected individuals.

These findings align with clinical data indicating that diarrhea and vomiting are hallmark symptoms of acute gastroenteritis of both bacterial and viral origin (Lima *et al.* 2019; Uddin *et al.* 2021; Domachowske & Dennehy 2025). Epidemiological studies reinforce the predominance of diarrhea, often accompanied by abdominal cramps and vomiting, as major contributors to morbidity and healthcare burden globally (Chavda *et al.* 2024).

Notably, dehydration remains a leading risk factor for severe outcomes, particularly among young children, the elderly, and immunocompromised individuals (WHO 2017; Sharma *et al.* 2020). Moreover, inadequate early management, including lack of rehydration therapy, can significantly worsen clinical outcomes (Laizāne 2020). These findings emphasize the importance of timely symptom recognition and prompt supportive treatment to prevent complications.

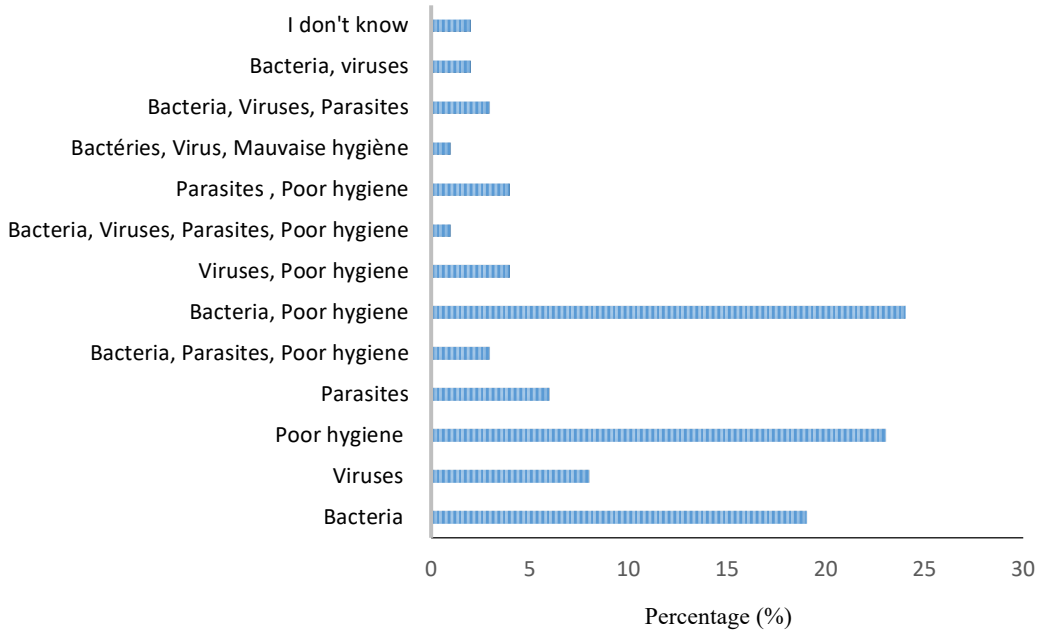

Figure 2. Distribution of perceived causes of gastroenteritis

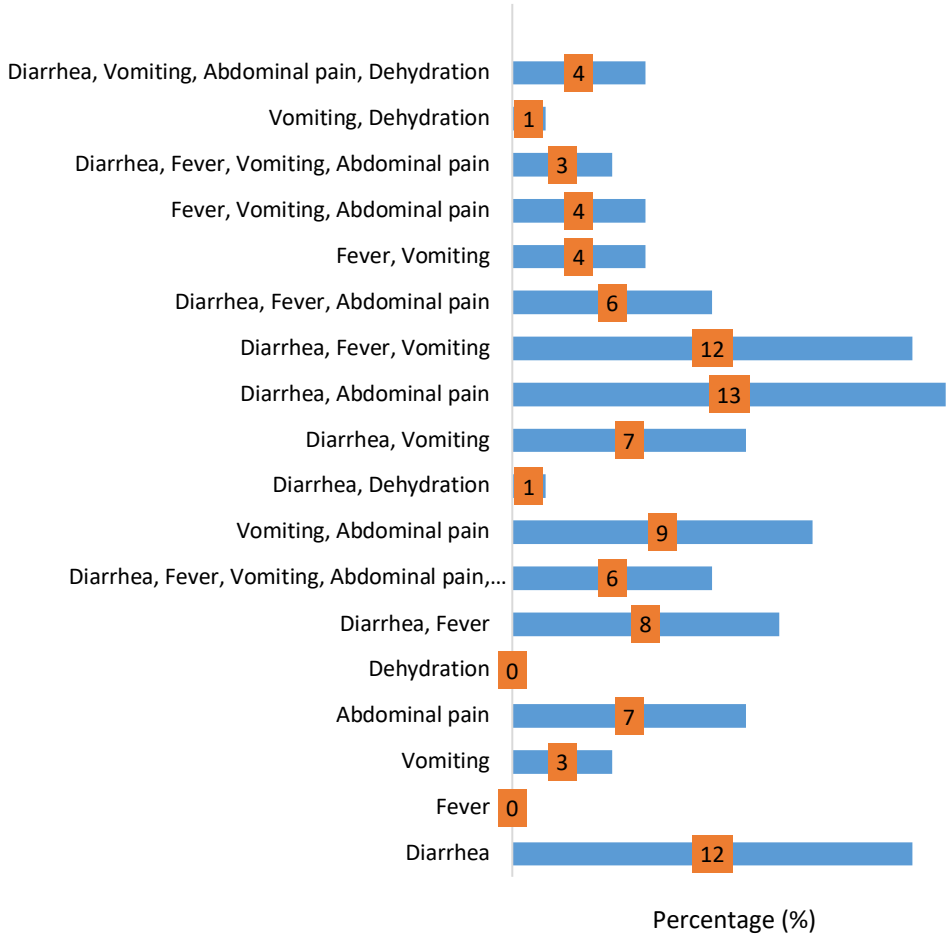

Figure 3. Distribution of perceived symptoms of gastroenteritis

Usual Treatments

Medicinal plants are widely used for treating digestive disorders due to their perceived natural and therapeutic properties. In the present study, over half of the respondents (52%) reported preferring medicinal plants, while 24% reported using them in combination with antibiotics (Figure 4). This preference may reflect perceptions of greater safety, accessibility, and cultural familiarity. The most frequently cited plants in this survey were *A. vulgaris* and *L. nobilis*, reflecting their strong cultural relevance and traditional use in the studied regions. Medicinal plants are often viewed as gentler alternatives to conventional pharmaceuticals; however, it is important to consider potential toxicity, dosage inconsistencies, and interactions with other treatments. Rational and informed use remains essential to avoid misuse or adverse effects.

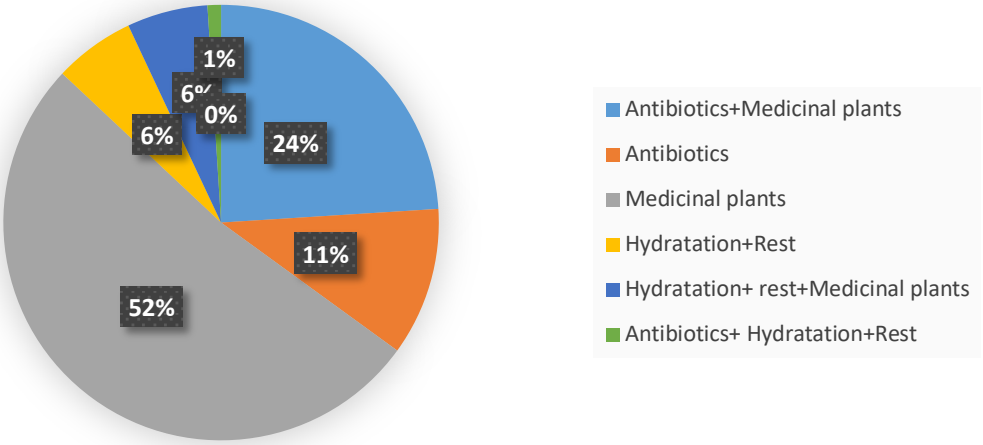

Figure 4. Frequency of treatment modalities commonly used by respondents

Experience of Microbial Gastroenteritis

Among the surveyed participants, 49% reported a history of microbial gastroenteritis, while 51% had never experienced the condition (Figure 5). This relatively high prevalence aligns with WHO estimates, which identify foodborne diarrheal diseases as a major global public health concern (WHO, 2015). Gender-based analysis revealed that 38% of women had been affected compared to 11% of men. This disparity may reflect differences in exposure risks, dietary habits, or physiological susceptibility (Patel *et al.* 2009; Kirk *et al.* 2014). Additionally, previous research suggests that women are more likely to seek medical consultation and report symptoms, potentially influencing prevalence estimates (Scallan *et al.* 2011). These observations support the inclusion of gender as a relevant variable in public health assessments of foodborne disease susceptibility.

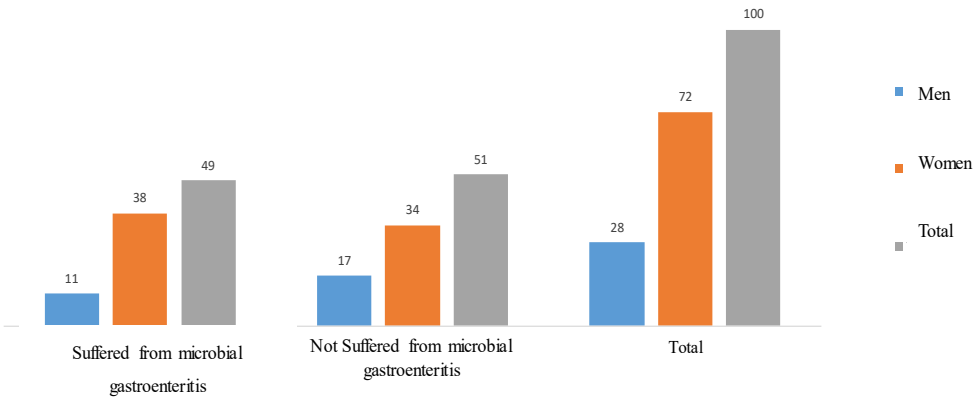

Figure 5. Prevalence of microbial gastroenteritis according the sex

Perceived Efficacy and Side Effects of Medicinal Plants

Respondents generally expressed a favorable perception of the efficacy of medicinal plants. A majority (81%) rated their effectiveness as moderate to high (scores 3 or 4), with score 3 being the most frequently selected (48%). Only 9% rated them as highly effective (score 5), while 10% perceived low efficacy (scores 1 or 2). Regarding side effects, 91% of participants reported no adverse reactions, while 9% cited undesirable effects (Figure 6). This aligns with literature noting that although medicinal plants are often considered safe, they may cause adverse effects due to inappropriate use or interactions (Mensah *et al.* 2019; Gouws and Hamman 2020). These findings underscore the importance of educating the public on the safe and evidence-based use of herbal remedies. Perceived efficacy and reported side effects are summarized in Table 2 and illustrated in Figure 6.

Table 2. Perceived efficacy and reported side effects of medicinal plants

Parameter	Category	Percentage (%)
Perceived efficacy	Low (scores 1–2)	10
	Moderate (score 3)	48
	High (scores 4–5)	42
Side effects	None reported	91
	Reported adverse effects	9

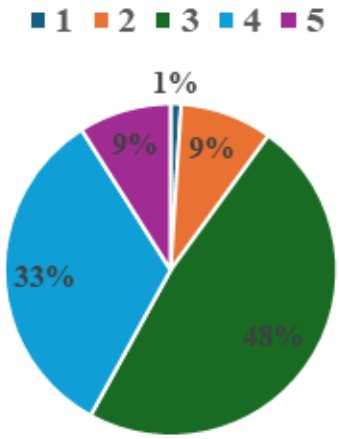

Figure 6. Distribution of perceived efficacy scores for medicinal plants (1 = not effective, 5 = highly effective)

Integration of Medicinal Plants into Modern Medicine

Among the 100 participants, 18 were healthcare professionals. Of these, 11 (11% of the total sample) supported the integration of herbal remedies into modern medical practice, while 7 (7%) opposed it. This indicates that all healthcare professionals surveyed expressed an opinion. Supportive attitudes suggest emerging openness toward integrative approaches, although concerns regarding standardization, clinical evidence, and regulation remain (Kalariya *et al.* 2023). These findings highlight the need for robust clinical studies, enhanced practitioner training, and tighter regulatory frameworks to ensure the safe incorporation of traditional remedies into mainstream healthcare.

Knowledge and Perception of *Artemisia vulgaris* and *Laurus nobilis*

The majority of participants (86%) reported familiarity with medicinal plants in general, and 89% were specifically familiar with *A. vulgaris* and *L. nobilis* (Figure 7). This reflects their widespread traditional use and recognition for their therapeutic properties. *A. vulgaris* is known for its antispasmodic and anti-inflammatory properties, often used in digestive and gynecological disorders (Ekiert *et al.* 2020), while *L. nobilis* is valued for its digestive, antiseptic, and anti-inflammatory effects (Al-Mijalli *et al.* 2022).

Infusion was the most common mode of preparation (86.6%), followed by decoction (10.5%), and a minority used both methods (3%). This preference may reflect accessibility and simplicity. Age distribution showed that infusions were predominantly used by participants aged 20–40 (29 individuals), followed by those aged 40–60 (23), and older adults over 60 (7). Decoction use remained marginal across all age groups, suggesting a generational trend toward more convenient

preparation methods. The plant parts used and preparation methods are summarized in Table 3, while the distribution of preparation methods by age group is illustrated in Figure 7.

Table 3. Plant parts used and preparation methods

Plant species	Used part	Preparation method
Artemisia vulgaris	Leaves	Infusion
Laurus nobilis	Leaves	Decoction

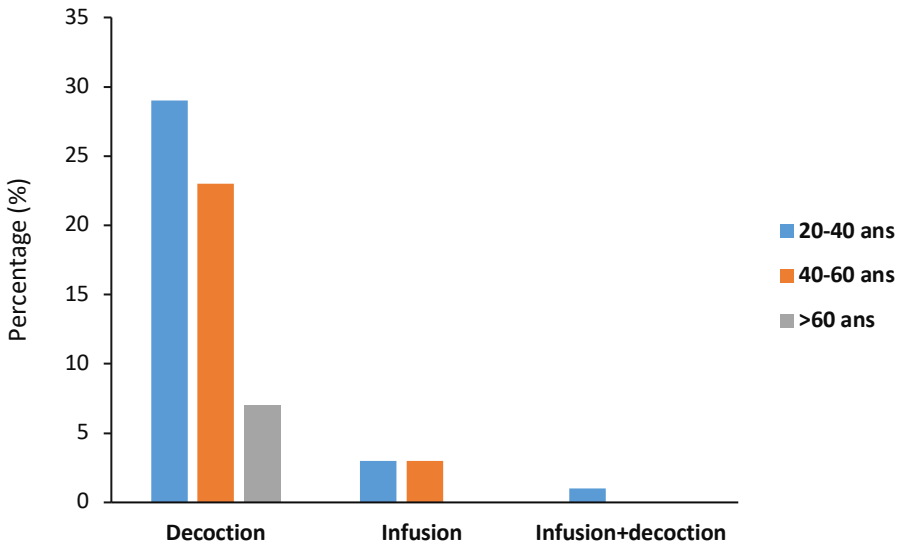

Figure 7. Familiarity with *Artemisia vulgaris* and *Laurus nobilis* among participants

Conclusion

This ethnobotanical survey revealed a high level of awareness regarding microbial gastroenteritis and a widespread preference for medicinal plants in its management. *A. vulgaris* and *L. nobilis* are well-known and perceived as effective and well-tolerated by the general population. However, the study also highlights the need for more stringent scientific validation and regulation to ensure safety and therapeutic efficacy. The generally positive outlook of healthcare professionals toward the integration of traditional remedies into modern medicine underscores the importance of bridging traditional knowledge and scientific research. Such integrative approaches could enhance the management of digestive disorders by combining cultural heritage with evidence-based practices. For future research, studies should focus on clinical trials to confirm the efficacy and safety of these plants, investigation of the active compounds responsible for antimicrobial effects, and the evaluation of optimal dosages and preparation methods to maximize therapeutic benefits.

Declarations

Ethics approval and consent to participate: Verbal informed consent was obtained from all participants prior to survey administration. The study was conducted in accordance with ethical guidelines for ethnobotanical research involving human participants. As the research was non-invasive, non-clinical, and conducted for academic purposes under Tunisian national regulations, formal institutional ethics approval was not required.

Access and Benefit-Sharing (Nagoya Protocol): This study involved documentation of traditional knowledge and collection of plant specimens in Tunisia. The research was non-commercial and conducted solely for academic purposes. No genetic resources were transferred outside Tunisia. The study complies with national regulations on access to genetic resources and traditional knowledge under the Nagoya Protocol.

Consent for publication: Not applicable.

Availability of data and materials: Data are available from the corresponding author upon reasonable request.

Competing interests: The authors declare no competing interests.

Funding: This research received no external funding.

Author contributions: Tabouii M: Conceptualization, data curation, investigation, software, writing – original draft.; Mahmoudi H: Formal analysis, review & editing; Aouadhi C: Supervision, visualization, review & editing.

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