

Health Awareness and Economic Dimensions of Medicinal Herb Consumption: An Interdisciplinary Perspective

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ABSTRACT

The use of medicinal herbs is playing an increasingly important role in natural health maintenance and prevention strategies, in line with European and global trends aimed at reducing lifestyle diseases through sustainable, low-risk means. The aim of the research was to explore the patterns of herbal medicine use among the Hungarian population using quantitative methods, based on a sample of 223 respondents. Cluster analysis identified four distinct consumer groups: minimally affected, committed intensive users, balanced users, and average interested parties. According to the results, attitudes towards medicinal herbs are overwhelmingly positive; strong social trust can be observed, especially in terms of safety. The standard deviation is low, with the majority of responses falling in the upper range of the scale (). The socio-demographic analysis (gender, age, place of residence, educational attainment) revealed statistically significant differences between the clusters, confirming that the use of phytotherapy is linked not only to health attitudes but also to social status. The Hungarian patterns fit well with the integrative approach preferred by the EU and WHO recommendations, which incorporates natural remedies into public health systems in a complementary manner. The practical application of the results is mainly evident in targeted health communication and regulatory development.

Keywords: herbal medicine use, cluster analysis, phytotherapy, health attitudes, health policy

INTRODUCTION

With the aging of the European population, there is an increasingly urgent need for healthcare systems to incorporate alternative measures to prevent chronic medication use in order to ensure long-term sustainability. One key area of prevention-based approaches is the use of medicinal plants, especially in cases of mild symptoms or chronic but non-acute conditions (Wang & Xiong, 2012; Rapoliene & Matuleviciute, 2024; Hosseini & Mobasheri, 2024). Health-conscious consumers are increasingly focused on delaying the onset of drug dependence and enabling their bodies to naturally counteract age-related functional decline (Bishop & Lewith, 2010; Bhattacharjee, Sandhanam, & Ghose, 2024). Polypharmacy—the simultaneous use of multiple medications—has serious social and economic consequences, especially in the older age group. Polypharmacy often leads to undesirable drug interactions, reduced adherence, and hospital admissions, which place a significant additional burden on the healthcare system (Maher, Hanlon, & Hajjar, 2014; Soler & Barreto, 2019; Laberge, Sirois, & Lunghi, 2021; Romano et al., 2022).

In contrast, herbal preparations—under appropriate medical supervision—may offer an alternative for treating minor conditions such as sleep disorders, mild digestive problems, anxiety, or mild blood pressure problems (Wang & Xiong, 2012; Dubas-Jakobczyk & Kocot, 2017; Lin et al., 2018). When examining the economic benefits of phytotherapy, several studies confirm that the use of complementary and alternative medicines can reduce the number of days of absence and improve work performance (Herman et al., 2014; Mongiovi, Shi, & Greenlee, 2016; Jódar-Sánchez et al., 2015). According to a study covering 10,000 employees, regular access to natural therapies can result in direct employer savings of up to several hundred dollars per person per year. The WHO (2013) *Traditional Medicine Strategy 2014–2023* sets a clear goal: to integrate proven safe herbal therapies into national health systems, particularly at the primary prevention level (WHO, 2013). However, public access is subject to significant financial constraints: herbal products are not typically covered by social security, so their prices are determined by market forces, which hinders their wider distribution (Bishop & Lewith, 2010; Verdoorn et al., 2021; Jungo et al., 2024). Our research has two objectives: on the one hand, we examine what financial arrangements (e.g., tax breaks, health insurance subsidies, corporate prevention programs) can make herbal-based prevention cost-effective. Second, we map the attitudes of the population towards medicinal herbs, with a particular focus on trust, price sensitivity, sources of information, and frequency of use. We assume that health-conscious phytotherapeutic practices can contribute to reducing patient numbers, delaying drug dependence, and generating long-term social savings.

LITERATURE REVIEW

Active ingredients of medicinal plants and their role in maintaining health

After lengthy study, medicinal plants were also used by our foraging ancestors. Our conquering ancestors were also interested in the healing properties of plants. In the 19th century, the cultivation of medicinal plants was limited to monasteries, from where, after a long period of time, medicinal plants found their way into home gardens and then into arable fields. Large-scale plant cultivation began slowly in Hungary, which helped to establish specialized research stations and educational opportunities in plant cultivation. Interest in the study of the active ingredients found in plants also grew. Hungary's climate is favorable for the cultivation of medicinal herbs, and the active ingredients extracted from them can be used in many industrial areas. These active ingredients can be classified into several groups, e.g., alkaloids, glycosides, saponin glycosides, flavonoids, bitter compounds, tannins, dyes, essential oils, milky juices, organic acids, vitamins, plant acids, resins, antibiotics, phytoncides, carbohydrates, fats, and waxes. The collection of medicinal plants requires careful attention. They should be obtained away from busy areas, at the edge of forests, in clearings, pastures, meadows, along waterways, in damp places, marshy, sandy or cultivated areas. The drying and storage of medicinal herbs is also important, as it helps to prolong their beneficial effects (Molnárné Juhász, 2021), (Burghardt, 2022). They can also be grown in home gardens, so it is worth learning about the characteristics and cultivation requirements of herbs that can be propagated from seed, seedlings, or cuttings (Molnárné Juhász, 2021).

After lengthy observation, medicinal herbs were also used by our foraging ancestors. Our conquering ancestors were also aware of the healing properties of plants, and in the 19th century, this knowledge was preserved in monasteries, from where it slowly found its way into home gardens and then into arable farming. With the start of large-scale medicinal herb cultivation in Hungary, specialized research stations and educational centers were also established, which facilitated the scientific study of the active ingredients of plants (Molnárné Juhász, 2021).

Hungary's climate is favorable for medicinal herb cultivation, and the active ingredients extracted from these plants can be used in a number of industries, from food to pharmaceuticals. Plant active ingredients include alkaloids, glycosides, saponins, flavonoids, bitter compounds, tannins, essential oils, organic acids, vitamins, phytoncides, resins, and antibiotic compounds (Molnárné Juhász, 2021; Burghardt, 2022). The collection of medicinal plants requires careful attention: it is recommended to collect them away from busy areas, in clearings, meadows, forest edges, or along waterways. Proper drying and storage are key to preserving the active ingredients. Since they can also be grown at home, it is important to know the cultivation requirements of species that can be propagated from seeds, seedlings, or cuttings (Molnárné Juhász, 2021). In the next section of our manuscript, we summarize the most important active ingredients and physiological effects of some medicinal herbs and medicinal herbs that are widely known and used in Hungary. Most of the species presented are part of the domestic flora or have long been cultivated in Hungarian phytotherapeutic tradition.

Plants That Support Digestive and Metabolic Processes

Common yarrow (*Achillea millefolium*) contains flavonoids, sesquiterpene lactones, and tannins. These compounds are effective in treating gastrointestinal complaints, menstrual cramps, loss of appetite, and skin and mucous membrane inflammations (Molnárné Juhász, 2021; Csurgó, 2001; Minarchenko et al., 2019). Field horsetail (*Equisetum arvense*) contains silicic acid, flavonoids, and fatty acids. It has diuretic, kidney cleansing, and mineral replenishing effects, thus aiding in the regeneration of the body (Molnárné Juhász, 2021). The main active ingredients of peppermint (*Mentha piperita*) are essential oils – menthol and menthone – as well as flavonoids and tannins. Based on clinical data, it has antibacterial, digestive and antispasmodic effects (Molnárné Juhász, 2021; Nagy et al., 2014; Karageçili & Gülçin, 2025). Fennel (*Foeniculum vulgare*) contains essential oil and dillapiol. It is traditionally used for its digestive, appetite-stimulating, and cholagogue effects (Molnárné Juhász, 2021; Guidi & Landi, 2014).

Plants That Support the Immune System and Overall Vitality

Purple coneflower (*Echinacea purpurea*) contains polysaccharides, chicoric acid derivatives, flavonoids, and alkylamides. Numerous studies confirm its immune-boosting and anti-inflammatory effects (Molnárné Juhász, 2021; Endre, 2019; Burlou-Nagy et al., 2022).

Sea buckthorn (*Hippophae rhamnoides*) has antioxidant, immunostimulatory, and wound-healing effects due to its high vitamin A, C, and E content and flavonoids (Molnárné Juhász, 2021; Erdős & Szöllősi, 2017).

Garlic (*Allium sativum*) contains sulfur compounds such as alliin and allicin, as well as flavonoids and vitamins. Its antibacterial, vasodilatory, and blood pressure-lowering effects have been clinically proven (Molnárné Juhász, 2021; Jafari et al., 2023).

Wild garlic (*Allium ursinum*) has a similar active ingredient profile and is a blood-purifying, cholesterol-lowering, and memory-supporting plant (Molnárné Juhász, 2021).

Plants That Support Nervous System and Mental Well-Being

Lemon balm (*Melissa officinalis*) contains essential oils, tannins, flavonoids, and saponins. In addition to its mild sedative, stress-relieving, and sleep-promoting effects, it is also suitable for alleviating heart and stomach complaints (Molnárné Juhász, 2021; Kovács et al., 2014; Karageçili & Gülçin, 2025). The essential oils and flavonoids of lavender (*Lavandula angustifolia*) are well known for their calming, headache-relieving, and sleep-improving effects, and are also beneficial for rheumatic complaints and muscle tension (Molnárné Juhász, 2021; Gerván & Hill, 2019; Elias & Draelos, 2024).

Plants That Support Circulation and Metabolic Processes

Safflower (*Carthamus tinctorius*) is rich in vitamins A, E, and K, as well as unsaturated fatty acids (linoleic acid, oleic acid). It protects the cardiovascular system, improves liver and bile function, and has antioxidant effects (Molnárné Juhász, 2021; Hoppe, 2017; Kovalev & Tsitsilin, 2024). Medicinal sage (*Salvia officinalis*) contains essential oils, flavonoids, and diterpenes. Its anti-inflammatory, antibacterial, and antioxidant properties play a role in maintaining oral and throat health (Molnárné Juhász, 2021; Németh et al., 2008; Karageçili & Gülçin, 2025).

Plants Useful for Skin and Hair Care

Medicinal chamomile (*Matricaria chamomilla*) contains sesquiterpene lactones, flavonoids, and essential oils. Due to its anti-inflammatory, antispasmodic, antibacterial, and skin care effects, it is one of the most popular medicinal plants in Hungary (Molnárné Juhász, 2021; Csurgó, 2001; Minarchenko et al., 2019). A common feature of the plants presented is that they offer a natural solution primarily for milder complaints and chronic, but not acute, conditions. These types of Hungarian medicinal plants are not only important in folk medicine, but also in modern phytotherapy, supporting the immune system, digestion, circulation, and mental health.

Within the European Union regulatory framework

Directive 2004/24/EC (also known as the "Herbal Directive") is an amendment to Directive 2001/83/EC in the field of herbal medicinal products and aims to provide uniform regulation for products marketed as herbal medicines that have a traditional use but not necessarily with efficacy supported by clinical trials (European Commission, 2024). The directive introduced the so-called "traditional-use registration" procedure, which allows the marketing of herbal medicinal products based on at least 30 years of documented use, of which at least 15 years must have been in the European Union (European Commission, 2024). The procedure does not require efficacy supported by general clinical trials—i.e., randomized trials are not mandatory—if the product meets the requirements for traditional use and its safety, quality, and documented use can be verified (AFMPS, 2011). One of the central scientific institutions involved in regulation is the Committee on Herbal Medicinal Products (HMPC), which operates within the European Medicines Agency (EMA) and is responsible, among other things, for developing European herbal monographs to ensure the safety and usability of herbal active substances and herbal preparations (FAMHP, 2020). Although the directive creates a common legal framework in the EU, registration and authorization procedures are partly the responsibility of the Member States, so national regulations apply. Although the directive creates a common legal framework in the EU, registration and authorization procedures are partly within the competence of the Member States, so there may be differences between national regulations, for example in registration fees, distribution channels, or advertising (EMA, n.d.; Eurocam, 2017; Kálmán & Grotte, 2023). The aim of harmonization is to promote the free movement of goods within the internal market, but differing national implementations can also result in administrative burdens and market competition disadvantages (Deal, 2010; House of Commons Library, 2014).

Global economic considerations

The economic importance of medicinal and aromatic plants is receiving increasing attention today, as these sectors serve health, environmental, and social objectives simultaneously. The production and export of phytotherapeutic raw materials plays a key role in rural employment and local economic diversification in many developing countries (Karki & Chowdhary, 2019). The export of non-timber forest products (NTFPs) – including medicinal plants – can account for up to 15–25% of rural household income in Nepal and India, particularly where GACP certification and organic collection practices have been implemented (Paudel et al., 2018).

From a sustainability perspective, GACP systems and FairWild certification can help ensure that medicinal plant collection provides both ecological protection and economic benefits. The FairWild premium, for example, is a fixed percentage of the export value of the product, which is spent on community development projects, thus supporting biodiversity conservation and local livelihoods (Sarnaik, Bride & Godbole, 2017; Malatyinszki et al., 2025).

In Mediterranean and African countries, the rural development impact of the herbal medicine sector is also evident: local production increases female employment, community self-determination, and income stability (Mudau, Chimonyo & Modi, 2022). The concept of a bio-based economy integrates these processes into a system of sustainable agriculture and circular production, promoting green economic growth and access to export markets (Dajnoki et al., 2023; El Ahmadi, El Allaoui & El Abdouni, 2025). Overall, the herbal economy is not only the basis for health innovations, but also a complex socio-economic driver that supports several Sustainable Development Goals (SDGs) – in particular Goals 8 (Decent work and economic growth) and 15 (Protecting terrestrial ecosystems) (Wani et al., 2021).

Far Eastern medicinal plants in the Central and Eastern European market: a narrow segment

The emergence of Far Eastern medicinal plants in Europe can be easily understood through the consumption patterns of non-local exotic fruits such as oranges and bananas. While these have become part of the everyday diet, other tropical fruits, such as papaya or mangosteen, are only available to consumers to a limited extent. A similar process can be observed in the herbal market: some plants originating in South and East Asia—such as ginger (*Zingiber officinale*), turmeric (*Curcuma longa*), and green tea (*Camellia sinensis*)—are now widely known and regularly used in Europe, either as spices or as dietary supplements (Cabrera et al., 2006; Hewlings & Kalman, 2017; Mashhadi et al., 2013). In contrast, a significant proportion of Far Eastern medicinal plants are still only available to a small, well-informed consumer group. These are mainly sought after by those interested in alternative medicine and natural adaptogens. *Ashwagandha* (*Withania somnifera*), one of the best-known Ayurvedic adaptogens, has become popular for its stress-reducing and sleep-quality-improving effects (Singh et al., 2011). *Shatavari* (*Asparagus*

racemosus), which is used to support female hormonal balance, is less common and its distribution is typically limited to imported products (Pundarikakshudu & Kanaki, 2020). *Cordyceps* (*Cordyceps sinensis*), a special medicinal mushroom valued in Asia for its energy-boosting and immunomodulatory effects, is also available in limited quantities in Europe, partly due to its high price and special storage conditions (Li et al., 2021). *Gotu kola* (*Centella asiatica*) is a plant used for nervous system and cognitive support, which is mainly available on the European market in the form of dietary supplements (Orhan, 2012). These plants are typically available in small quantities to targeted, informed, and health-conscious consumers. Their market integration is hampered by several factors: limited scientific evidence of health effects, import dependency, and consumer ignorance. At the same time, growing demand for natural functional foods and phytotherapeutic products, especially among younger, more health-conscious generations, suggests that the market for these medicinal plants may gradually expand in Europe.

METHODOLOGY

The aim of the research was to explore public attitudes towards the use of medicinal herbs, price sensitivity, and opportunities for promotion. The study was conducted as a non-representative, exploratory questionnaire survey between June and August 2024. Data collection was conducted online using a self-administered questionnaire, which researchers distributed primarily through convenience sampling, among their acquaintances, in online communities, and on professional platforms. Responses were voluntary and anonymous. The sample cannot be considered nationally or regionally representative, but it was suitable for mapping preliminary patterns and social attitudes. During the study, the researchers sought answers to the following questions:

1. For what purposes do respondents use medicinal herbs in their daily lives?
2. Which demographic groups are more likely to use medicinal herbs regularly?
3. **How confident are respondents in the effectiveness and safety of medicinal herbs?**
4. **What sources do they use to obtain information about medicinal herbs?**
5. **What measures do respondents consider effective in reducing the price of medicinal herbs and improving their availability?**

The questionnaire contained only closed questions, which allowed for structured, quantitative analysis of the data. Demographic characteristics (e.g., gender, age, type of residence, educational attainment) were measured using simple choice variables. Questions regarding herbal medicine use, sources of information, and certain behavioral patterns used a binary (yes/no) response format. To assess respondents' attitudes and confidence, items rated on a five-point Likert scale were used to examine perceptions of the efficacy, safety, and prevalence of herbal medicines. Questions related to price sensitivity also used a scale and category selection format. Data processing was performed using SPSS statistical software. Descriptive statistical methods were used to describe the composition of the sample and the basic patterns of responses. For categorical variables, frequency distributions and percentages were calculated, while for scale variables, mean and standard deviation values were calculated. Cross-tabulation analysis was used to explore possible correlations between responses, for example, between age and the purposes of herbal medicine use, and between education level and the use of information sources. The aim of the research was to explore the knowledge, habits, and attitudes of the Hungarian population regarding the consumption, use, and perception of medicinal herbs. The study placed particular emphasis on mapping attitudes towards natural remedies, health-preserving efforts, and the motivations behind purchasing decisions. Data was collected using a questionnaire containing only closed questions. Respondents provided answers on topics such as their herbal consumption habits, methods of obtaining information, level of trust, and attitudes toward prevention. The questionnaire contained various types of closed questions, including single and multiple choice questions, as well as Likert scale ratings.

Data collection took place between March 1 and May 31, 2025, over a three-month period. The questionnaire was available online, and participation was voluntary. A total of 223 people completed the questionnaire. The sample cannot be considered representative of the entire Hungarian population, but the results provide a general picture of public attitudes and trends regarding medicinal plants. The demographic distribution shows the diversity of the sample and its slight bias (Table 1).

Table 1: Demographic distribution

Characteristics	N	%
Male	98	43.9
women	125	56.1
18-29	64	28.7
30-44	94	42.2
45-59	51	22.9

60 years and older	14	6.3
Village/small town	36	16.1
small town <50,000 inhabitants	74	33.2
large city	56	25.1
capital	57	25.6
skilled worker	38	17.0
high school graduate	93	41.7
higher education	92	41.3

Source: own compilation based on SPSS output

The sample of respondents mainly consists of educated women from urban areas. In terms of gender ratio, women are more strongly represented, which is consistent with social patterns that generally show greater interest in natural remedies. In terms of distribution by place of residence, respondents from small towns and cities are in the majority, which may indicate that the use of medicinal herbs is not only linked to rural traditions, but is also part of a conscious search for health in urban areas. Based on educational data, the sample consists of highly qualified respondents, most of whom have a high school diploma or higher education. This suggests that the majority of participants not only have access to relevant information, but are also likely to be able to interpret it critically. Such a knowledge-oriented attitude also promotes the conscious use of medicinal herbs. The sample reflects an educated, informed, and predominantly female group of respondents, which may be a relevant target group for examining the social perception and availability of medicinal plants. The collected data were processed using the SPSS 28.0 statistical software package. During the analysis, we primarily used descriptive statistical methods: we examined the characteristics of each variable based on frequency distributions, percentage distributions, mean values, and standard deviations. To explore the relationships between the answers to the questions, we performed cross-tabulation analyses by demographic breakdown (e.g., gender, age, educational attainment), and tested the significance of the correlations using the chi-square (χ^2) test where appropriate. The purpose of clustering was to identify patterns among respondents based on their attitudes toward herbal medicine use. We used the k-means clustering procedure in SPSS software for the analysis. We used only two variables for clustering: the respondent's monthly expenditure on herbal preparations (in forints) and the diversity of use, i.e., how many types of health complaints they use herbal preparations for. We did not standardize the variables during clustering, as the scale formats used were meaningful in themselves. When interpreting the clusters, we took into account the average values of each variable in order to identify distinct group profiles based on the respondents' preferences.

RESULTS

Answers to the research questions

Research question 1

"For what purposes do respondents use medicinal herbs in their everyday lives?" The answers to this question show that the vast majority of respondents use medicinal herbs to alleviate specific health complaints (Table 2).

Table 2 Distribution by purpose of use

Purpose of use	N	%
Colds/respiratory complaints	140	63
Digestive problems	10	45
Stress / sleep	80	36
Immune system strengthening	70	32
Pain relief	40	18
Other	12	5

Source: own compilation based on SPSS output

Based on the data analysis, it can be clearly concluded that the main purpose of use is to treat respiratory and digestive symptoms, with stress relief and immune system strengthening also featuring significantly. The table below shows the purposes by frequency and percentage:

The use of medicinal herbs is mainly concentrated on the relief of colds and respiratory complaints, which is also prominent in Hungarian folk and modern traditions – e.g., chamomile, linden, and thyme teas. This application is the most widely accepted and common. The treatment of digestive problems is also a common purpose, which is also deeply rooted in the culture of home remedies (e.g., peppermint, fennel, yarrow). This suggests that many people use medicinal herbs as an alternative to medication for milder complaints. Their use in cases of stress and

sleep disorders also indicates health psychology dimensions: here, respondents also use natural preparations (e.g., lemon balm, lavender) to support their mental well-being. This shows that the use of medicinal herbs goes beyond symptomatic treatment and also plays a complementary role in lifestyle. Immune boosting and pain relief are less common, which may indicate that in these cases, respondents either tend to turn to traditional medical solutions or have less confidence in the effectiveness of herbal remedies in this area. The relatively low value of the "other" category indicates that the majority of respondents use herbs for specific, known purposes and rarely deviate from traditional uses. This distribution confirms that herbal medicine is used as a practical response to specific problems, and that the vast majority of users apply these natural remedies in a goal-oriented manner.

Research question 2

"Which demographic groups are more likely to use medicinal herbs regularly?" We examined this question using cross-tabulation analysis. The tables below show the distribution of regular herbal medicine use according to four demographic characteristics: gender, age, place of residence, and educational attainment. Each cross-tabulation is supplemented by a chi-square test, which indicates the statistical significance of the correlations. The tests examine whether the differences are random or indicate real differences.

Table 3 – Distribution by gender

Gender	N	Regular use %
Male	98	43.9
women	125	56.1

Chi-square: $\chi^2(1) = 6.02$, $p = 0.014 \rightarrow$ significant correlation between gender and usage.

Source: own compilation based on SPSS output

Table 4 – Distribution by age

Age	N	Regular use %
18–29	64	28.7
30–44	94	42.2
45–59	51	22.9
60 years and older	14	6.3

Source: own compilation based on SPSS output

Chi-square: $\chi^2(3) = 12.85$, $p = 0.005 \rightarrow$ significant correlation between age and usage.

Table 5 – Distribution by place of residence

Place of residence	N	Regular use %
village/small town	36	16.1
small town	74	33.2
big city	56	25.1
capital	57	25.6

Source: own compilation based on SPSS output

Chi-square: $\chi^2(3) = 9.44$, $p = 0.024 \rightarrow$ significant correlation between type of residence and usage.

Table 6 – Distribution by educational attainment

Education	N	Regular use %
skilled worker	38	17.0
high school graduate	93	41.7
higher education	92	41.3

Source: own compilation based on SPSS output

Chi-square: $\chi^2(2) = 4.91$, $p = 0.086 \rightarrow$ not significant, but close to the threshold value. We examined the regular use of medicinal herbs along several demographic characteristics, supplemented by cross-tabulation analysis and chi-square tests. The aim of the analysis was to reveal in which groups this type of health-preserving behavior is more common and whether the differences can be statistically substantiated. Based on gender breakdown, the regular use of medicinal plants is more common among women than among men. According to the chi-square test, this difference is significant and cannot be considered a random deviation. Women are generally more health-conscious and open to alternative, natural remedies, which may contribute to their more frequent use. Attitudes related to caregiving roles and family responsibilities may also support the acceptance of medicinal herbs.

There are differences between age groups: middle-aged respondents are the most active users, while the youngest and oldest groups have lower rates of use. The differences are statistically significant, so age does have an impact on frequency of use. The reason for this is presumably that middle-aged people strive for a more health-conscious lifestyle, herbal remedies are becoming increasingly available to them, and they are increasingly looking for alternatives to drug treatment. In contrast, there are several reasons for the more restrained use of herbal remedies among older respondents. Many of them are already taking multiple medications and are therefore more cautious about alternative solutions, especially if there is no adequate medical background or professional guidance. The price of high-quality herbal products can also be a deterrent, especially for those on a fixed income. The type of residence also has an impact on habits. The highest rate of use is observed among people living in small towns, while regular use is lower in villages, large cities, and the capital. The chi-square test confirms that the differences are not random. This practice is particularly active among small town residents, where traditional attitudes, the sharing of personal experiences, and openness to natural solutions are all present. In these settlements, local markets, herbal shops, and community knowledge often facilitate access to natural products, while urban services are also within reach.

The situation of the rural population is paradoxical: although they live directly in the natural environment and, in theory, have the opportunity to collect and cultivate plants, regular use is less common. This may be due to the loss of traditional knowledge across generations, as well as greater trust in medical care and quick access to medicines. In many cases, the knowledge and motivation necessary for the use of natural preparations are lacking, especially if the family or community background does not support their use. In the capital and large cities, where the selection is wider and information sources are more abundant, the use of medicinal plants is still not common to the same extent. This is also due to the fact that the highly institutionalized healthcare system prioritizes drug treatment, while natural methods receive less emphasis. The urban lifestyle is less conducive to the use of slower-acting, natural methods, so medicinal herbs are often used only as a supplement. In terms of educational attainment, the differences are not statistically significant, but the value close to the test is noteworthy. The rate of regular use is almost the same among those with secondary and higher education, while those with lower educational attainment are less likely to take advantage of this opportunity. This may indicate differences in health literacy, critical information use, and trust in alternative solutions. In many cases, high-quality herbal preparations from reliable sources require a significant financial investment, which also limits the potential user base. They are most affordable for those who consciously strive to develop a natural lifestyle and are willing to devote time, money, and attention to maintaining their health.

Regular use of herbal remedies is therefore not solely a health or cultural choice, but is strongly dependent on physical and economic access, the characteristics of the local environment, and the lifestyle chosen by the individual.

Research question 3

"How confident are respondents in the effectiveness and safety of medicinal herbs?" The averages, standard deviation, and distribution provide a sufficient answer to this question (Table 6). Respondents clearly have a positive attitude towards medicinal herbs: they rate both their effectiveness and safety favorably. Interestingly, there were no respondents who completely rejected either area – no one chose the lowest points on the scale. This in itself indicates a strong basis of trust. The distribution of safety ratings is narrower, with a stronger concentration around the most positive responses. There is slightly more variation in the assessment of effectiveness, but even so, positive responses dominate. The third research question examines respondents' confidence in the effectiveness and safety of medicinal herbs. To map this, we used ratings measured on a five-point Likert scale, where higher scores indicate greater agreement. The table below shows the development of the assessment using average values, standard deviation, and response distribution.

Table 7 – Effectiveness, safety

Variable	Mean	Standard deviation (Std. Dev.)	N=3	N=3	N=4	N=4	N=5	N=5
How confident are you in the effectiveness of medicinal herbs?	4.07	0.797	63	28.3	81	36.3	79	35.4
How safe do you consider the use of medicinal herbs to be?	4.43	0.725	31	13.9	65	29.1%	127	57.0

Source: own compilation based on SPSS output

Respondents clearly have a positive attitude towards medicinal herbs: they rate both their effectiveness and safety favorably. Interestingly, there were no respondents who completely rejected either area – no one chose the lowest scores on the scale. This in itself indicates a strong basis of trust. The distribution of safety ratings is narrower, with a stronger concentration around the most positive responses. There is slightly more variation in the assessment of effectiveness, but even so, positive feedback dominates. All this suggests that for respondents, the reliability and natural nature of medicinal herbs, and the resulting lack of risk, are among the most important considerations, ahead of expectations regarding targeted effects.

Research question 4

"What sources do you use to obtain information about medicinal herbs?" The aim of this question was to find out what channels respondents use to obtain information about the use of medicinal herbs. The answer options included traditional, informal (e.g., family, friends), formal (e.g., books, education), as well as digital and professional sources (e.g., the internet, pharmacists, doctors). In the questionnaire, we asked about the method of obtaining information in a multiple-choice format, so respondents could indicate more than one source.

During the analysis of the data, we used frequency analysis in the SPSS program, which allowed us to determine the absolute and relative frequency of each source. This gave us an idea of which channels dominate in obtaining information about herbal medicine use and to what extent respondents rely on professional versus lay sources of knowledge (Table 7).

Table 8 – Sources of information

Information source	Yes (N)	Yes (%)	No (N)	No (%)	Average	Standard deviation
Internet / social media	188	84.3	35	15.7	0.84	0.365
Pharmacist	53	23.8	170	76.2	0.24	0.427
Doctor	56	25.1	167	74.9	0.25	0.435
Family/acquaintances	150	67.3	73	32.7	0.67	0.47
Books / professional literature	132	59.2	91	40.8	0.59	0.493

Source: own compilation based on SPSS output

Based on the data, the primary source of information about medicinal plants is the internet and social media, which are used by the vast majority of respondents. This trend is not surprising, as these platforms offer fast, easily accessible content that is often based on personal experiences. The second most common source is family and friends, which shows that direct human relationships, trust, and personal experiences continue to play an important role in health-related decisions. In contrast, doctors and pharmacists are much less likely to be consulted on this topic. It is important to note that this does not reflect a dismissive attitude on the part of healthcare professionals, but rather professional caution. Since scientific evidence on the effects of herbal medicines is often limited and inconsistent, healthcare professionals primarily recommend products whose efficacy and safety have been clinically proven. In addition, possible interactions between herbal medicines and drugs require increased caution. It is the responsibility of professionals to provide sound, safe advice—this cautious approach often manifests itself in a more cautious, restrained attitude toward herbal medicines.

Among the sources, books and professional literature proved to be the most divisive: while many consider them to be important and reliable sources of information, others make less use of them, perhaps because of their limited accessibility or scientific language. This contradiction clearly shows that when seeking information, people often choose easily understandable, direct sources, even if they are less well-founded. Respondents tend to rely on informal, readily available sources, while professional advice—although important—takes a back seat. This is not the fault of professionals, but rather a characteristic of today's information environment, where credibility often compromises convenience and accessibility.

Research question 5

"What measures do respondents consider effective in reducing the price of medicinal herbs and improving their availability?" The aim of the question was to explore what types of economic or policy measures respondents believe would promote wider access to herbal preparations. The questionnaire listed several possible interventions, such as social security support, health insurance reimbursement, tax breaks, and coverage through corporate health programs.

Respondents could select more than one option, so the analysis provided an opportunity to form a picture of social support and the types of measures that would be accepted by the population. The responses reflect not only cost sensitivity, but also opinions on the fairness of access to healthcare (Table 8).

Table 9 – Reduction of consumer prices

Measure	Yes (N)	Yes (%)	No (N)	No (%)	Average	Standard deviation
TB support	165	74.0	58	26.0	0.74	0.44
Health insurance fund settlement	141	63.2	82	36.8	0.6	0.483
VAT reduction	169	75.8	54	24.2	0.76	0.429
Support for local producers	211	94.6	12	5.4	0.95	0.226
Public awareness	191	85.7	32	14.3	0.86	0.351

Source: own compilation based on SPSS output

The majority of respondents were in favor of various measures aimed at reducing the price of medicinal herbs and improving their availability. The results show that they do not consider a single solution, but would support several complementary options. Measures that are not only financial in nature, but also take into account community aspects and the relationship with nature, enjoy outstanding social support. A significant proportion of respondents supported government intervention, such as social security support or tax cuts, but even more widely accepted were approaches based on local production, collection, and expanding the knowledge of the population. The importance of education was highlighted, suggesting that people not only want to buy these products, but also want to understand their background, effects, and responsible use. Health insurance fund eligibility proved to be a somewhat more divisive issue, probably because this option is less accessible or unknown to many people. At the same time, the population would clearly be open to state or community schemes that bring herbal products closer to everyday health practices. The responses shed light not only on the issue of economic access, but also on the type of production and supply model that the population considers desirable. The current system, based on mass production and wholesale distribution, is in many ways far removed from the values represented by the respondents.

There are several successful examples in Romania of how medicinal herbs can be produced and processed in a natural way within local communities. Gathering, backyard cultivation, and small-scale production are models that simultaneously promote sustainability, healthy lifestyles, and the strengthening of the rural economy. Such systems not only reduce the price of products, but also build consumer confidence, as the production process is transparent, people-oriented, and authentic. Decentralized processing, for example in the form of drying or extraction plants in smaller communities, not only increases logistical flexibility, but also preserves the freshness, quality, and cultural value of the products. This is in sharp contrast to approaches where medicinal herbs are produced industrially and marketed as mass-produced food products, such as those offered by certain Slovakian or multinational tea manufacturers. The respondents' needs clearly point in a natural, community-based, and knowledge-based direction. Support for policy instruments that fit this approach—such as local incentives, the establishment of community processors, and the introduction of educational programs—may be key to ensuring the social embeddedness and long-term sustainability of herbal products.

Clusters

The aim of the cluster analysis was to group respondents according to their herbal medicine use habits, with particular regard to the number of health problems for which they use these products and their monthly expenditure. Using the K-means clustering method with SPSS software, four clusters were identified that reflect different consumption patterns (see Table 9 – Final Cluster Centers). The cluster centers clearly show that there are significant differences between the groups in terms of both the diversity of herbal medicine use and monthly spending. The Euclidean distances between the clusters (Table 10) also support the distinctiveness of the groups, with the greatest distance (4.628) observed between clusters 1 (minimally affected) and 2 (committed intensive users), which indicates a sharp contrast in attitudes and purchasing behaviors.

Table 9 – Final Cluster Centers

Final Cluster Centers				
	Cluster			
	1	2	3	4
For how many types of problems do you use medicinal herbs?	61	4.47	3.16	2.45
How much do you spend on herbal products each month?	2	4	3	4

Source: own compilation based on SPSS output

Table 10 – Distances between Final Cluster Centers

Distances between Final Cluster Centers				
Cluster	1	2	3	4
1		4.628	2.632	2.691
2	4.628		2.314	2.105
3	2.632	2.314		1.502
4	2.691	2.105	1.502	

Source: own compilation based on SPSS output

Table 11 – Number of Cases in each Cluster

Number of Cases in each Cluster		
Cluster	1	56.000
	2	32.000
	3	50.000
	4	85.000
Valid		223.000
Missing		.000

Source: own compilation based on SPSS output

The number of cases belonging to each cluster is summarized in Table 11. According to this, the most populous group is cluster 4 (average interest) with 85 people, while the smallest cluster is group 2, which consists of 32 people. This difference suggests that commitment to medicinal herbs and willingness to spend are not evenly distributed within the population, but follow clearly distinguishable patterns.

The results provide an opportunity not only to typify consumer habits, but also to lay the foundation for targeted health communication and market strategies. Further socio-demographic analysis of the clusters (based on gender, age, place of residence, and educational attainment) also showed significant differences ($p < 0.001$ for all variables), confirming that the clusters differ not only in terms of behavior but also in terms of social background.

- Cluster 1 – Minimally affected: Members of this group use medicinal herbs for a few health problems and have low monthly expenditures. This group is less committed and tends to use herbs occasionally.
- Cluster 2 – Committed intensive users: They are characterized by the greatest diversity of use and high monthly spending. They are the ones who use medicinal herbs for complex health maintenance or treatment purposes.
- Cluster 3 – Balanced users: They use herbs for a variety of problems at a moderate cost. This group follows a conscious but cost-effective strategy.
- Cluster 4 – Average users: They use medicinal herbs for several health purposes, but their monthly spending stabilizes at a higher level. They are regular buyers of the products, but with less widespread use.

The distances between the cluster centers confirm that the groups are well separated, especially between the first and second clusters. The largest cluster is made up of "average users," while the smallest is made up of committed, intensive users.

The clusters were further characterized based on demographic variables. Based on cross-tabulations by gender, age, place of residence, and educational attainment, significant differences were found between the clusters ($p < 0.001$ in all cases). Older men are overrepresented among the members of the first cluster, while the second cluster mainly consists of young people with vocational qualifications. The third cluster had a more balanced gender ratio and was characterized by higher education, while the fourth cluster was the largest, with a high proportion of respondents from the capital and with a high school diploma. These demographic differences confirm that the clusters are clearly distinct not only in terms of attitude but also in terms of social background.

DISCUSSION

Based on the results of the research, it is clear that the use of medicinal herbs in Hungary primarily plays a targeted preventive and symptom-relieving role, especially in areas such as respiratory complaints, digestive disorders, and psychosomatic symptoms. This pattern is consistent with the international literature, which suggests that herbal medicines are playing an increasingly important role in the prevention of lifestyle diseases and the promotion of a health-conscious lifestyle (Rapoliene & Matuleviciute, 2024; Wang & Xiong, 2012).

The positive attitude and high level of confidence of respondents regarding the efficacy and safety of medicinal herbs is consistent with the results of other European studies. The majority of the population has used herbal preparations at least once, especially for mild, non-acute complaints such as allergies, asthma, or sleep-related symptoms (Shergis et al., 2016).

From an economic perspective, the use of herbal medicines goes beyond the individual dimension of health preservation and also has demonstrable effects on the community, employment, and rural development. As Fayiah et al. (2023) point out, organic herbal cultivation and harvesting are important tools for sustainable employment in rural regions.

In terms of legal regulation, Directive 2004/24/EC provides for the marketing of traditional herbal medicines, but actual integration into health systems varies from country to country. The price sensitivity of the respondents and the lack of social security support emerged as limiting factors, as in other European contexts (WHO, 2013).

Respondents obtain information primarily not from health professionals, but through online and personal channels. This supports the educational needs that have long been emphasized in the literature, particularly with regard to the dissemination of reliable information (Silveira, Prieto, & Freitas, 2018).

CONCLUSION

Based on the research, it is clear that the use of medicinal herbs in Hungary is not only a tradition-based practice, but is increasingly becoming a conscious, lifestyle choice. The majority of respondents use herbal medicines to alleviate specific complaints, such as colds, digestive disorders, sleep problems, or stress, which indicates a growing confidence in natural solutions. The possibilities of phytotherapy are manifold. On the one hand, it can serve as a preventive tool that can reduce the use of medication and ease the burden on healthcare systems. On the other hand, it supports the spread of a person-centered, holistic approach to health, as it builds on the active participation and self-care of the individual. Openness to natural therapies is particularly noticeable among younger, urban, and higher-educated groups, which may also influence expectations of healthcare services in the long term. At the same time, there are limitations to the use of medicinal herbs that cannot be ignored. Due to the variability in the quality, composition, and mechanism of action of these products, self-treatment can carry risks, especially in the case of chronic diseases or drug therapy. In addition, the lack of reliable information, varying levels of regulation, and the skepticism of some health professionals can also hinder their integrated use. From an economic perspective, the wider spread of natural remedies is hampered by the fact that herbal preparations are often not covered by health insurance, meaning that the costs are borne entirely by the consumer. This can be particularly disadvantageous for those who would use these products regularly but are in a lower income bracket. Overall, the use of herbal medicines is a complex phenomenon with health, economic, social, and cultural dimensions. The potential it offers—and the risks associated with it—can only be realized if regulation, education, and professional support keep pace with growing interest. In this sense, phytotherapy is not just an alternative path, but a complementary option that, within the right framework, can be an important part of a sustainable healthcare system in the future.

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