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Original Research

An Ethnobotanical Investigation of Medicinal Plants Used by Local Residents of Ilam, Western Iran, for the Treatment of Neck Pain

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Abstract

Iran owns a diverse climate and is home to various tribes, each exhibiting its own cultural approaches and customs in utilizing medicinal plants for the prevention, control, and treatment of diseases. In order to gather valuable ethnobotanical information on medicinal plants, further studies among these tribes are necessary, because with the loss of these people, their historical and empirical knowledge may also be forgotten forever. In this systematic ethnobotanical study conducted in Ilam city (western Iran), an attempt was made to explore and suggest the medicinal plants indigenous to this region, plus their use in treating neck pain. Information associated with traditional treatment of neck pain was collected using an ethnobotanical questionnaire. A full list of herbal pharmacies in Ilam was obtained from the Food and Drug Administration and the required information was collected by the interviewer through in-person visits to each of these pharmacies. The questionnaire included personal information, names of native plants, parts used, method of use, and effects of traditional treatment for neck pain. In this study, 25 participants were included, most of whom were male, aged between 20 and 40 years, and held a bachelor's degree. The majority of participants were also Kurdish speakers. Data analysis shows that 11 medicinal plants belonging to 9 plant families are used in the treatment of neck pain in Ilam. Medicinal plants *Armoracia rusticana* L., *Salix alba* L., *Calendula persica* C.A.Mey., *Quercus brantii* Lindl., *Hypericum helianthemoides* Spach, *Olea europaea* L., *Elaeagnus angustifolia* L., *Ziziphora clinopodioides* Lam., *Viola modesta* Boiss., *Lavandula angustifolia* Mill., *Amygdalus lycioides* Spach are among the plants used in Ilam city in treating neck pain. Based on the results obtained, *Calendula persica* C.A.Mey. was the most cited plant for neck pain (RFC = 0.48); while several species, including *A. rusticana* and *O. europaea*, were less frequently used (RFC = 0.16). The Lamiaceae family is the most commonly used family. Aerial parts were the most commonly used parts with 29% usage and decoction with 36% was the most common traditional method of consumption. The diverse flora of Ilam offers a promising foundation for pharmaceutical researches to explore traditional and herbal remedies and alternative treatments for neck pain.

Keywords: Herbal medicine; Traditional medicine; Neck pain; Ilam; Ethnobotany

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Introduction

The neck serves as a vital connection between the head and the trunk. It is a complex region composed of numerous bones, muscles, nerves, blood vessels, lymphatic structures, and various connective tissues. Damage or dysfunction affecting any of these components can result in neck pain [1]. Neck pain represents a prevalent global health concern, ranking as the fourth leading cause of disability. Its prevalence is increasing worldwide, with significant repercussions for individuals, families, communities, healthcare systems, and businesses. The results revealed that the global burden of neck pain increased from 1990 to 2021, with the highest levels of incidence and disability observed among women and populations in countries with a low Socio-demographic Index (SDI). Moreover, neck pain is generally more common in developed countries than in developing countries and is reported more frequently in urban populations compared to rural ones [2,3].

Neck pain is often classified based on its duration: acute or chronic. Acute neck pain typically lasts less than three months; whereas chronic neck pain persists for a longer period. Although most acute cases resolve within days or weeks, approximately 10% may progress to chronic pain [3,4]. Various factors contribute to neck pain, including trauma, prolonged poor postures (e.g., in the workplace), and inflammation. Psychological factors such as chronic stress, inadequate social support, anxiety, and depression also play significant roles. Biologically, neck pain may arise from neuromusculoskeletal or autoimmune diseases, and demographic characteristics such as older age and female sex may increase risk [5–8]. While most acute episodes are self-limiting, over one-third of patients experience persistent or recurrent low-grade symptoms beyond one year, with genetic and psychosocial factors contributing to this prolonged course [9].

Treatment of acute neck pain often involves pharmacological interventions, including muscle relaxants and nonsteroidal anti-inflammatory drugs (NSAIDs). Due to limited research on chronic neck pain, clinical management frequently relies on studies of other chronic pain conditions, including interventions such as yoga and exercise. Surgery may be considered for selected cases of chronic pain [9-13]. Although conventional medications can provide short-term relief, their long-term use is generally not recommended due to the risk of adverse effects, highlighting the need for alternative approaches [14]. Many patients turn to complementary therapies, such as traditional Chinese medicine and botanical medicine, as potentially safe and effective options for pain management [15,16].

Herbal medicine refers to substances derived from plants with nutritive, therapeutic, or prophylactic properties [17]. Ethnobotanical knowledge is of critical importance for pharmacological research and drug development, serving multiple roles, including direct therapeutic application, providing raw materials for drug synthesis, and serving as a model for active pharmaceutical compounds [18]. Notably, nearly a quarter of contemporary medicinal agents are derived from plant extracts, underscoring the importance of exploring diverse natural environments in the search for new medicinal plants [17-19].

In many developing countries, traditional medicine plays a central role in meeting healthcare needs. For instance, in Africa, 90% of the population relies on traditional healers and herbal medicines; while in India, approximately 70% of the population depends on these practices. Even in China, where modern medicine is widely accessible, traditional approaches account for nearly 40% of healthcare services and are integrated into over 90% of public hospitals [20,21]. Iran, with its rich diversity of medicinal plants, has a long-standing tradition of using natural remedies to manage a broad spectrum of disorders. This knowledge has been carefully preserved and transmitted across generations [22]. Well-known medicinal plants in Iran used for joint pain include turmeric, black pepper, ginger, Cassia, and *Colchicum autumnale* L. (autumn crocus) [23,24].

Ethnomedicine studies how cultures understand and respond to health and illness through traditional medical practices and healing methods, encompassing both the cultural beliefs and their practical application in healthcare [25]. Ilam province, situated within the Zagros Mountains, has a rich history as part of the ancient Elamite civilization. Archaeological sites and inscriptions attest to its antiquity. Known as the "Bride of the Zagros," Ilam features diverse natural attractions and climates, ranging from cool mountainous areas to hot, arid regions that support unique biodiversity. The province comprises ten cities, including Ilam, Ivan, Dareh Shahr, and Abdanan, with the city of Ilam itself nestled among forested mountains. This geographic diversity contributes to the remarkable flora of the region, including over 400 species of medicinal plants, making it an important center for traditional medicine [26].

The aim of this study is a descriptive-analytical and ethnobotanical investigation of therapeutic herbs in Ilam city that are traditionally used to relieve neck pain.

Materials and Methods

Study design and setting

This study was conducted using a cross-sectional ethnobotanical design in Ilam city, Iran, between April and November 2025 of the Iranian calendar. Ilam, the capital and most populous city of Ilam province, had a population of 222,770 according to the 2014 census. The dominant language in this region is Kurdish. Geographically, Ilam city is bordered by Sirvan to the north, Chavar to the northwest, Mehran to the southwest, Malekshahi to the south, and Badra to the east. Ilam province itself shares borders with Kermanshah, Lorestan, and Khuzestan provinces

and has the longest border with Iraq.

Selection of informants

An ethnobotanical survey was carried out in Ilam city to collect information on traditional herbal remedies for neck pain. Data were obtained through individual interviews with local herbalists, whose contact information was provided by the Ilam Food and Drugs Deputy. The interviews were conducted by the researcher using a structured questionnaire, which included demographic information about the herbalists, as well as detailed information for each medicinal plant. This information encompassed the traditional name of the plant, the specific part used, preparation methods, routes of administration, and reported therapeutic effects for neck pain.

Plant authentication

Herbarium specimens were first collected for the medicinal plants identified in the questionnaires, following traditional knowledge reported by the herbalists. Authentication of the plant species was performed at the Biotechnology and Medicinal Plants Research Center, Ilam University of Medical Sciences, Iran. The confirmed names of the herbs were verified and standardized using online databases. To ensure accuracy, the initial traditional data were cross-checked against the confirmed herb names listed in The Plant List database and the *Flora of Ilam* by Dr. Valiollah Mozafarian.

Data analysis method

In this study, key indicators, including the Use Report (UR), Relative Frequency of Citation (RFC), and Informant Consensus Factor (ICF), were employed to evaluate the significance of plant species in local medicinal practices. The UR represents the total number of use reports for each plant, as provided by the informants. The RFC was calculated to determine the relative importance of each plant species in local medicine. Data analysis was performed using SPSS software.

Use report index (UR)

To analyze the data obtained from the interviews and in accordance with the objectives of this study, the UR index was employed. The UR represents the total number of use reports for each plant as reported by the informants.

Relative frequency of citation (RFC)

The quantitative index of RFC was calculated to assess the relative importance of each species in the local medicinal practices of the region. The RFC index was determined using the following formula:

$RFC = FC/ N$

Where FC represents the number of informants who reported the use of a specific plant, and N is the total number of interviewees. The RFC value ranges from 0, when no informants mention the plant, to 1, when all interviewees report the plant as a remedy.

Additionally, the Informant Consensus Factor (ICF) is used to assess the degree of agreement among informants regarding the use of a particular medicinal plant. The ICF is calculated using the following formula:

$ICF = (N - n) / (N - 1)$

In the ICF formula, N represents the total number of plant citations, and n denotes the number of plant species used. These quantitative methods enable researchers to identify the most important plant species for further investigation in reviews and clinical trials. Traditional medicinal data on plants used for neck pain were collected through standardized questionnaires, following guidelines from the *Journal of Ethnopharmacology*. In addition to interviewing herbalists, information was also gathered from other local experts with knowledge of herbal medicine.

Ethical considerations

Ethical approval for this study was obtained from the Ethics Committee of Ilam University of Medical Sciences. All participants were fully informed about the study's objectives and procedures, and written informed consent was obtained from each participant. Participant confidentiality was strictly maintained, and all research activities were conducted in accordance with ethical guidelines.

The research project was conducted at the School of Medicine, Ilam University of Medical Sciences, and all stages were carried out in accordance with ethical research principles following the approval of the ethics code IR.MEDILAM.REC.1401.069. This project was implemented as a thesis/grant, and all procedures including data collection, data analysis, and preparation of the final report were performed in compliance with university regulations and established research standards.

Results

Demographic characteristics, including gender, education level, age, age group, and language, are presented in table 1. Following the analysis of data obtained from the questionnaires; the botanical information of medicinal plants used for treating neck pain in Ilam is summarized in table 2. The abundance of plant families, the percentage of organs used, and the traditional methods of use are illustrated in figures 1 and 2. Based on the results, the Lamiaceae family was the most frequently used plant family (Figure 1). Aerial organs, accounting for 29%, were the most commonly utilized plant parts (Figure 2), and decoction, with 36%, was the predominant traditional method for preparing herbal remedies (Figure 3).

Quantitative methods in the present ethnobotanical study were used to identify the most important medicinal plant species for initiating further pharmacological research. The values of percentage of frequency of use (PFU), UR, and RFC for the recorded plants are presented in table 3.

Among the medicinal plants reported for the treatment of neck pain, *Calendula persica* C.A.Mey. was the most

frequently cited (UR = 12, RFC = 0.48), followed by *Lavandula angustifolia* Mill. (RFC = 0.32). Several species, including *Hypericum helianthemoides* Spach, *Elaeagnus angustifolia* L., and *Amygdalus lycioides* Spach, showed moderate use (RFC = 0.28). Species such as *Armoracia rusticana* L., *Olea europaea* L., and *Ziziphora clinopodioides* Lam. were less frequently mentioned (RFC = 0.16). Overall, these data highlight the key plants traditionally employed for managing neck pain among the local population.

Table 1. Demographic Characteristics of Study Participants

Characteristics	Categories	Frequency (n)	Relative Abundance (%)
Gender	Male	13	52%
	Female	12	48%
Education level	Diploma	5	20%
	Associate degree	2	8%
	Bachelor's degree	15	60%
	Master's degree	3	12%
Age group	20–40 years	17	68%
	41–60 years	8	32%
Age (range)	Minimum	26	—
	Maximum	55	—
Language	Kurdish	15	60%
	Lor	5	20%
	Persian	5	20%

Table 2. Medicinal plants effective on neck pain in Ilam city

Persian Name	Scientific Name	Plant Family	Herbarium Code	Organ Used	Traditional Method of Use
Torob kouhi	*Armoracia rusticana* L.	Brassicaceae	HR524	Leaves, stem	Fresh
Biid	*Salix alba* L.	Salicaceae	HR588	Leaves	Infusion
Hamishe bahar	*Calendula persica* C.A.Mey.	Asteraceae	HR118	Aerial parts	Infusion
Balut	*Quercus brantii* Lindl.	Fagaceae	HR269	Fruit	Decoction, fresh fruit
Gole raei zagrosi	*Hypericum helianthemoides* Spach	Hypericaceae	HR326	Leaves, flowers	Decoction
Zeytoon	*Olea europaea* L.	Oleaceae	HR427	Fruit, oil	Poultice, fresh fruit
Senjed	*Elaeagnus angustifolia* L.	Elaeagnaceae	HR259	Fruit	Infusion, fresh fruit
Kakouty kouhi	*Ziziphora clinopodioides* Lam.	Lamiaceae	HR383	Aerial parts	Decoction
Banafshe foroutan	*Viola modesta* Boiss.	Violaceae	HR670	Flowers	Infusion, decoction
Ustukhuddus	*Lavandula angustifolia* Mill.	Lamiaceae	HR010	Aerial parts	Decoction
Tangers	*Amygdalus lycioides* Spach	Rosaceae	HR561	Aerial parts	Poultice

Table 3. PFU, RFC, UR of studied plants

Plant Name	Percentage of frequency of use (%PFU(	Number of respondents mentioning the plant (UR)	Relative frequency of citation (RFC)
Armoracia rusticana L.	19.2	4	0.16
Salix alba L.	57.6	5	0.20
Calendula persica C.A.Mey.	42.3	12	0.48
Quercus brantii Lindl.	34.6	6	0.24
Hypericum helianthemoides Spach	15.3	7	0.28
Olea europaea L.	19.2	4	0.16
Elaeagnus angustifolia L.	15.3	7	0.28
Ziziphora clinopodioides Lam.	19.2	4	0.16
Viola modesta Boiss.	57.6	5	0.20
Lavandula angustifolia Mill.	26.9	8	0.32
Amygdalus lycioides Spach	15.3	7	0.28

Abbreviations: PFU: Percentage of frequency of use, **UR**: Number of respondents mentioning the plant, **RFC**: Relative frequency of citation, calculated using, **RFC = UR / N** (where N = 25)

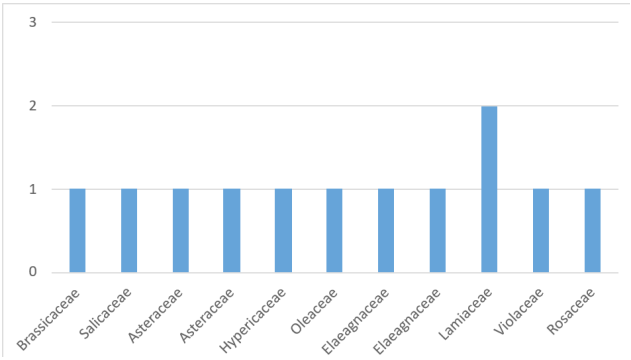

Figure 1. Distribution of plant families affecting neck pain in Ilam

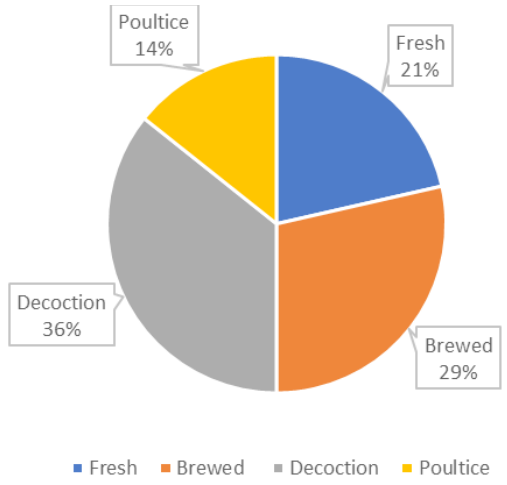

Figure 2. Percentage of use of plant organs effective on neck pain in Ilam

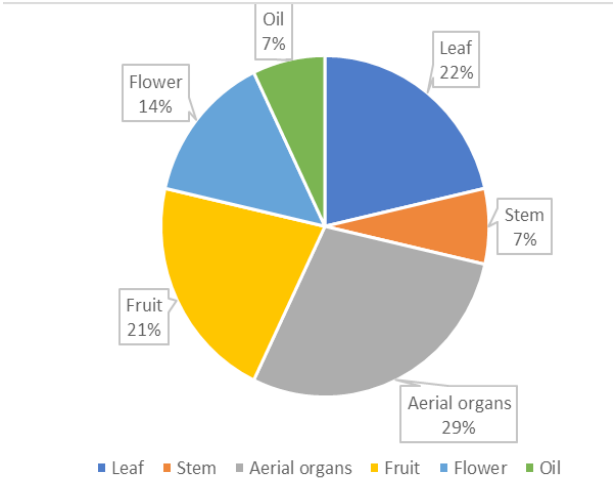

Figure 3. The percentage of the method of use of plant parts effective on neck pain in Ilam

Additional information regarding the plant families effective for treating neck pain is presented in figure 1. Some species were mentioned by every interviewee, indicating their widespread traditional use. According to our results, *Ziziphora capitata*, *Crocus haussknechtii*, *Medicago polymorpha* L., *Thymbra spicata* L., *Solanum nigrum* L., *Curcuma longa* L., and *Datura innoxia* Mill. are among the most commonly used plants for the treatment of neck pain.

Discussion

In many parts of the world, particularly in regions with large populations, traditional medicine has experienced a resurgence in popularity, largely due to its accessibility and affordability. This aligns with the World Health Organization's (WHO) recommendation to integrate Complementary and Alternative Medicine (CAM) with evidence-based pharmaceuticals to achieve the "Health for All" program. However, despite increased awareness of certain herbal plants over the past two decades, herbal medicine remains poorly understood by both the general public and medical practitioners [27-29].

Ethnobotany is the study of human interactions with plants within their cultural environments. Humans have historically relied on plants for survival, and this dependence has fostered a deep fascination with plant diversity. Knowledge of medicinal plants, refined over generations through trial and error, forms a vital part of every community's heritage [30,31]. Traditional Persian Medicine (TPM) is among the most ancient forms of traditional medicine, widely recognized through the manuscripts of Avicenna and Rhazes [32].

Iran's unique topography and diverse climate have resulted in a remarkable variety of plant life, with 8,167 recorded vascular species. This botanical richness is complemented by a long-standing tradition of using plants for medicinal purposes [33]. A study by Ahmadi et al. demonstrated a significant increase in the use of traditional plant medicine among the Iranian adult population, rising from 11.1% in 2005 to 23.5% in 2011 [34]. The herbal remedies used by local communities in Ilam for neck pain reflect the region's diverse flora, as revealed by this study. This observation corroborates previous research, such as Wirth et al.'s 2005 review, which documented 24 herbal pain therapies across 34 studies [35].

In a 2016 publication, Thawkar highlighted the therapeutic potential of *Mentha arvensis* L. (Japanese Mint) for treating rheumatic pain, arthritis, and inflamed joints [36]. Safa et al. (2013) recorded 150 plant species belonging to 53 families that were effective in treating painful disorders, gastrointestinal issues, and dermatological diseases in Hormozgan, Iran [37]. A 2012 study by Mosaddegh et al. explored the flora of Kohgiluyeh and Boyer-Ahmad provinces in Iran and identified Asteraceae and Lamiaceae as the most prominent plant families in the region [38]. *Armoracia rusticana* has demonstrated efficacy in treat-

ing bronchitis in a 2023 clinical trial. While its antioxidant activity is established, the underlying mechanisms require further investigation. In Ilam, our results show that its leaves and stems are traditionally used to relieve neck pain [39, 40]. *Salix alba* (white willow) has been utilized for an extended period for various ailments, including chronic and acute inflammation, infections, and fever. Similar to the aerial parts of *Calendula persica*, the leaves of *Salix alba* are used for pain relief [41,42].

In a 2018 trial, Moshfeghy et al. reported that *Quercus brantii* exhibited antifungal effects comparable to clotrimazole cream against *Candida* infections [43]. *Hypericum helianthemoides* is a traditional medicinal plant in Khorasan, Iran, valued for its antimicrobial properties, and its chemical composition was reported by Motavalizadehkakhky in 2012 [44].

Our research also investigated the potential of *Olea europaea* leaves and fruit for neck pain relief. This plant has demonstrated promising activity in other health conditions, including cholesterol and blood sugar management, as well as antibacterial, neuroprotective, antioxidant, anti-inflammatory, and hypotensive effects [45]. *Elaeagnus angustifolia* fruit contains various bioactive compounds, including flavonoids, alkaloids, minerals, and vitamins, which may contribute to its traditional use in Iranian folk medicine as an analgesic, antipyretic, diuretic, and pain reliever [46].

In 2023, Hongbing Liu et al. confirmed that flavonoids from *Ziziphora clinopodioides* enhance atherosclerosis regulation by modulating oxidative stress, lipid metabolism, and inflammatory responses through the actions of cynaroside, linarin, kaempferide, acacetin, genkwanin, chrysin, and apiin [47]. Additionally, Firoozeei et al. demonstrated a significant reduction in depression scores following the use of lavender (*Lavandula angustifolia*) [48].

Conclusion

This study demonstrated that Ilam province is a region with diverse plant flora, providing a valuable basis for the expanded medicinal use of local herbs to develop potentially therapeutic products for the treatment of neck pain. The results highlight the richness of herbal medicine flora and ethnobotanical knowledge in Ilam, as well as the substantial potential for sourcing raw materials from medicinal plants in this region. It is essential to manage, preserve, and disseminate this knowledge while conducting phytochemical and pharmacological investigations on species with high use value to facilitate the development of effective natural medicines. Considering the extensive knowledge and experience of local communities regarding the surrounding plant resources, further research focusing on the systematic documentation of ethnobotanical knowledge, as well as preclinical and clinical evaluation and industrial application, is strongly recommended.

Conflict of Interests

None.

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