



RESEARCH ARTICLE

# Exploration of traditional ethno-gynaecological knowledge: advances to ethnobotanical studies from indigenous communities of Neelum Valley in the Himalayan Region

Muhammad Manzoor<sup>1</sup>, Mushtaq Ahmad<sup>1\*</sup>, Muhammad Zafar<sup>1</sup>, Syed Waseem Gillani<sup>2\*</sup>, Ghulam Mujtaba Shah<sup>2\*</sup>, Hamayun Shaheen<sup>3</sup>, Wajid Zaman<sup>4</sup>, Shazia Sultana<sup>5</sup>, Shaista Jabeen<sup>1</sup> & Khaydarova Khilola Khishlatovna<sup>6</sup>

<sup>1</sup>Department of Plant Sciences, Quaid-i-Azam University, Islamabad 45320, Pakistan

<sup>2</sup>Department of Botany, Hazara University, Mansehra 21120, Pakistan

<sup>3</sup>Department of Botany, University of Azad Jammu & Kashmir, Muzafarabad 13100, Pakistan

<sup>4</sup>Department of Life Sciences, Yeungnam University 38541, South Korea

<sup>5</sup>College of Life Sciences, Neijiang Normal University Sichuan 641100, China

<sup>6</sup>Department of Sociology, National University of Uzbekistan, Tashkent 100174, Uzbekistan

\*Email: [mushtaq@qau.edu.pk](mailto:mushtaq@qau.edu.pk), [sgillani@bs.qau.edu.pk](mailto:sgillani@bs.qau.edu.pk), [gmujtabashah@hu.edu.pk](mailto:gmujtabashah@hu.edu.pk)



## ARTICLE HISTORY

Received: 08 January 2024

Accepted: 28 March 2024

Available online

Version 1.0 : 16 April 2024

Version 2.0 : 23 April 2024



## Additional information

**Peer review:** Publisher thanks Sectional Editor and the other anonymous reviewers for their contribution to the peer review of this work.

**Reprints & permissions information** is available at [https://horizonepublishing.com/journals/index.php/PST/open\\_access\\_policy](https://horizonepublishing.com/journals/index.php/PST/open_access_policy)

**Publisher's Note:** Horizon e-Publishing Group remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

**Indexing:** Plant Science Today, published by Horizon e-Publishing Group, is covered by Scopus, Web of Science, BIOSIS Previews, Clarivate Analytics, NAAS, UGC Care, etc See [https://horizonepublishing.com/journals/index.php/PST/indexing\\_abstracting](https://horizonepublishing.com/journals/index.php/PST/indexing_abstracting)

**Copyright:** © The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited (<https://creativecommons.org/licenses/by/4.0/>)

## CITE THIS ARTICLE

Manzoor M, Ahmad M, Zafar M, Gillani SW, Shah GM, Shaheen H, Zaman W, Sultana S, Jabeen S, Khishlatovna KK. Exploration of traditional ethno-gynaecological knowledge: advances to ethnobotanical studies from indigenous communities of Neelum valley in the Himalayan region. *Plant Science Today*. 2024; 11(sp1): 77-86.  
<https://doi.org/10.14719/pst.3264>

## Abstract

The indigenous communities of the Kashmir region are exclusively dependent on medicinal plants for the treatment of various gynecological disorders. Due to the remoteness and unavailability of modern medications, indigenous communities still use traditional healthcare practices to cure various diseases related to women. The specific objective of this study is to document the traditional ethno-gynecological knowledge in Neelum Valley. Field visits were conducted from April to November 2023 to gather data on medicinal plants used for gynecological problems. Both questionnaires and group discussions were used to collect the data. The gathered data was analyzed using a variety of quantitative metrics, such as use value (UV), and relative frequency citation (RFC). A total of 45 plant species belonging to 22 families were collected from the study area. Herbs made up the majority of the medicinal plants employed by indigenous populations (91.1%), whereas leaves, the most often used plant part, contributed 22.22%. Among medicinal plants, *Geranium wallichianum* had the highest use value (1.41), whereas *Arnebia benthamii* had the highest relative frequency citation (0.80). This study emphasizes how important it is to preserve traditional knowledge, pointing out that younger people are losing understanding due to a lack of interest. The documentation of traditional ethno-gynecological knowledge is crucial for the preservation, discovery of novel medications, and sustainable conservation of vulnerable medicinal flora.

## Keywords

diversity; Ethnobotany; indigenous communities; Kashmir; medicinal plants

## Introduction

Ethnobotany offers a traditional approach to addressing health issues related to women. Medicinal herbs are used to treat women's health issues such as abortion, menstruation, menopause, leucorrhoea, infertility, and delivery problems (1). It has been reported that problems with sexual and reproductive health account for 18% of the total worldwide burden of disease (2). During pregnancy, women frequently seek out herbal medicines and cures, believing that they are safe. However, some plants can be dangerous due to their ability to induce abortion and stimulate

menstruation. Although natural herbal remedies are often believed to be safe when used during pregnancy, there is recognition that these remedies may have negative impacts that could be harmful to both the foetus and the pregnant woman (3). Menstrual problems are generally not regarded as serious health issues by global health organizations. However, these health conditions can greatly disrupt women's daily lives, emphasizing the importance of safe and effective treatments. Because they have limited access to modern medications, women frequently turn to traditional treatments in various parts of the world, including Latin America, Africa, and Asia (4).

Numerous ethnic groups have reported the use of herbal remedies to treat healthcare issues related to women (5, 6). Indigenous ethnic communities are known for their rich traditional and cultural legacy, but they also tend to have lower levels of empowerment (7). Traditional knowledge is still used in these ethnic groups' healthcare practices to address a variety of health conditions, including gynecological problems (8). Indigenous communities use unique practices for preparing and treating different illnesses that are frequently passed down through the centuries (9-11). During pregnancy, herbal remedies are used to prepare the uterus and cervix for birth, reduce pain, and strengthen the myometrium (12). However, it is critical to document and undertake pharmacological studies on these natural medications to ensure their safe use (13). Women consider herbs as dependable friends throughout their lives because of their therapeutic properties and few adverse effects. Herbal remedies have always been a favorite among women, and this trend is still expanding (14).

In Pakistan, women from rural communities frequently experience gynecological disorders as a result of inadequate lifestyles, an improper diet, and significant physical activity, even when pregnant (15). Women's health is vital and more complicated than it would first seem (16). Across the world, using herbal remedies to promote a safe pregnancy and ease childbirth is a common practice (17). Women in remote regions frequently experience financial and academic challenges, which leads to a dependence on traditional plant-based cures for a variety of health problems due to restricted access to contemporary healthcare facilities (18). Even though there are healthcare facilities nearby, the native people's poverty frequently makes it difficult for them to pay for the allopathic drugs that doctors prescribe. As a result, traditional medicine is used by rural women to maintain their health during pregnancy. They prefer traditional midwives and replace herbal remedies with synthetic ones at home (19).

However, the indigenous communities of AJK possess significant knowledge regarding gynecological problems. The Neelum Valley is a remote area with diverse ethnic communities residing in the mountainous region and dependent on these herbal remedies for the treatment of various ailments. This region is unexplored in the context of gynecological disorders, while various studies have been done that are limited to the documentation of general ethnobotanical uses. Due to the availability of

modern medications, this traditional ethno-gynecological knowledge is declining and may become extinct in the future. So, there is a need to document this traditional ethno-gynecological knowledge for future generations as well as for the discovery of new drugs. Considering the abovementioned problems, the current study was designed to document the traditional knowledge of medicinal plants used for gynecological disorders and conserve the medicinal plants as well as traditional knowledge for future generations.

## Materials and Methods

### Study Area

Azad Jammu and Kashmir (AJK) is located in the northwest of Pakistan in the Pir-Panjal Subrange of the Western Himalayan Mountains. It covers 13,297 square kilometers overall, spanning longitudes 73° and 73° north and latitudes 33° and 36° east (20, 21). The current field survey was conducted in the 10 villages present in the high-altitude mountainous region of Kashmir, western Himalayas (Fig. 1). The topography is undulating, with deep ravines, uneven ground, and high mountains dominating the area (22, 23). The research region has severe winter weather from November to April, with record-low temperatures, heavy snowfall, and freezing temperatures as low as -10 °C. The summer months of June to August are comparatively long and chilly, with an average temperature of about 10 °C. The area receives about 1000 mm of precipitation annually, most of which falls as snow in the winter (21, 24).

### Data Collection

Ethnobotanical data was acquired throughout 10 villages in the Neelum Valley by using a questionnaire and group discussion (Appendix 1). A preliminary analysis was followed by the selection of a group of people and the collection of data regarding their interests and proficiency with plant identification and use. 103 informants were interviewed; most of them were older than forty. There were 19 local herbalists, 76 women, and 8 males among the respondents (Table 1). All participants were provided with a comprehensive explanation of the research's aims and objectives before the collection of ethnomedicinal data to ensure their cooperation and permission in compliance with the International Society of Ethnobiology Codes of Ethics (ISE 2006). To facilitate contact with the participants, the discussions were conducted in the native languages of the area (Hindko, Pharai, Gojri).

### Plant Collection & Identification

Several field visits were made for the collection of traditional ethno-gynecological knowledge from different villages of Neelum Valley between April to November 2023. All collected plant specimens were processed according to conventional protocols, which included pressing, drying, and adhering to the standard herbarium sheet. All collected plant species were identified using available literature (25) and online sources ([www.floraofpakistan.com](http://www.floraofpakistan.com)). Each medicinal plant name was validated by using the online source ([www.worldfloraonline.com](http://www.worldfloraonline.com)).

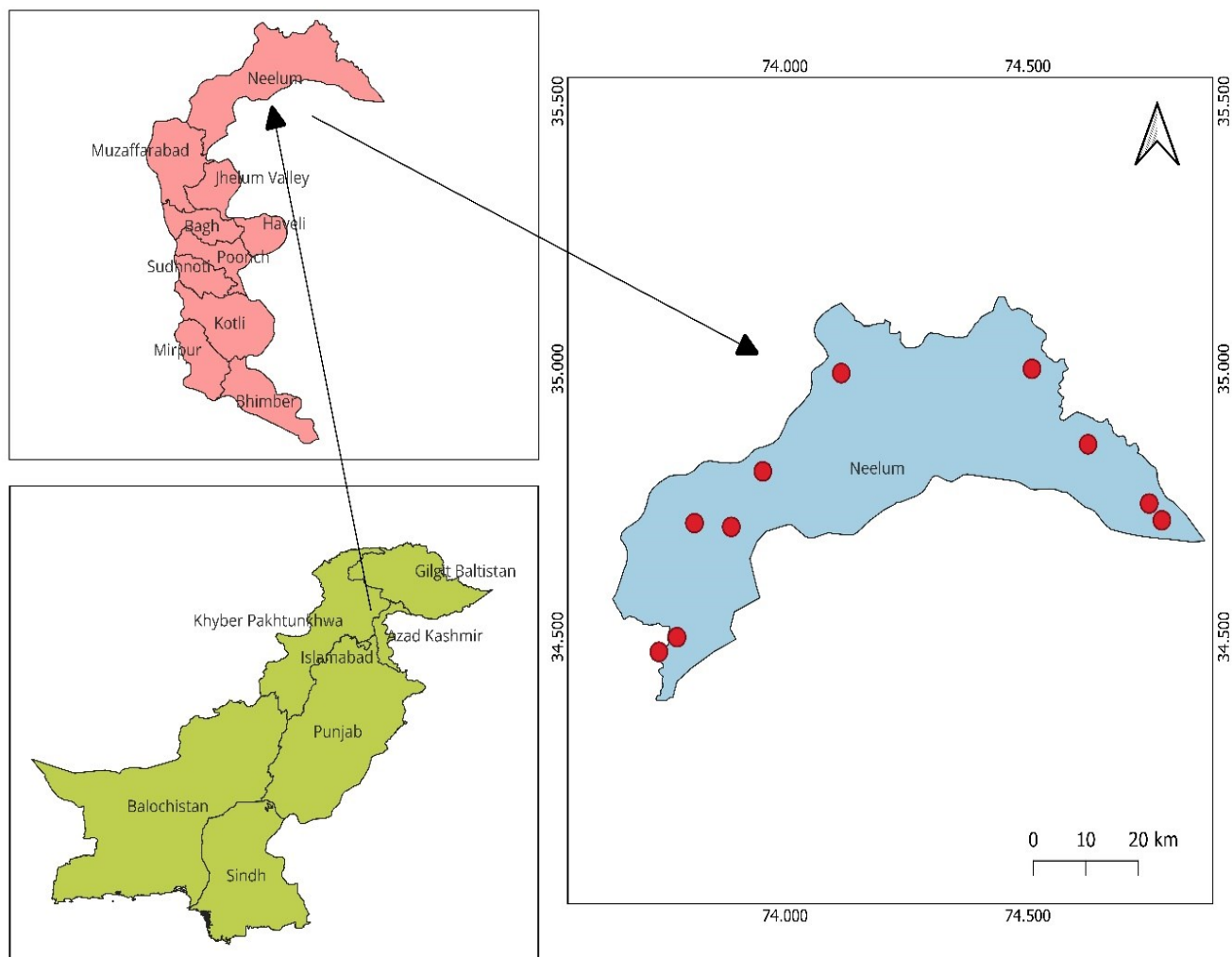


Fig. 1. Map of Study area in Kashmir and location of sampling sites.

Table 1. Demographic information of informants from the study area.

Demographic Information	Informants	Percentage
<b>Gender</b>		
Men	12	11.65%
Women	91	88.34%
<b>Informants Category</b>		
Indigenous people	84	81.55%
Local Herbalists	19	18.44%
<b>Informants age group</b>		
Between 25-35	07	6.79%
Between 36-45	13	12.62%
Between 45-60	49	47.57%
> 65 years	34	33.00%
<b>Informants' education level</b>		
Intermediate or above	05	4.85%
Middle Level	07	6.79%
Primary Level	12	11.65%
Illiterate	79	76.69%

## Data Analysis

### Use Value

The use value (UV) is an important metric for defining the relative importance of species (26). The following formula can be used to calculate the UV:

$$UV = \sum U_i / N$$

Where N is the total number of informants, and  $U_i$  is the total number of uses reported by an informant for a given species.

### Relative Frequency Citation

The significance of relative frequency citation (RFC) was used to assess ethnobotanical information. By taking into account the frequency citation (FC), which is calculated by dividing the total number of informants (N) in the ethnobotanical survey, this measure highlights the importance of local plant species (27). The higher value of RFC indicated the significance of the species. The following formula can be used to calculate the RFC:

$$RFC = FC / N$$

### Family Use Value

To describe the most important plant families in the study area, the family use value (FUV) was calculated using the use values of the species following the Prance et al. (51) formula.

$$FUV = \sum UV_s / N_s$$

Where UVs represent the use values of species present in the specific family and  $N_s$  represent the total number of species present in that family during the study.

## Results and Discussion

### Demographic Description of Informants

The survey was carried out in local languages with 103 informants. Of these, 19 (18.44%) were local herbalists, 76 (73.78%) were females, and 8 (7.76%) were males (Table 1). The majority of female respondents were illiterate due to the remoteness of the area and the faraway education center. During field visits, women, especially those of older age, were targeted to document ethno-gynecological knowledge, which is well aware of the usage of medicinal plants for gynecological disorders. During the field survey, it was observed that young generations are losing understanding of traditional knowledge due to a lack of interest. Due to the unavailability of modern healthcare facilities and severe environmental conditions, local communities frequently use herbal remedies for the cure of various gynecological disorders (28). The settlements of local communities are close to nature, and they have better experience with the utilization of natural resources (10, 29, 30).

### Medicinal Plant Diversity

The medicinal plant diversity, families, used parts, ailments, habits, and modes of administration are presented in Table 2. The ethnobotanical plant survey explored 45 plant species belonging to 43 genera and 22 families. Herbs (91.1%) were recorded as the most dominant medicinal plants utilized for the cure of ethno-gynecological disorders, followed by shrubs (6.7%) and trees (2.2%) (Fig. 2). Asteraceae was recorded as the predominant family in the study area, contributing 24.88%, followed by Lamiaceae (8.89%), Apiaceae, Boraginaceae, and Polygonaceae (6.67%), respectively (Fig. 3). Indigenous communities frequently use herbs because they find it easy to crush them and use them for a variety of medicinal purposes. The abovementioned families, like Asteraceae, Lamiaceae, Apiaceae, Boraginaceae, and Polygonaceae, were reported by many

researchers' predominant families from the western Himalayas (31-34). These families contain a significant amount of bioactive compounds that are used for the cure of various diseases (35). Numerous studies in ethnobotany are consistent with our results (36-38).

### Preparation of Herbal Remedies

Herbal remedy preparation involves different parts of medicinal plants, such as leaves, aerial parts, whole plants, flowers, rhizomes, roots, bark, seeds, and fruits. Leaves were the most utilized part for the preparation of herbal remedies, contributing 22.22%, followed by aerial parts (14.81%), whole plant (12.96%), roots (12.96%), flower (11.11%), rhizome (9.26%), fruit (7.26%), seeds (7.26%), and bark (1.85%) (Fig. 4). Decoction (36.21%) is the most frequently used mode of preparation for the cure of gynecological disorders, followed by powder (25.86%), cooked (17.24%), infusion (8.62%), raw (6.90%), crushed (3.45%), and juice (1.72%) (Fig. 5). The indigenous communities of Kashmir, who live close to forests and high meadows, harvest leaves from their surroundings with ease to make herbal treatments. Some leaves of medicinal plants are dried in the air and used, especially in the winter when there is a lot of snow on the ground. As a result, these indigenous communities make good use of these ingredients to treat gynecological conditions at any time of year. Because medicinal plant leaves contain a variety of bioactive substances called alkaloids, which have the potential to be medications that treat gynecological problems, they are widely used in traditional healthcare around the world (39, 40). A decoction is extensively used in indigenous communities since it is simple to crush and prepare, to prevent gynecological problems. The recommended dosage of herbal remedies for expecting women depends on the degree of seriousness and duration of the condition (41, 42). Similar findings were also reported by some researchers across the globe (38, 43, 44).

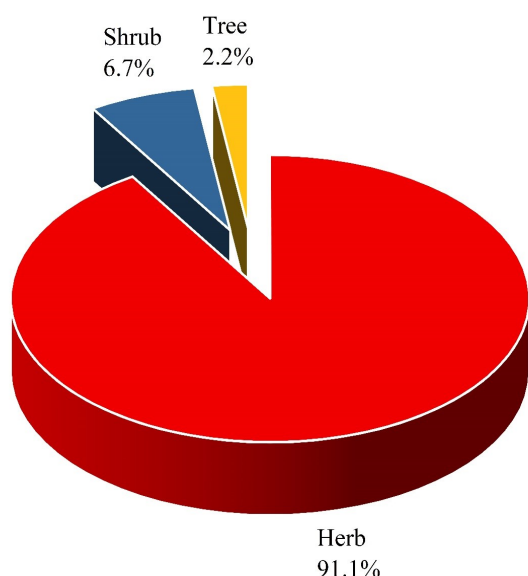


Fig. 2. Classification of Medicinal flora based on plant habit.

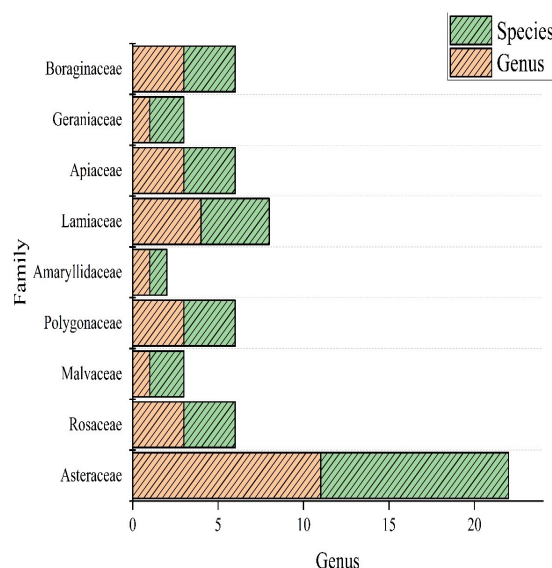


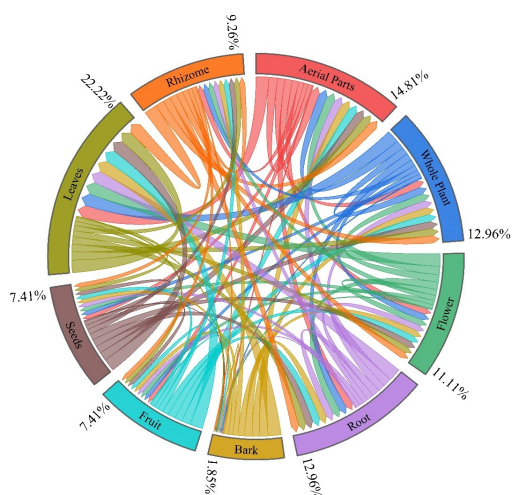
Fig. 3. Proportion of species and genera of medicinal flora.

**Table 2.** Medicinal plant diversity, Families, Habit, Used part, and Mode of administration.

Sr. No.	Plant Name	Voucher No.	Habit	Part Used	Remedies Preparation	Ailments Treated	UV	RFC	FUV
<b>Amaranthaceae</b>									
1	<i>Amaranthus viridis</i> L.	EGN-3219	Herb	Se, Lf	Coo	Labor pain, Weakness	0.98	0.43	0.98
<b>Amaryllidaceae</b>									
2	<i>Allium humile</i> Kunth	EGN-3220	Herb	Rh	Cok, Dec	Urinary tract infection, Urination Pain	0.7	0.69	0.7
<b>Apiaceae</b>									
3	<i>Heracleum candicans</i> Wall. ex DC.	EGN-3245	Herb	Rt	Pow	Regulate Menstrual cycle	0.54	0.42	
4	<i>Bupleurum falcatum</i> L.	EGN-3242	Herb	Wp	Dec	Regulate the Menses	0.31	0.11	0.37
5	<i>Foeniculum vulgare</i> Mill.	EGN-3225	Herb	Fr, Lf	Coo, Dec	Enhance Lactation, Menstrual Cycle, Vomiting, Headache	1.11	0.34	
<b>Asparagaceae</b>									
6	<i>Polygonatum verticillatum</i> (L.) All.	EGN-3248	Herb	Lf, Rt	Pow, Dec	Urinary tract infection	0.31	0.14	0.31
<b>Asteraceae</b>									
7	<i>Achillea millefolium</i> L.	EGN-3224	Herb	Rt, Lf	Pow	Leucorrhea, Menstrual pain	0.63	0.7	
8	<i>Artemisia absinthium</i> L.	EGN-3217	Herb	Wp	Dec	Control Bleeding after Childbirth, Vaginal pain	0.34	0.34	
9	<i>Cirsium arvense</i> (L.) Scop.	EGN-3232	Herb	Se	Dec, Pow	Menstrual Disorder	0.47	0.25	
10	<i>Ligularia jacquemontiana</i> (Decne.) M.A.Rau	EGN-3229	Herb	Rt	Pow	Labour pain	0.32	0.04	
11	<i>Matricaria chamomilla</i> L.	EGN-3214	Herb	Fl	Inf	Control Bleeding after Childbirth, Vaginal pain	0.47	0.33	
12	<i>Sonchus arvensis</i> L.	EGN-3254	Herb	Lf	Coo	Weakness after delivery	0.23	0.15	0.02
13	<i>Saussurea costus</i> (Falc.) Lipsch.	EGN-3236	Herb	Rh	Pow, Coo	Backache	1.31	0.65	
14	<i>Calendula arvensis</i> L.	EGN-3241	Herb	Fl	Inf, Pow	Pain during menstruation, Irregular menstrual cycles	0.56	0.12	
15	<i>Cichorium intybus</i> L.	EGN-3239	Herb	Fl, Se	Cru, Dec	Control Bleeding after Childbirth, Labour Pain	0.25	0.41	
16	<i>Dolomiaea macrocephala</i> DC. ex Royle	EGN-3226	Herb	Rh	Pow	Backache, Labour Pain	0.28	0.36	
17	<i>Taraxacum officinale</i> F.H.Wigg.	EGN-3255	Herb	Lf	Inf	Breast problems	0.18	0.25	
<b>Berberidaceae</b>									
18	<i>Berberis jaeschkeana</i> Schneider	EGN-3244	Shrub	Rt, Fr	Pow, Coo	Labour pain, Backache	0.76	0.7	0.76
<b>Betulaceae</b>									
19	<i>Betula utilis</i> D.Don	EGN-3243	Tree	Br	Raw	Weakness, Backache	0.41	0.32	0.41
<b>Boraginaceae</b>									
20	<i>Arnebia benthamii</i> (Wall. ex G.Don) I.M.Johnst.	EGN-3218	Herb	Ap	Dec	Urinary tract infection, Enhance Lactation, Control Bleeding after Childbirth, Labour pain	1.2	0.8	
21	<i>Cynoglossum wallichii</i> G.Don	EGN-3230	Herb	Ap	Dec	Body Weakness, Backache	0.36	0.09	0.08
22	<i>Lindelofia longiflora</i> Baill.	EGN-3233	Herb	Rt, Fl	Dec	Backache, Labour Pain	0.24	0.11	
<b>Caprifoliaceae</b>									
23	<i>Dipsacus inermis</i> Wall.	EGN-3227	Herb	Ap	Dec	Enhance Lactation, Menstrual Cycle	0.3	0.04	0.3

<b>Dioscoreaceae</b>									
24	<i>Dioscorea deltoidea</i> Wall. ex Griseb.	EGN-3228	Herb	Lf	Dec	Urine Infection,	0.51	0.42	0.51
<b>Fabaceae</b>									
25	<i>Lotus corniculatus</i> L.	EGN-3238	Herb	Wp	Pow	Backache, Urinary tract problem	0.33	0.16	0.33
<b>Geraniaceae</b>									
26	<i>Geranium himalayense</i> Klotzsch	EGN-3247	Herb	Rh	Coo, Pow	Regulate Menstrual cycle, Labour pain, Leucorrhoea	1.27	0.78	0.705
27	<i>Geranium wallichianum</i> D.Don	EGN-3246	Herb	Rh	Coo, Pow	Regulate Menstrual cycle, Labour pain, Leucorrhoea	1.41	0.79	
<b>Lamiaceae</b>									
28	<i>Nepeta cataria</i> L.	EGN-3234	Herb	Wp	Inf	Headache and vomiting during pregnancy	0.07	0.13	0.33
29	<i>Ajuga integrifolia</i> Buch. - Ham.	EGN-3221	Herb	Wp	Dec	Vomiting, Sever Headache	1.09	0.48	
30	<i>Origanum vulgare</i> L.	EGN-3251	Herb	Se	Cru, Coo	Labour pain, Backache	0.62	0.4	
31	<i>Thymus linearis</i> Benth.	EGN-3256	Herb	Ap	Pow	Swelling of feet and lower legs	1.33	0.69	
<b>Malvaceae</b>									
32	<i>Malva sylvestris</i> L.	EGN-3215	Herb	Ap	Coo, Dec	Urinary Infection	0.4	0.03	0.25
33	<i>Malva parviflora</i> L.	EGN-3237	Herb	Fl	Dec	Weakness, Vaginal Pain	0.5	0.23	
<b>Papaveraceae</b>									
34	<i>Meconopsis aculeata</i> Royle	EGN-3235	Herb	Ap	Dec	Weakness, Improve Health after delivery	0.92	0.3	0.92
<b>Phytolaccaceae</b>									
35	<i>Phytolacca acinosa</i> Roxb.	EGN-3253	Herb	Fr	Raw	Breast problems	0.21	0.08	0.21
<b>Plantaginaceae</b>									
36	<i>Plantago major</i> L.	EGN-3213	Herb	Lf	Inf	Backache, Control excessive bleeding during menses	0.26	0.13	0.26
<b>Polygonaceae</b>									
37	<i>Aconogonum alpinum</i> (All.) Schur	EGN-3223	Herb	Ap, Rt	Raw	Leucorrhoea	0.14	0.21	0.03
38	<i>Polygonum aviculare</i> L.	EGN-3249	Herb	Lf	Dec	Swelling of feet and lower legs	0.46	0.18	
39	<i>Persicaria alpina</i> Gross.	EGN-3252	Herb	Ap	Dec	Weakness after delivery	0.09	0.05	
<b>Pteridaceae</b>									
40	<i>Adiantum capillus-veneris</i> L.	EGN-3222	Herb	Wp	Dec	Body Weakness, Pain relief	0.61	0.11	0.61
<b>Ranunculaceae</b>									
41	<i>Caltha palustris</i> L.	EGN-3240	Herb	Lf	Pow, Coo	Menstrual Disorder	0.4	0.08	0.4
<b>Rosaceae</b>									
42	<i>Fragaria nubicola</i> Lindl. ex Lacaïta	EGN-3216	Herb	Fr, Lf	Dec, Raw	Control Bleeding during pregnancy, Backache	0.56	0.46	0.04
43	<i>Cotoneaster roseus</i> Edgew.	EGN-3231	Shrub	Lf	Jui	Control Bleeding after Childbirth, Urinary tract infection	0.5	0.14	
44	<i>Rosa sempervirens</i> L.	EGN-3250	Shrub	Fl	Dec	Regulate Menstrual cycle	0.13	0.02	
<b>Urticaceae</b>									
45	<i>Urtica dioica</i> L.	EGN-3257	Herb	Wp	Pow	Menstrual problems, Leukorrhoea	0.06	0.04	0.06

**Abbreviations:** Ap = Aerial Parts, Wp = Whole Plant, Fl = Flower, Lf = Leaves, Rt, Root, Se = Seeds, Rh = Rhizome, Fr = Fruit, Br = Bark, Dec = Decoction, Inf = Infusion, Coo = Cooked, Pow = Powder, Ext = Extract, Cru = Crushed, Jui = Juice, UV = Use Value, RFC = Relative Frequency Citation, FUV = Family Use Value.



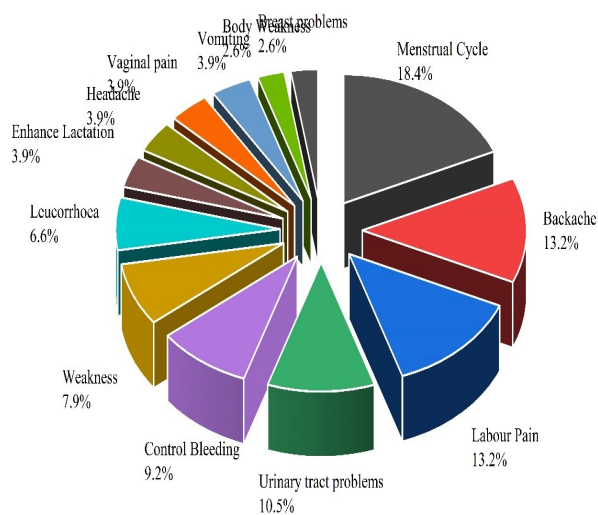
**Fig. 4.** Percentage of used plant parts for the cure of numerous gynecological disorders.

### Treated gynecological disorders

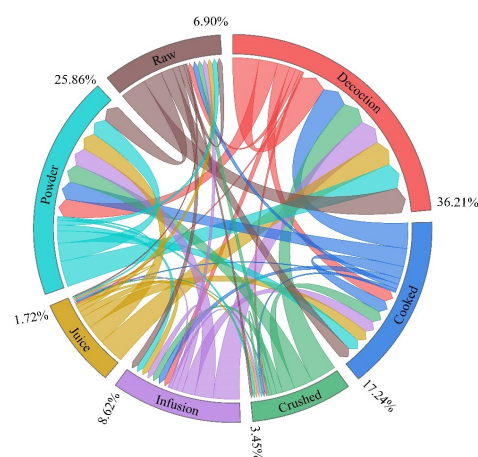
In terms of the most commonly treated gynecological disorders with herbal treatments, the results revealed that the majority of informants use plants to treat the menstrual cycle (18.42%), followed by backache (13.16%), labor pain (13.16%), urinary tract problems (10.53%), control bleeding (9.21%), weakness (7.89%), leucorrhoea (6.58%), and enhance lactation (3.94%). Other disorders accounted for less than 3% of treated gynecological disorders (Fig. 6).

### Use Value

Use value is very crucial for the identification of the most valuable medicinal plants used in the investigated area. The use value of medicinal plants ranges from 0.06 to 1.41 (Table 2). The highest UV was calculated for *Geranium wallichianum* (1.41), followed by *Thymus linearis* (1.33), *Saussurea costus* (1.31), *Geranium himalayense* (1.27), *Arnebia benthamii* (1.20), *Foeniculum vulgare* (1.11), and *Ajuga integrifolia* (1.09). In terms of use value linked to medicinal plant families, the highest value was calculated for the Amaranthaceae family (0.98), followed by Papaveraceae (0.92), Berberidaceae (0.76), and



**Fig. 6.** Representation of the percentages of the most treated disorders among informants.



**Fig. 5.** Percentage distribution remedies preparation.

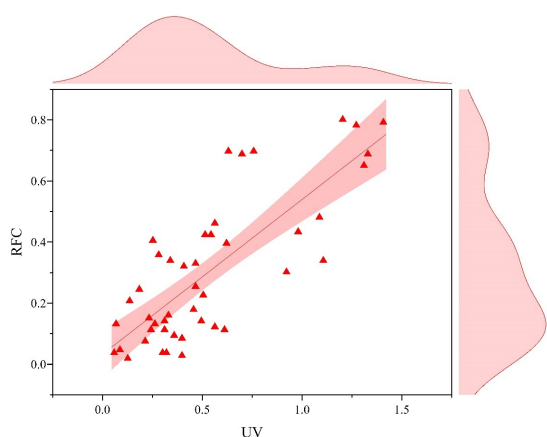
Geraniaceae (0.70) (Table 2). The higher use value indicates multiple uses of medicinal plants as well as the dependency and reliance of local communities on medicinal plants for the treatment of numerous diseases (35). The widespread consumption of medicinal plants in this region emphasizes the significance of prioritizing their preservation (45). Medicinal plants with higher use value are vulnerable in the region and need sustainable management and conservation by involving community-based initiatives (10, 21).

### Relative Frequency Citation

Relative frequency citation is a quantitative method used in ethnobotany to measure the importance of a species in treating various diseases, as stated by informants (46). The RFC value ranges from 0.80 to 0.02 (Table 2). The highest RFC value was calculated for *Arnebia benthamii* (0.80), followed by *Geranium wallichianum* (0.79), *Geranium himalayense* (0.78), *Achillea millefolium* (0.70), *Allium humile* (0.69), and *Thymus linearis* (0.69). Locals are familiar with a range of high-RFC plant species that are common in the area, mostly because they have been used for a long time in traditional medicine. These plants could be useful for commercial authentication as well as medication discovery (10, 47). The higher relative frequency of citations highlights the potential of medicinal plants for the treatment of gynecological diseases, which also pose a serious threat to medicinal plants, as well as this valuable traditional knowledge (30, 48). Understanding the importance of these often-used species in the region is essential for their preservation, and carrying out a comprehensive vulnerability analysis can aid in their preservation (37, 49).

### Pearson Correlation Analysis

The Pearson correlation statistical technique was employed on the quantitative metrics, such as RFC and UV. The statistical analysis result revealed that both variables (RFC and UV) showed a positive relationship (Fig. 7). Based on the significant level of the coefficient ( $P = 0.790$ ), the citations of a species might account for the variation in its usage value. This shows that the current study has made a significant contribution to the documentation of traditional ethno-gynecological knowledge about medicinal herbs (32, 50).



**Fig. 7.** Correlation between UV and RFC.

### Advances in Ethno-gynaecological studies

The emerging field of ethno-gynecological knowledge has experienced a notable upsurge in recent decades, concerning advances in ethnobotanical studies. This interaction has revealed an incredible amount of information about indigenous communities' knowledge and traditional ethnomedicinal practices concerning women's health. With increased research into ethnobotanical resources, the field of ethno-gynecology, which emphasizes traditional practices related to women's diseases, has made considerable progress. Indigenous communities in mountainous regions across the globe have traditionally used herbal remedies to cure a variety of gynecological problems, and the growing field of ethnobotanical study has given this traditional knowledge a systematic understanding. Globally, ethnobiologists can bridge the knowledge gap between ethno-gynaecology and ethnobotany through multidisciplinary collaborations, providing valuable insight into the complex interactions of medicinal plant diversity, traditional practices, and women's health. It is possible to establish innovative therapeutic methods based on traditional practices through the use of this integrative approach, which also helps to preserve traditional ethno-gynecological knowledge. The growing integration of ethno-gynecology and ethnobotanical research gives a comprehensive viewpoint that enhances our understanding of women's health in a variety of cultural contexts and creates the groundwork for future advances in medical science.

The current findings highlight the valuable medicinal plants utilized by the local community for the treatment of gynecological disorders. Due to the remoteness of the study area, local populations still used traditional healthcare systems to cure various diseases related to women. Among the reported therapeutic plants, local communities frequently used herbs extensively, with decoctions and leaves being the most prevalent types of cures and plant parts used. *Arnebia benthamii*, *Geranium wallichianum*, *Thymus linearis*, and *Saussurea costus* are the most significant medicinal plants in the study area based on quantitative ethnobotanical metrics. Community-based initiatives are suggested to conserve the vulnerable medicinal plants of the region.

### Conclusion

This study provides the first detailed exploration of traditional ethno-gynecological knowledge from the Western Himalayan mountainous regions of Kashmir. The region contains diverse medicinal plants and traditional ethno-gynecological knowledge, which play a crucial role in the treatment of gynecological disorders among local communities. This study highlights the significance of traditional knowledge as well as dwindling knowledge among the younger generation due to a lack of interest. The documentation of traditional ethno-gynecological knowledge is crucial for the preservation, discovery of novel medications, and sustainable conservation of vulnerable medicinal flora.

### Acknowledgements

The author is highly thankful to the local communities of Neelum Valley for sharing valuable knowledge and cooperation during field visits.

### Authors' contributions

MM and SWG carried out the field study, and herbarium preparation, participated in the data typing, and drafted the manuscript. HS, GMS, and SS edited and reviewed the manuscript. SJ, KKK, and WZ data curation and data analysis. MA and MZ conceptualized and supervised the study.

### Compliance with ethical standards

**Conflict of interest:** Authors do not have any conflict of interest to declare.

**Ethical issues:** None.

### References

1. Ciebiera M, Esfandyari S, Sibli H, Prince L, Elkafas H, Wojtyta C, Al-Hendy A, Ali M. Nutrition in Gynecological Diseases: Current Perspectives. *Nutrients* 2021; 13, 1178.
2. Kaingu CK, Oduma JA, Kanui TI. Practices of traditional birth attendants in Machakos District, Kenya. *J Ethnopharmacol.* 2011;137:495-502. <https://doi.org/10.1016/j.jep.2011.05.044>.
3. Tariq A, Adnan M, Iqbal A, Sadia S, Fan Y, Nazar A, Mussarat S, Ahmad M, Olatunji O, Begum S. Ethnopharmacology and toxicology of Pakistani medicinal plants used to treat gynecological complaints and sexually transmitted infections. *S Afr J Bot.* 2018;114:132-49. <https://doi.org/10.1016/j.sajb.2017.11.004>.
4. Van Andel T, de Boer HJ, Barnes J, Vandebroek I. Medicinal plants used for menstrual disorders in Latin America, the Caribbean, sub-Saharan Africa, South and Southeast Asia and their uterine properties: A review. *J Ethnopharmacol.* 2014;155:992-1000. <https://doi.org/10.1016/j.jep.2014.06.049>.
5. Wang L, Nanakorn W. Food and medicinal plants used for childbirth among Yunnanese Chinese in Northern Thailand. 2003.
6. Jain A, Katewa S, Chaudhary B, Galav P. Folk herbal medicines used in birth control and sexual diseases by tribals of southern Rajasthan, India. *J Ethnopharmacol.* 2004;90:171-7. <https://doi.org/10.1016/j.jep.2004.06.004>.



- [doi.org/10.1016/j.jep.2003.09.041](https://doi.org/10.1016/j.jep.2003.09.041).
7. Thresia C. Health inequalities in South Asia at the launch of sustainable development goals: Exclusions in health in Kerala, India need political interventions. *Int J Health Serv.* 2018;48:57-80. <https://doi.org/10.1177/0020731417738>.
  8. Shukla G, Bhat JA, Chakravarty S. Species richness and folk therapeutic uses of ethnomedicinal plants in West Bengal, India –A meta-analysis. *Phytomedicine Plus.* 2022;2:100158. <https://doi.org/10.1016/j.phyplu.2021.100158>.
  9. Lawal I, Amao A, Lawal K, Alamu O, Sowunmi I. Phytotherapy approach for the treatment of gynaecological disorder among women in Ido Local Government Area of Ibadan, Oyo State, Nigeria. *J. Adv Sci Res.* 2013;4:41-4.
  10. Manzoor M, Ahmad M, Zafar M, Gillani SW, Shaheen H, Pieroni A, Al-Ghamdi AA, Elshikh MS, Saqib S, Makhkamov T. The local medicinal plant knowledge in Kashmir Western Himalaya: a way to foster ecological transition via community-centered health-seeking strategies. *J Ethnobot Ethnomed.* 2023;19:56. <https://doi.org/10.1186/s13002-023-00631-2>.
  11. Patel P, Patel M. Ethnogaecological uses of plants from Gujarat, India. *Ban J Plant Tax.* 2012;19:93.
  12. Tournaire M, Theau-Yonneau A. Complementary and alternative approaches to pain relief during labor. *Evid Based Complement Alternat Med.* 2007;4:409-17. <https://doi.org/10.1093/ecam/nem012>.
  13. Ahmed M, Hwang JH, Hasan MA, Han D. Herbal medicine use by pregnant women in Bangladesh: a cross-sectional study. *BMC Complement Altern Med.* 2018;18:1-9. <https://doi.org/10.1186/s12906-018-2399-y>.
  14. Overk CR, Yao P, Chen S, Deng S, Imai A, Main M, Schinkovitz A, Farnsworth NR, Pauli GF, Bolton JL. High-content screening and mechanism-based evaluation of estrogenic botanical extracts. *Comb Chem High Throughput Screen.* 2008;11:283-93.
  15. Tareen RB, Bibi T, Khan MA, Ahmad M, Zafar M, Hina S. Indigenous knowledge of folk medicine by the women of Kalat and Khuzdar regions of Balochistan, Pakistan. *Pak J Bot.* 2010;42:1465-85.
  16. Cohen S. Promoting sexual and reproductive health advances maternal health. *Guttmacher Policy Rev.* 2009;12:8-12.
  17. Van der Kooi R, Theobald S. Traditional medicine in late pregnancy and labour: perceptions of Kgaba remedies amongst the Tswana in South Africa. *Afri J Trad Compand Altern Med.* 2006;3:11-22.
  18. Qureshi RA, Ghufuran MA, Gilani SA, Yousaf Z, Abbas G, Batool A. Indigenous medicinal plants used by local women in southern Himalayan regions of Pakistan. *Pak J Bot.* 2009;41:19-25.
  19. Randrianarivony T, Randrianasolo A, Andriamihajarivo T, Ramarosandratana AV, Jeannoda VH, Rakotoarivony F, Bussmann RW. Useful plants and tradition for pregnancy, child delivery and for post-partum care used by people living around Analavelona forest in South west Madagascar. 2016;15:66-78.
  20. Alam NM, Shaheen H, Manzoor M, Tinghong T, Arfan M, Idrees M. Spatial Distribution and Population Structure of Himalayan Fir (*Abies pindrow* (Royle ex D. Don) Royle) in Moist Temperate Forests of the Kashmir Region. *Forests.* 2023;14:482. <https://doi.org/10.3390/f14030482>.
  21. Rana VS, Sharma S, Rana N, Kumar V, Sharma U, Modgill V, Prasad H. Underutilized fruit crops in North-Western Himalayan region under changing climatic scenario. *Gene Res Crop Evo.* 2023;70(1):37-69.
  22. Shaheen H, Aziz S, Dar M. Ecosystem services and structure of western Himalayan temperate forests stands in Neelum valley, Pakistan. *Pak J Bot.* 2017;49:707-14.
  23. Khan S, Shaheen H, Aziz S, Nasar S. Diversity and distribution of Genus *Primula* in Kashmir region: an indicator genus of the western Himalayan mountain wetlands and glacial forelands. *Biodivers Conserv.* 2021;30:1673-88. <https://doi.org/10.1007/s10531-021-02163-1>.
  24. Pak-Met. The normals of climatic data of Azad Jammu & Kashmir. Pakistan Meteorological Department, Regional Centre Muzaffarabad, Pakistan; 2018. Available from: <https://www.pmd.gov.pk/en>.
  25. Ali H, Qaiser M. Flora of Pakistan. Islamabad, Karachi. *J Med Plants Res.* 1993-2007;191-215.
  26. Phillips O, Gentry AH, Reynel C, Wilkin P, Gálvez-Durand B C. Quantitative ethnobotany and Amazonian conservation. *Conserv Biol.* 1994;8:225-48.
  27. Albuquerque UP, Lucena RF, Monteiro JM, Florentino AT, Cecília de Fátima C. Evaluating two quantitative ethnobotanical techniques. *Ethnobot Res Appl.* 2006;4:051-60.
  28. Jan M, Mir TA, Jan HA, Bussmann RW, Aneaus S. Ethnomedicinal study of plants utilized in pregnancy, childbirth and postpartum healthcare in Kashmir Himalaya. *J Herb Med.* 2023;42:100767. <https://doi.org/10.1016/j.hermed.2023.100767>.
  29. Sharma PK, Chauhan N, Lal B. Observations on the traditional phytotherapy among the inhabitants of Parvati valley in western Himalaya, India. *J Ethnopharmacol.* 2004;92:167-76. <https://doi.org/10.1016/j.jep.2003.12.018>.
  30. Gillani SW, Ahmad M, Zafar M, Haq SM, Waheed M, Manzoor M, Shaheen H, Sultana S, Rehman FU, Makhkamov T. An Insight into Indigenous Ethnobotanical Knowledge of Medicinal and Aromatic Plants from Kashmir Himalayan Region. *Ethnobot Res Appl.* 2024;28:1-21.
  31. Shaheen H, Awan SN, Aziz S. Distribution pattern, conservation status, and associated flora of the genus *Juniperus* in subalpine pastures of the Kashmir Himalayas. *Mount Res Develop.* 2017;37:487-93.
  32. Awan AA, Akhtar T, Ahmed MJ, Murtaza G. Quantitative ethnobotany of medicinal plants uses in the Jhelum valley, Azad Kashmir, Pakistan. *Acta Ecol Sin.* 2021;41:88-96. <https://doi.org/10.1016/j.chnaes.2020.09.002>.
  33. Ahmed MJ, Murtaza G, Shaheen H, Habib T. Distribution pattern and associated flora of *Jurinea dolomiaea* in the western Himalayan highlands of Kashmir: an indicator endemic plant of alpine phytodiversity. *Ecol Indic.* 2020;116:106461. <https://doi.org/10.1016/j.ecolind.2020.106461>.
  34. Khan S, Shaheen H, Mehmood A, Nasar S, Khan T. Ethnobotanical and antibacterial study of *Primula* plants traditionally used in the indigenous communities of Western Himalaya, Pakistan. *Saudi J Biol Sci.* 2022;29:3244-54.
  35. Kayani S, Ahmad M, Zafar M, Sultana S, Khan MPZ, Ashraf MA, Hussain J, Yaseen G. Ethnobotanical uses of medicinal plants for respiratory disorders among the inhabitants of Gallies-Abbottabad, Northern Pakistan. *J Ethnopharmacol.* 2014;156:47-60. <https://doi.org/10.1016/j.jep.2014.08.005>.
  36. Mirzaman Z, Kayani S, Manzoor M, Jameel MA, Waheed M, Gillani SW, Babar CM, Bussmann RW. Ethnobotanical study of Makra Hills district Muzaffarabad, Azad Jammu and Kashmir, Pakistan. *Ethnobot ResAppl.* 2023;26:1-17.
  37. Manzoor M, Ahmad M, Zafar M, Haq SM, Shaheen H, Waheed M, Gillani SW, Sultana S, Makhkamov T. Unveiling the Indigenous Ethnomedicinal knowledge of Genus *Nepeta* from Division Muzaffarabad, Azad Jammu & Kashmir, Pakistan. *Ethnobot Res Appl.* 2023;26:1-15.
  38. Ahmed MJ, Akhtar T. Indigenous knowledge of the use of medicinal plants in Bheri, Muzaffarabad, Azad Kashmir, Pakistan. *Europ J Integ Med.* 2016;8:560-9. <https://doi.org/10.1016/j.eujim.2016.01.006>.
  39. Haq SM, Yaqoob U, Calixto ES, Rahman IU, Hashem A, Abd\_Allah

- EF, Alakeel MA, Alqarawi AA, Abdalla M, Hassan M. Plant resources utilization among different ethnic groups of Ladakh in Trans-Himalayan Region. *Biology*. 2021;10:827.
40. Kayani S, Ahmad M, Gillani SW, Manzoor M, Rehman FU, Jabeen S, Butt MA, Babar CM, Shah SAH. Ethnomedicinal appraisal of the medicinal flora among the sub-alpine and alpine Indigenous communities of Palas Valley Kohistan, Northern Pakistan. *Ethnobot Res Appl*. 2024;28:1-29.
41. Aziz MA, Adnan M, Khan AH, Shahat AA, Al-Said MS, Ullah R. Traditional uses of medicinal plants practiced by the indigenous communities at Mohmand Agency, FATA, Pakistan. *J Ethnobiol Ethnomed*. 2018;14:1-16. <https://doi.org/10.1186/s13002-017-0204-5>.
42. Jan M, Mir TA, Jan HA, Khare RK. Medicinal plants diversity and their uses for Gynecological Disorders of District Baramulla, Jammu and Kashmir, India. *Vegetos*. 2022;35:438-52.
43. Tayjanov K, Khojimatov O, Gafforov Y, Makhkamov T, Normakhamatov N, Bussmann RW. Plants and fungi in the ethnomedicine of the medieval East - a review. *Ethnobot Res Appl*. 2021;22:1-20.
44. Boboiev S, Makhkamov T, Bussmann RW, Zafar M, Yuldashev A. Anatomical and phytochemical studies and ethnomedicinal uses of *Colchicum autumnale* L. *Ethnobot Res Appl*. 2023;25:1-9.
45. Umair M, Altaf M, Abbasi AM. An ethnobotanical survey of indigenous medicinal plants in Hafizabad district, Punjab-Pakistan. *PLoS One*. 2017;12:e0177912.
46. Hussain S, Hamid A, Ahmad KS, Mehmood A, Nawaz F, Ahmed H. Quantitative ethnopharmacological profiling of medicinal shrubs used by indigenous communities of Rawalakot, District Poonch, Azad Jammu and Kashmir, Pakistan. *Revist Brasil Farmacog*. 2019;29:665-76.
47. Ahmad KS, Hamid A, Nawaz F, Hameed M, Ahmad F, Deng J, Akhtar N, Wazarat A, Mahroof S. Ethnopharmacological studies of indigenous plants in Kel village, Neelum valley, Azad Kashmir, Pakistan. *J Ethnobiol Ethnomed*. 2017;13:1-16. <https://doi.org/10.1186/s13002-017-0196-1>.
48. Mukherjee PK, Nema NK, Venkatesh P, Debnath PK. Changing scenario for promotion and development of Ayurveda-way forward. *J Ethnopharmacol*. 2012;143:424-34. <https://doi.org/10.1016/j.jep.2012.07.036>.
49. Vitalini S, Iriti M, Puricelli C, Ciuchi D, Segale A, Fico G. Traditional knowledge on medicinal and food plants used in Val San Giacomo (Sondrio, Italy)—An alpine ethnobotanical study. *J Ethnopharmacol*. 2013;145:517-29. <https://doi.org/10.1016/j.jep.2012.11.024>.
50. Bano A, Ahmad M, Zafar M, Sultana S, Rashid S, Khan MA. Ethnomedicinal knowledge of the most commonly used plants from Deosai Plateau, Western Himalayas, Gilgit Baltistan, Pakistan. *J Ethnopharmacol*. 2014;155:1046-52. <https://doi.org/10.1016/j.jep.2014.05.045>.
51. Prance GT, Balee W, Boom BM, Carneiro RL. Quantitative ethnobotany and the case for conservation in Amazonia. *Conserv Biol*. 1987;1:296-310.