# Ethnobotanical applications of medicinal plants of family Asteraceae in Allah Wali Lake Gutumsar, District Astore, Gilgit-Baltistan, Pakistan

Salim Khadim, Sujjad Hyder, Arshad Ali Shedayi, Tehseen Zuhra, Hasnain Abbas

**Correspondence**

**Salim Khadim[1]*, Sujjad Hyder[2], Arshad Ali Shedayi[1], Tehseen Zuhra[2]*, Hasnain Abbas[1]**
[1]Karakoram International University, Department of Plant Sciences, Gilgit, Pakistan
[2]Karakoram International University, Department of Environmental Sciences, Gilgit, Pakistan
[3]Karakoram International University, Department of Animal Sciences, Gilgit, Pakistan

*Corresponding Author: salim.edu.pk@gmail.com , tehseensalim2020@gmail.com

**Ethnobotany Research and Applications 29:16 (2024)** - http://dx.doi.org/10.32859/era.29.16.1-17
Manuscript received: 30/03/2024 – Revised manuscript received: 05/06/2024 - Published: 06/06/2024

## Research

## Abstract

*Background*: The current research was conducted in Allah Wali Lake Gutumsar district Astore, Pakistan. The research aims to document the local indigenous knowledge for effective treatments of diverse ailments from the family Asteraceae.

*Methods*: During the fieldwork in the study site, ethnobotanical data was collected through free listings and interviews involving 63 local key informants. To measure the cultural significance of collected flora, we employed indices; Relative Frequency Citation, Use Value, Fidelity Level, Informant Consensus Factor Index and Pearson's correlation coefficient.

*Results*: 13 medicinal plant species from the Asteraceae family in the region are documented, which belong to 10 genera and were utilized for diverse ailment treatments. In the habit, herbs (92%) were dominant, among the plant parts, aerial part (46%) were prevalently used in traditional medicine. Traditional practices heavily rely on decoctions (56%) to address issues such as digestive problems, fever, cold, and cough. *Taraxacum officinale* stands out with the highest RFC (0.889), UV (0.952), FL (100%), and ICF for dermatitis, diuretic, dysentery, and fever (1), highlighting its prevalence and significance in the region. The relationship between RFC and UV shows, strong correlation coefficient r (0.675*) with p value is less than 0.05 (< 0.011), whereas the (r2) value of (0.427).

*Conclusions*: The locals of the study area depend on medicinal plants for healthcare, highlighting rich indigenous knowledge. This research commences the recording of indigenous knowledge, endorsing responsible resource management. Subsequent studies seek to unveil biodiversity, sustainable use of medicinal plants, and conservation management in the region.

*Keywords*: Allah Wali Lake, Asteraceae, Ethnobotany, Indigenous knowledge, Medicinal plants

## Background

The term "Ethnobotany" was introduced by John W. Harsberger in 1896 (Khadim *et al.* 2024). Ethnobotany is the exploration of how local people utilize plant species in their daily routines, covering areas like nutrition, herbal medicine, customs, and public interactions. (Usman *et al.* 2022, Jan *et al.* 2020, Shah *et al.* 2023). Globally, traditional folk medicine draws from an extensive pool of 35,000 to 70,000 plant species, emphasizing the broad faith in natural medications (Noor *et al.* 2012). Such widespread usage underscores the significant role of herbaceous flora treatment in different cultural routines worldwide (Mir *et al.* 2022). The study area remains unexplored, emphasizing the importance of documenting indigenous knowledge concerning Asteraceae species for future reference.

Approximately 6,000 flowering plants thrive in Pakistan, with an important 2,000 species holding specific significance in indigenous traditions (Khadim *et al.* 2024). In the beginning of 1950s, traditional medicine was the choice for health remedies for around 84% of Pakistanis, and this percentage may have decreased slightly since then (Goodman and Ghafoor 2011). Pointing out a significant gap in documenting Pakistan's herbaceous diversity, from 5,700 plant species, only 400-600 are officially recognized for their medicinal properties (Ikramullah *et al.* 2007). The Himalaya, Karakoram, and Hindu Kush mountains have 25,000 plant species, with 10% being economically or medicinally valuable. This underscores the importance of these mountains in preserving nature. In the Himalayas, 70-80% of locals use traditional plant medicines, with 70% coming from the natural habitat (Khadim *et al.* 2024, Bano *et al.* 2014).

Gilgit-Baltistan's diverse ethnicities and historical links to various civilizations contribute to its rich heritage of traditional medicine (Caroe and Biddulph 1972). The region, shaped by its connections with neighboring Chinese regions, boasts a rich biodiversity with about 300 therapeutic and aromatic plant species (Wali *et al.* 2022, Bano *et al.* 2014, Khan *et al.* 2011) Since the British era, Astore Valley has been known for hub of medicinal plants in Gilgit-Baltistan, remaining a center for these valuable resources (Noor *et al.* 2014*,* Shinwari and Gilani 2003). The Deosai plateau in Astore and Skardu, detailed in the Flora of Pakistan, lists 342 plant species. Yet, there is a gap in literature concerning the medicinal uses of these plants (Bano *et al.* 2014).

Gilgit-Baltistan's medicinal plants are endangered by anthropogenic activities, soil destruction, natural disasters, and fluctuation of climate, threatening their well-being (Arshad *et al.* 2014*,* Arshad 2012). The importance of medicinal plants to human health is undeniable, as roughly 75% of pharmaceuticals derived from plants originate from indigenous sources, impacting both local communities and the global pharmaceutical landscape (Zareef *et al.* 2023). Indigenous communities' plant knowledge not only enriches science but also plays a vital role in conserving diverse species (Pradhan *et al.* 2020, Kunwar & Bussmann. 2008, Leduc *et al.* 2006, Gemedo-Dalle *et al.* 2005). Ethnobotanical studies are crucial for preserving unique traditions and preventing the permanent loss of valuable cultural knowledge. (Khadim *et al.* 2024, Kunwar & Bussmann 2008).

The Asteraceae (Compositae) family stands as the most diverse vascular plant family globally, comprising 1600 to 1700 genera and 24,000 to 30,000 species (Hanif, 2012). Many unique medicinal plants from this plant family are utilized in traditional medicine practices across the globe (Jan *et al.* 2021a, Jan *et al.* 2021b), reflecting a long-standing human tradition of utilizing plants for healing (Jan *et al.* 2022, Pradhan *et al.* 2020).

The Asteraceae family takes precedence in Gilgit Baltistan for traditional remedies, as indicated by research findings. Its dominance is observed across various regions: Astore with 19 species (Noor *et al.* 2012), Gilgit-Baltistan with 30 species (Salim *et al.* 2019), 10 species (Arshad 2012), Maruk Nallah and Haramosh Valley with 21 species (Abbas *et al.* 2019), Skardu valley 7 species (Bano *et al.* 2014) and Humza-Nagar with 9 species (Hyder *et al.* 2013). The study area is yet to be explored, underscoring the crucial need to record indigenous knowledge related to Asteraceae species for future reference.

The locals of the study area face very hard challenges in the sense of health sector, due to such limited resources to handle health issues, native people rely on herbal medications. They have deep knowledge about herbal treatments and for this, the study aims to explore the area’s challenges regarding health issues and document the ethnomedicinal values of family Asteraceae species and their indigenous knowledge about treatments for different diseases.

## Materials and Methods

### Study area

The research area "Allah Wali Lake Gutumsar" is located between 35° 24.00' N latitude and 75° 01.00' E longitude. The elevation ranges from 2800 m to 5000 m. The study area is depicted in (Figure 1). The Allah Wali Lake located at Gutumsar is very famous for tourism. Some pictorial views of the study area and medicinal plants are shown in (Figure 2). The native people of this region mainly depend on agriculture and natural resources. They aggregate wheat, barley, potato, and many vegetables. They keep different animals like yaks, sheep, goats. The health facilities are non-existent, far away from this village about one and half hour on foot with unpaved road, a small dispensary exist which covers three villages that is not enough advance to handle serious health issues. This health limitation favors the use of herbal medication by native people (Khadim *et al.* 2024).

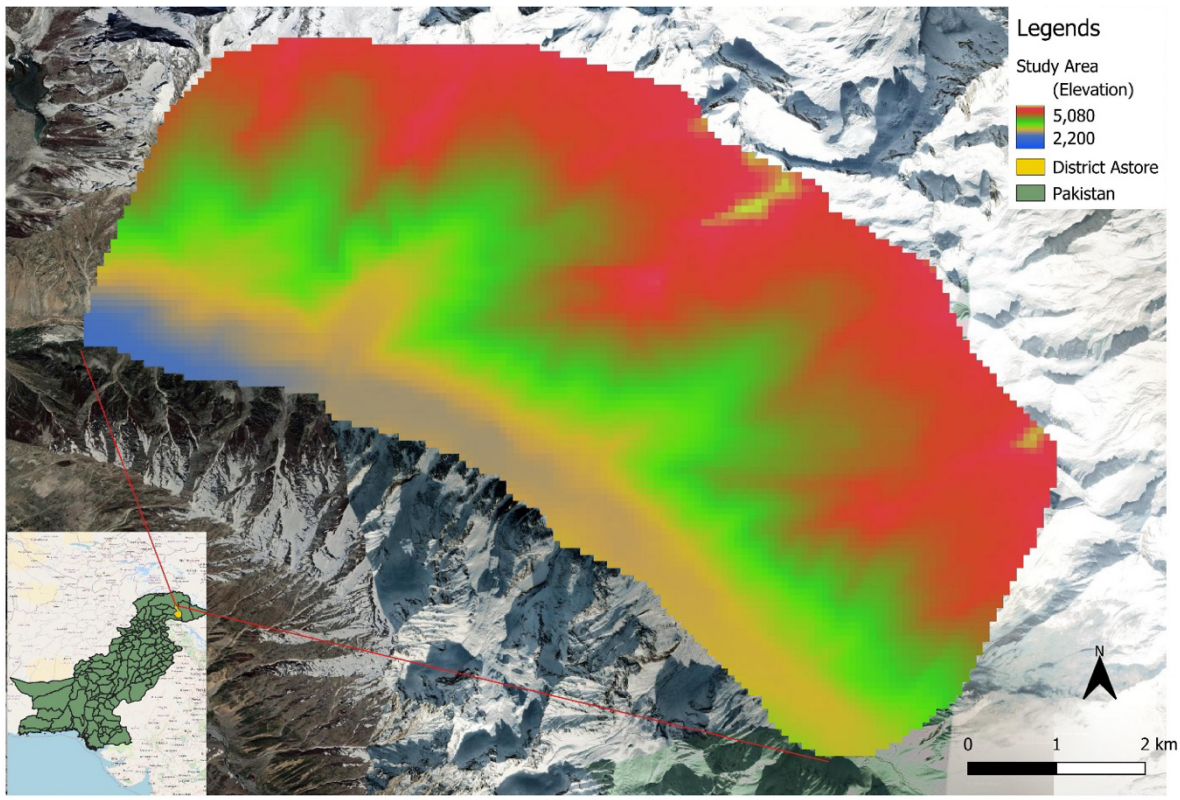


Figure 1. Map of the study area

### Field investigations and information collection

We planned field visits in the years 2022 to 2023 to collect plant specimens. During the field, we thoroughly collected plant specimens from diverse places within the selected site. Images were accurately taken during specimen collection. The collected plant specimens were correctly pressed with presser, dried with drier and then fixed on standard herbarium sheets 11.5" × 17.5" (Ahmad *et al.* 2017). For the identification and its authentication, we used the Flora of Pakistan https://www.tropicos.org/Project/Pakistan (Ali & Qaiser 1986), taxonomic literature available literature, compared with the herbarium at Karakoram International University Gilgit (KIU), Pakistan. Identification was done by all the above-mentioned methods, all information relating to plant specimens was noted on labels attached to the herbarium sheets. Identified specimens were kept at KIU Herbarium, Department of Plant Sciences for upcoming investigations.

Study area

Allah Wali Lake

*Artemisia santolinifolia*

*Taraxacum officinale*

*Cousinia thomsonii*

Study site

During Field visit

Housing during field visit

Figure 2. Pictorial views of study area, medicinal plants and field visited sites.

**Gathering ethnomedicinal information**

For the collection of ethnomedicinal information we employed open and semi-structured questionnaires, field investigations, field interviews, respondent comments, and conducted field walks (Khadim *et al.* 2024, Wali *et al.* 2022, Cavendish 2012). On the field, we met with 63 native people, including 41 males and 22 females, revealing the intensity of their indigenous knowledge. We carefully them selected through the intriguing snowball method.

The current research followed moral guidelines and acquired prior consent from participants. We obtained explicit consent from respondents and elders, collecting data on medicinal plants through interviews, focusing on local names, treatments, and preparation methods.

***Data Analysis***

The collected quantitative data was statistically calculated, employing essential indices such as Relative Frequency of Citation, Use Value, Fidelity Level, Informant Consensus Factor and Pearsons correlation coefficient.

***Relative Frequency of Citations***

The quantitative data was calculated through Relative Frequency of Citations (RFC) to assess the significance of collected plant species cited by participants (Khadim *et al.* 2024, Ali *et al*. 2023).

$$RFC = FC/N$$

(0 < RFC < 1) It demonstrates the significance of every species and is computed by considering the (FC) Frequency of Citation, which denotes the number of respondents citing the usage of a specific species, while 'N' signifies the total sum of respondents (Khoja *et al.* 2024, Shah *et al.* 2023, Pradhan *et al.* 2020).

***Use Value***

Use value is a measure that computes both the primary and secondary traditional use values of a species within a particular cultural context (Khadim *et al.* 2024, Bhat *et al.* 2012). The Use Value is employed to express the comparative significance of every plant in the practices of native communities. The use value ranges from zero to a positive value, this metric signifies greater use value with its higher importance and lower use values indicates lower importance of that species (Khadim *et al.* 2024, Zhou *et al.* 2023). Following the formula:

$$UV = \Sigma Ui / N$$

'ΣUi' represents the total sum of usage reports from every single informant, with 'N' indicating the total number of informants.

***Fidelity Level***

This metric described as the proportion of survey participants, that they reported using a specific plant species to treat a particular ailment in study area.

$$FL\ \% = Np/N \times 100$$

'Np' denotes the number of respondents who mentioned the use of the specific species for a particular disease, whereas 'N' refers to the total number of respondents who cited the species for any ailment (Khoja *et al.* 2024, Hankiso *et al.* 2023).

***Informant Consensus Factor***

Indigenous knowledge of traditional medicine frequently includes while using the specific plant species to address various distinct diseases. To evaluate the reliability of ethnomedicinal information, we employed Heinrich's method Informant consensus factor (ICF) (Heinrich, 2000). This was employed to evaluate the level of confidence among informants about the utilization of plant species within every ailment category.

$$ICF = Nur\text{-}Nt/Nt\text{-}1$$

In this context, 'Nur' indicates the number of use reports for each disease category, and 'Nt' represents the number of taxa used in that specific category by all respondents. The value ranges from 0 to 1, signifying consensus among informants. High

value indicates standard for choosing specific species to address a particular disease (Khoja *et al.* 2024, Khadim *et al.* 2024, Horackova *et al.* 2023).

***Pearson's correlation Coefficient***

To find the correlation between relative frequency citation and use value, we used software SPSS version 20, to analyze Pearson's correlation Coefficient. Additionally, the calculation of r-square was computed for the cross-species variation in relative frequency citation clarified by the variance in the use value (Amjad *et al.* 2017).

***Socio Demographics***

Table 1 illustrates the demographic distribution of informants, encompassing key variables such as gender, age, occupation, religion, and language proficiency. A total of 63 informants were interviewed, the majority, comprising 65%, were male, while the remaining 35% were female. In terms of age, the distribution revealed 25% below 40 years, 56% between 41 and 60 years, and 19% aged 60 or above. Occupationally, 44% identified as farmers, 24% as housewives, 25% in various other roles, and a smaller 6% were teachers. All informants shared a common religious affiliation, Islam, representing 100% of the sample. Language-wise, all spoke their native language, Astori Shina, with 59% proficient in Urdu. Furthermore, it was observed that elderly individuals without formal education possess extensive knowledge about herbal plants compared to other age groups. This observation is attributed to the younger generation's less familiarity with herbal remedies and their inclination towards allopathic medicine.

Table 1 Sociodemographic data of surveyed informants

| Variables | Categories | No. of Individuals | % |
|---|---|---|---|
| Informants | Male | 41 | 65 |
| | Female | 22 | 35 |
| Age | <40 | 16 | 25 |
| | 41-60 | 35 | 56 |
| | 60 > | 12 | 19 |
| Occupation | Teacher | 4 | 6 |
| | Farmer | 28 | 44 |
| | Housewife | 15 | 24 |
| | Others | 16 | 25 |
| Religion | Islam | 63 | 100 |
| Speaking | Native (Astori Shina) | 63 | 100 |
| | Urdu | 37 | 59 |

## Results and Discussion

**Diversity of family Asteraceae**

Our research focused on the medicinal plants of the family Asteraceae. In the study area, we identified 13 species, representing 10 different genera depicted in (Table 2). Notably, the dominant genus was *Artemisia* with three species, followed by *Anaphalis* with two species. The remaining genera—*Aster, Conyza, Cousinia, Echinops, Leontopodium, Scorzonera,* and *Tanacetum*—each contribute one species. These findings not only offer insights into the distribution of therapeutic plants in the area but also emphasize their importance in the cultural and healing traditions of Parishing Valley. This research provides a foundational understanding of the botanical richness that contributes to the well-being of the community.

**Habit categories**

The research revealed that 92% of the documented medicinal plant species of the family Asteraceae manifest as herbs, underscoring their prevalent use in treating various ailments by the local community. This observation attests to the adaptability of herbs within the region. Consistent with earlier studies (Karima *et al.* 2024, Guo *et al.* 2023, Bahadur *et al.* 2023, Ahmad *et al.* 2014, Cooper *et al.* 2005, Teklehaymanot, 2009), our findings align with the trend of herbs taking a prominent position in traditional medicine. The ecological significance of the predominance of herbs cannot be overstated, as it not only contributes to local biodiversity but may also hold cultural and medicinal importance within the community. Additionally, a minor yet noteworthy 8% is represented by sub-shrubs, showcasing their relevance in folk medicine, as

depicted in (Figure 3). This categorization based on plant habits provides valuable insights for understanding the local ecology and is instrumental in guiding conservation efforts in the study area.

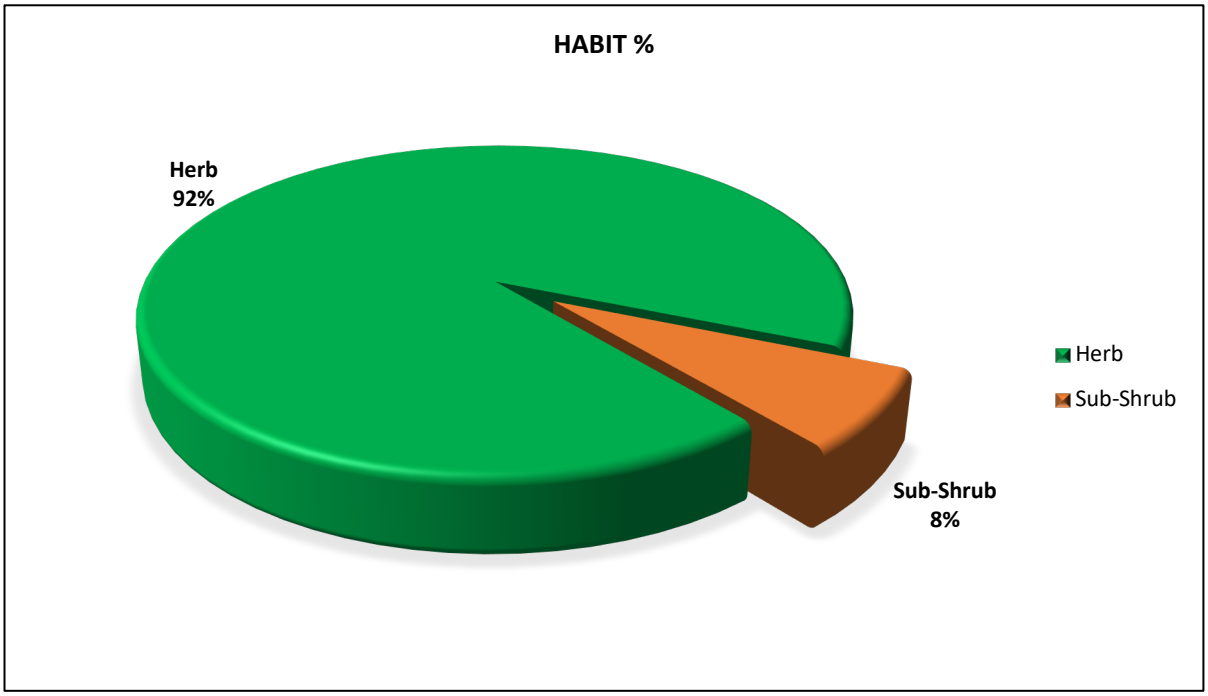


Figure 3. Habit categories and percentages

Table 2. Check list of medicinal plants of family Asteraceae and their respective traditional use in the study area

| Botanical name and Vocher Number | Life Form | Habit | Local Name | Plant Parts | Method | Categories | UV | RFC | FL |
|---|---|---|---|---|---|---|---|---|---|
| **Asteraceae** | | | | | | | | | |
| *Anaphalis nepalensis* (Spreng.) Hand.-Mazz. **SK-2311** | He | Herb | Chikee | L | Decoction, powder | Digestive system | 0.889 | 0.19 | 37 |
| *Anaphalis virgata* Thomson ex C.B. Clarke **SK-2312** | He | Herb | Sangopaje | WP | Smoke, Decoction | Cold and cough | 0.476 | 0.429 | 21 |
| *Aremisia scoparia* Waldst. & Kit **SK-2313** | He | Herb | Jaa | AP | Decoction | Digestive, Fever, Cold and cough | 0.651 | 0.571 | 90 |
| *Artemisia rutifolia* Stephan ex Spreng. **SK-2314** | He | Herb | zoon | AP | Decoction | Mycosis | 0.571 | 0.683 | 71 |
| *Artemisia santolinifolia* Turcz. ex Besser **SK-2315** | Ch | Herb | zoon | AP | Decoction | Anti Inflammation and tumors | 0.683 | 0.667 | 62 |
| *Aster altaicus* Willd. var. *altaicus* **SK-2316** | He | Herb | Kach | WP | Direct | Tonic | 0.238 | 0.159 | 56 |
| *Conyza viscosa* Mill. **SK-2317** | He | Herb | Chitayal | AP | Decoction | Cold and cough, tonic and dysentery | 0.254 | 0.111 | 54 |
| *Cousinia thomsonii* C.B. Clarke **SK-2318** | He | Herb | Cahcukony | AP | Direct, Decoction | Arthritis, Digestive system, Cough, and dermatitis | 0.714 | 0.54 | 84 |
| *Echinops echinatus* Roxb **SK-2319** | He | Herb | Jacheer | WP | Juice, Direct | Digestive system, Cough, and arthritis | 0.587 | 0.206 | 65 |
| *Leontopodium nanum* (Hook. f. & Thomson ex C.B. Clarke) Hand.-Mazz. **SK-2320** | He | Herb | Jangali kach | WP | Direct, Decoction | Tonic | 0.222 | 0.302 | 60 |
| *Scorzonera virgata* DC. **SK-2321** | He | Herb | Gori phool | F | Decoction | Anti Inflammation and Mycosis | 0.19 | 0.19 | 49 |
| *Tanacetum artemisioides* Sch. Bip. ex Hook. f. **SK-2322** | Ch | Sub-shrub | Pholly/fool | AP | Decoction | Anti Inflammation | 0.111 | 0.143 | 16 |
| *Taraxacum officinale* L. **SK-2323** | He | Herb | Lakani | L and R | Powder, Decoction | Tonic, Diuretic, Jaundice, Digestive system, Cough, and diabetics | 0.952 | 0.889 | 100 |

**Legends**: **UV** use value; **RFC** relative frequency citation, **FL** fidelity level **Life form** He Hemicryptophyte, Ch Chamaephyte **Plant parts** L leaves, F flowers, AP aerial parts, R roots, WP whole plant

**Plant parts**

Our research sheds light on the local use of plant parts for medicinal purposes in our study area depicted in (Figure 4). Aerial parts stand out as the most utilized, making up 46% of the total, showcasing their potential for various health benefits. The whole plant closely follows at 31%, emphasizing a comprehensive and holistic approach to traditional medicine. Flowers and leaves, each contributing 8%, likely offer specific healing properties, while the combination of roots and leaves at 8% suggests a potential combined effect. This distribution underscores the adaptability and specialization of different plant parts, highlighting their versatility in addressing diverse health concerns in our community.

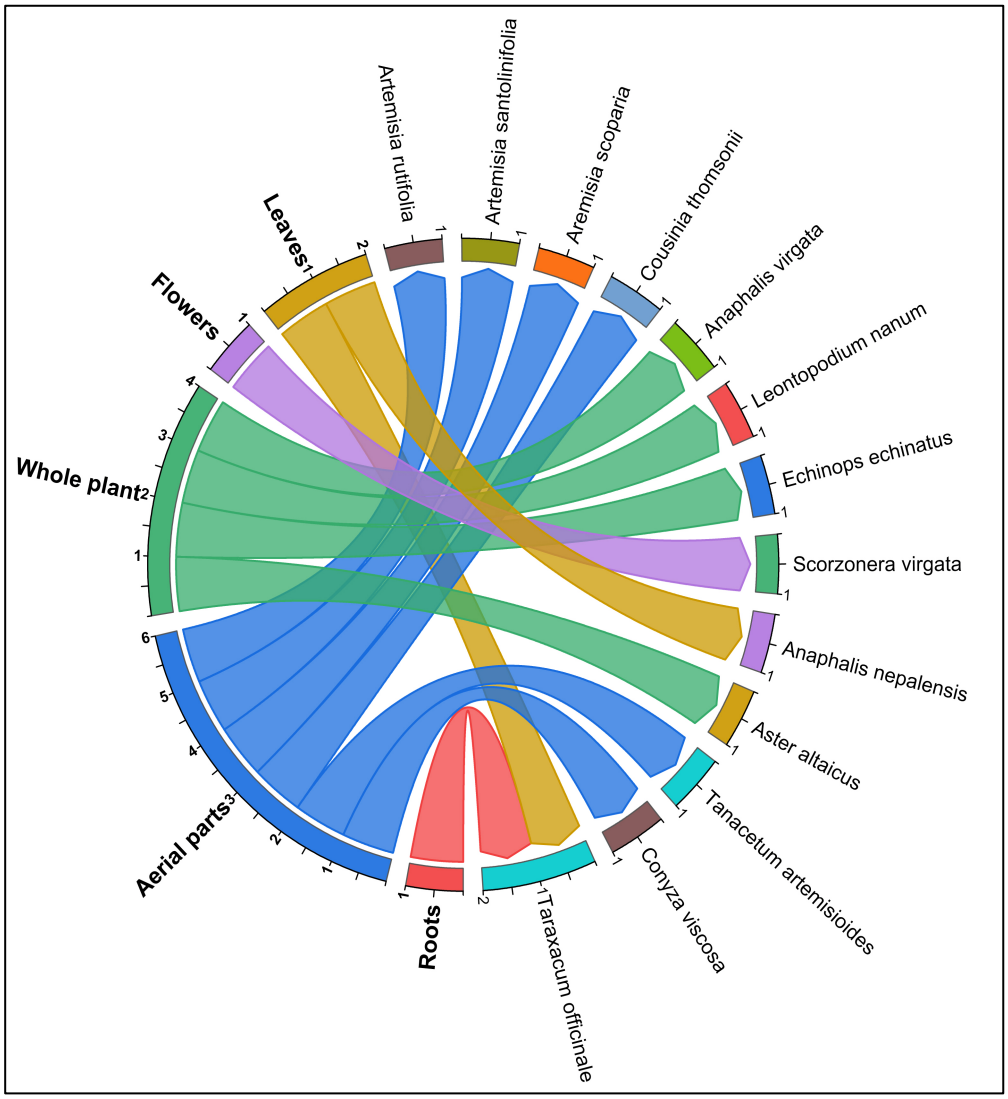


Figure 4. Shows the plant parts used in traditional medicine

**Preparation method**

Through quantitative analysis from collected flora, we explored the usage patterns of traditional remedies. The research findings revealed a prevalent practice of oral intake, topical application, similar studies highlighting the preference for oral intake (Tahir *et al.* 2023, Khadim *et al.* 2024, Bahadur *et al.* 2023). Decoction (56%) was the dominant method, used in traditional applications (Figure 5). Decoction includes the plant material was boiled in water to extract medicinal compounds, often used as tea in numerous regions of Pakistan (Bahadur *et al.* 2023). For instance, residents in the study area used *Artemisia scoparia* as a decoction for digestive problems, fever, cold, and cough, and *Artemisia santolinifolia* for inflammation and tumors. Conversely, smoke and juice were less favored, representing only 6% of applications. Notably, *Anaphalis virgata* burns and *Leontopodium nanum* were commonly used for addressing colds and coughs.

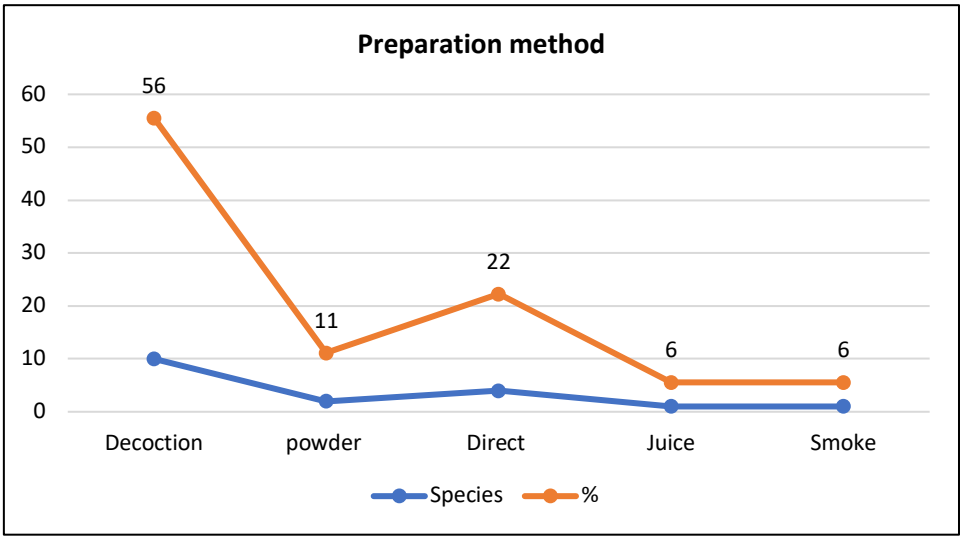


Figure 5. Shows the preparation methods and percentages

**Analysis of ethnomedicinal quantitative information**

***Relative Frequency Citation***

Our findings highlight *Taraxacum officinale* as the most frequently mentioned plant species with a Relative Frequency of Citation (RFC) at (0.889), followed by *Artemisia rutifolia* (RFC 0.683), and *Artemisia santolinifolia* (RFC 0.667). On the other hand, *Tanacetum artemisioides* had the lowest RFC at 0.143 as shown in (Figure 6). Frequent plant citations result from easy accessibility, effectiveness, and minimal side effects. RFC, a key metric, shows how often these plants are mentioned for various purposes, highlighting their widespread availability and importance in local practices. Plants with higher RFC are commonly used by locals and nomads for various ailments, emphasizing their significance in community health practices.

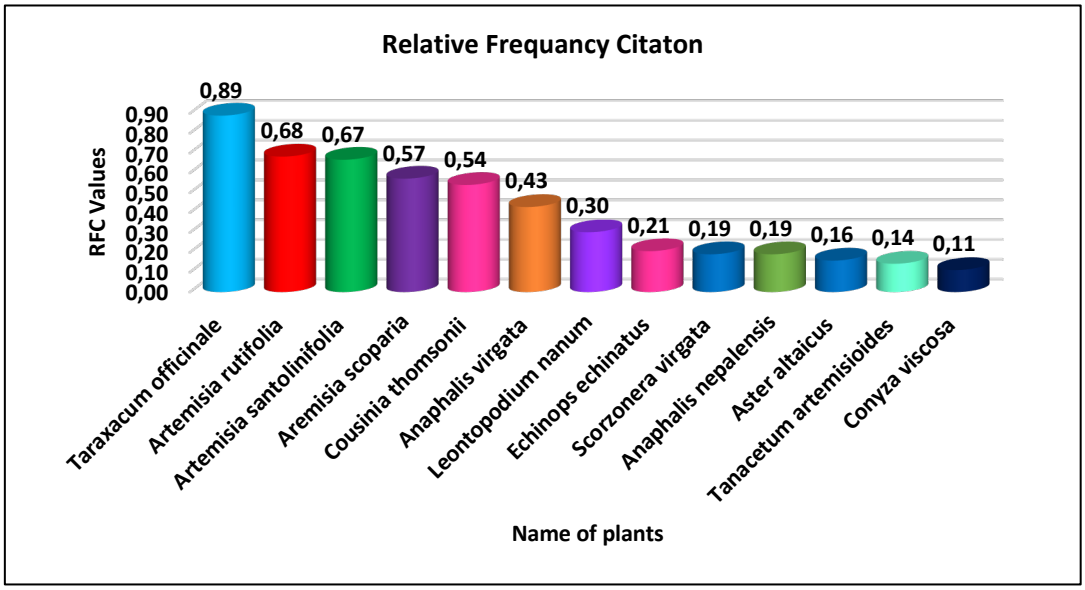


Figure 6. Shows the relative frequency citation of different plant species

***Use Value***

The Use Value measures the significance of different plant species in native practices. The value ranges from 0 to 1. The plant species with higher value showed greater significance whereas lower use value for plant species indicates low usage of that species. Remarkably, among the recorded medicinal plants in the study area, *Taraxacum officinale* stood out with the highest Use Value (UV) at 0.952, followed by *Anaphalis nepalensis*. (UV 0.889) and *Cousinia thomsonii* (UV 0.714). In contrast, *Tanacetum artemisioides* displayed the least UV value (0.111), indicating a comparatively lower significance in Indigenous practices depicted in (Figure 7). This data intensely explains the changing values of position attached to diverse plant species in traditional usage, as meticulously detailed is depicted in (Table 2).

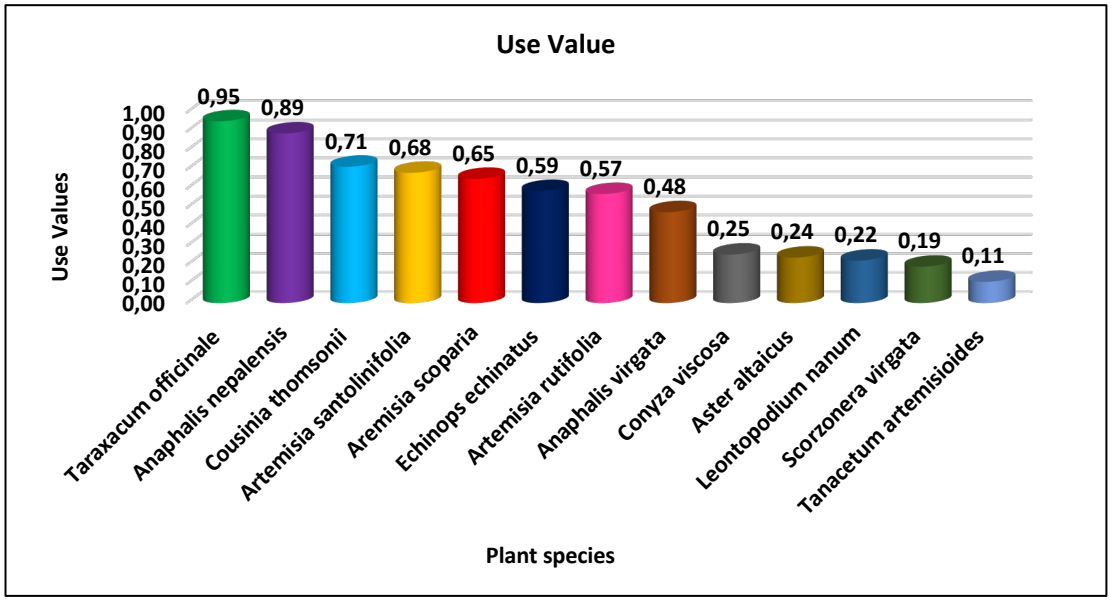


Figure 7. Shows the Use Value of different plant species

**Fidelity level**

Examining fidelity levels (FL) for cited plant species and their effectiveness in treating specific ailments, reveals a wide range, from 16% to 100% shown in (Table 2). *Taraxacum officinale* takes the lead with a perfect fidelity level of 100%, followed by *Aremisia scoparia* (90%), *Cousinia thomsonii* (84%), and *Artemisia rutifolia* (71%). In contrast, *Tanacetum artemisioides* specializes in addressing anti-inflammatory concerns but shows a minimal fidelity level of 16% shown in (Figure 8).

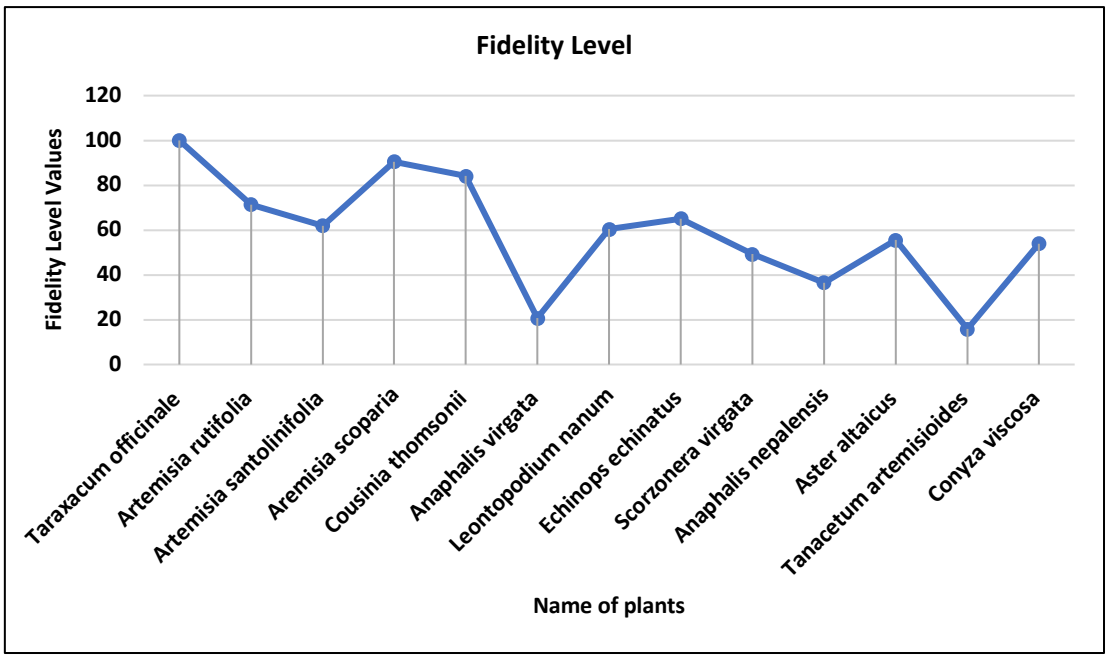


Figure 8. Shows the fidelity level of different plant species

***Pearson's correlation Coefficient***

To find the relationship between RFC and UV, Pearson's correlation Coefficient was calculated for all the distinct species. By computing in SPSS software, the findings showed positive correlation between RFC and UV. This suggested that all those species which are more cited by the informants, have higher use value and vice versa. The strong correlation coefficient r (0.675*) with *p*-value is less than 0.05 < 0.011. The values are shown in (Table 3), whereas the r-squared (r2) value of (0.427) details depicted in (Figure 9). It revealed that the trend where RFC is high, UV is also showing high value across all plant

species (Ahirwar & Gupta 2024, Bano *et al.* 2014). Similar studies also revealed the same results worldwide (Amjad *et al.* 2017, Vijaykumar *et al.* 2015).

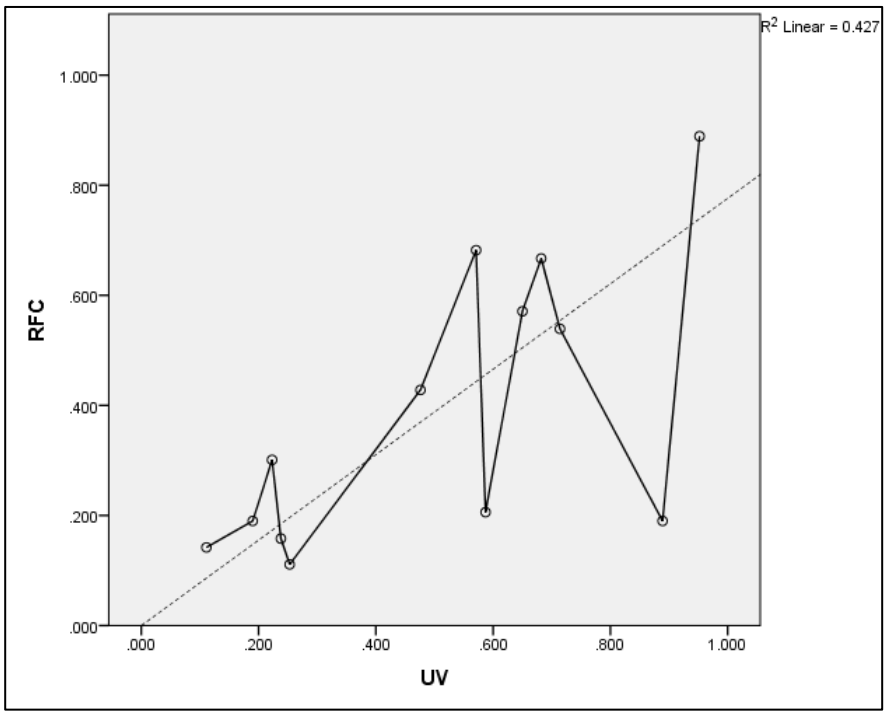


Figure 9. Shows the positive correlation between RFC and UV

Table 3. Descriptive analysis of Pearson's correlation coefficient

| Descriptive Statistics | | | |
|---|---|---|---|
| **Species** | **Mean** | **Std. Deviation** | **N** |
| UV | .503053 | .2775422 | 13 |
| RFC | .390720 | .2551673 | 13 |
| **Correlations** | | | |
| | N = 13 | UV | RFC |
| UV | Pearson Correlation | 1 | .675* |
| RFC | Pearson Correlation | .675* | 1 |
| | Sig. (2-tailed) | .011 | |
| *. Correlation is significant at the 0.05 level (2-tailed). | | | |

***Informant consensus factor***

The documented flora was accurately recorded, the percentage of diverse plant species used to treat various diseases, as outlined in the table, covering ailments like digestive system, dysentery, tonic, colds and coughs, arthritis, fever, inflammation, diuretic, and dermatitis. To gauge the consensus among informants on plant species selection for different ailments, the study computed the Informant Consensus Factor (ICF), with notable findings showing a substantial ICF value range of 1 to 0.96, the highest values were for dermatitis, diuretic, dysentery, and fever. This indicates an extreme level of confidence among respondents in the usage of particular plant species for health concerns. On the other hand, the tonic category stands out with the lowest ICF value of 0.96, indicating some disagreement among informants on the best plants for tonics. Details depicted in (Table 4).

In recent years, a significant amount of data has been collected, illustrating the reliance of ethnic communities, including those in Pakistan, on plant species for their indigenous therapeutic applications (Bahadur *et al*. 2023, Kayani *et al.* 2014, Jimenez-Arellanes *et al.* 2003).

Dominant genus and respective species percentages depicted in (Table 5), encapsulates a comprehensive overview of the plant species utilized by the local population in our study area for addressing various health concerns. The data reveals a nuanced approach to traditional healing, with distinct plant species allocated to specific ailments. Remarkably, six species stand out as remedies for cold and cough, highlighting the local knowledge of plants effective in respiratory conditions. Digestive problems find resolution through the utilization of four different plant species, while inflammation and tonics exhibit a diversity of three species each. Arthritis, a condition demanding focused treatment, is addressed with two specific plant species, attesting to the targeted use of botanical resources. Moreover, singular plant species are enlisted for dermatitis, diuretics, dysentery, and fever, underscoring the precision in matching plant properties to health issues are depicted in Figure 10. This depiction of the data not only shows how much the local people know about plants and their uses but also points out that these plants could be useful for healing.

Table 4. Informant consensus factor of different disease categories

| Category | Nur | % | Nt | % | Nur-Nt | Nur-1 | ICF= (Nur-Nt)/(Nur-1) |
|---|---|---|---|---|---|---|---|
| Arthritis | 82 | 12.1 | 2 | 9.1 | 80 | 81 | 0.99 |
| Cold and cough | 145 | 21.4 | 6 | 27.3 | 139 | 144 | 0.97 |
| Dermatitis | 56 | 8.3 | 1 | 4.5 | 55 | 55 | 1 |
| Digestive system | 141 | 20.8 | 4 | 18.2 | 137 | 140 | 0.98 |
| Diuretic | 53 | 7.8 | 1 | 4.5 | 52 | 52 | 1 |
| Dysentery | 23 | 3.4 | 1 | 4.5 | 22 | 22 | 1 |
| Fever | 57 | 8.4 | 1 | 4.5 | 56 | 56 | 1 |
| Anti Inflammation | 78 | 11.5 | 3 | 13.6 | 75 | 77 | 0.97 |
| Tonic | 56 | 8.3 | 3 | 13.6 | 53 | 55 | 0.96 |

**Legends** Nur, Number of Use Reports, Nt, Number of Taxa, ICF, Informant Consensus Factor

Table 5. Checklist of dominant genera and percentages

| S. No | Genus | Species | Percentage (%) |
|---|---|---|---|
| 1. | *Anaphalis* | 2 | 15 |
| 2. | *Artemisia* | 3 | 23 |
| 3. | *Aster* | 1 | 8 |
| 4. | *Conyza* | 1 | 8 |
| 5. | *Cousinia* | 1 | 8 |
| 6. | *Echinops* | 1 | 8 |
| 7. | *Leontopodium* | 1 | 8 |
| 8. | *Scorzonera* | 1 | 8 |
| 9. | *Tanacetum* | 1 | 8 |
| 10. | *Taraxacum* | 1 | 8 |

## Conclusion

This research investigated how the natives of the study area use the plant species from the family Asteraceae in their traditional healing practices and how much they have indigenous knowledge about medicinal practices. The uniqueness of this research is that it focuses on a particular group of plants and their specific use in the area.

The current study revealed the ethnomedicinal plants of family Asteraceae documented 13 species belonging to 10 different genera. In the traditional practices of the local communities of Allah Wali Lake Gutumsar, a variety of plant species of family Asteraceae play a crucial role in addressing various health concerns and fulfilling practical needs. People use plant species for healing different diseases, because it is easy to harvest, cheap and within the region. This holistic approach reflects the profound traditional knowledge embedded in the local communities' utilization of their natural resources.

Furthermore, this study is a key starting point for documenting and safeguarding indigenous knowledge related to traditional medicine. By highlighting this unique information, the research contributes to a broader understanding of the close

connection between communities and their local plant resources. Future studies are needed to explore the region for conserving and sustainable use of flora.

## Declarations

**List of abbreviations:** UV use value; RFC relative frequency citation, FL fidelity level Life form He Hemicryptophyte, Ch Chamaephyte Plant parts L leaves, F flowers, AP aerial parts, R roots, WP whole plant, Nur number of use reports, Nt Number of taxa, ICF informant consensus factor

**Ethics approval and consent to participate:** All interviewees gave their poral prior informed consent.

**Consent for publication:** All persons shown in images gave their poral prior informed consent to have their images shown

**Availability of data and materials:** Not applicable

**Competing interests:** The authors declare that there is no conflict of interest.

**Funding:** No funding has been received for the study.

**Author contributions:** SK, the first author, managed all parts of the research; designing scheduling field surveys, specimen collection, identification, data analysis and producing original draft to till approval of manuscript. SH and AAS design the research, assist in specimen identification, and review the manuscript, TZ and HA helped in collecting plant specimens and ethnomedicinal information. TZ assisted in data analysis and producing original manuscript draft.

## Acknowledgements

This research paper is part of Salim Khadim's M.Phil. thesis. We extend our gratitude to all respondents for their participation and the valuable knowledge they provided. Special thanks to the first author's supervisor, Dr. Arshad Ali Shedayi, and co-supervisor, Dr. Sujjad Hyder, for their guidance and support. Additionally, we express our deep appreciation to Karakoram International University Gilgit for fostering a supportive research environment.

## Literature cited

Abbas Q, Hussain A, Khan SW, Hussain A, Shinwari S, Hussain A, Ullah A, Zafar M, Ali K. 2019. Floristic diversity, ethnobotany and traditional recipes of medicinal plants of Maruk Nallah, Haramosh Valley, District Gilgit, Gilgit Baltistan. Proceedings of the Pakistan Academy of Sciences, 56(3B):97-112.

Ahirwar RK, Gupta V. (2024). Quantitative ethnomedicinal investigation of medicinal plants used by traditional healers to treat various diseases in the district Dindori, Madhya Pradesh, India. Ethnobotany Research and Applications, 28:1–31.

Ahmad M, Sultana S, Fazl-i-Hadi S, Ben Hadda T, Rashid S, Zafar M, Khan MA, Khan MPZ, Yaseen G. 2014. An Ethnobotanical study of Medicinal Plants in high mountainous region of Chail valley (District Swat- Pakistan). Journal of Ethnobiology and Ethnomedicine, 10(1):10-36.

Ahmad KS, Hamid A, Nawaz F, Hameed M, Ahmad F, Deng J, Akhtar N, Wazarat A, Mahroof S. 2017. Ethnopharmacological studies of indigenous plants in Kel village, Neelum Valley, Azad Kashmir, Pakistan. Journal of Ethnobiology and Ethnomedicine 13(1): 68

Ali S, Shah SA, Saeed RF, Iqbal J, Ijaz S, Munazir M. 2023. Ethnomedicinal plant use value in Lower Swat, Pakistan. Ethnobotany Research and Applications, 25:1-22.

Ali SI, Qaiser M. 1986. A phytogeographical analysis of the phanerogams of Pakistan and Kashmir. Proceedings of the Royal Society of Edinburgh. Section B. Biological Sciences, 89:89–101.

Arshad Ali Shedayi. 2012. Ethnomedicinal uses of plant resources in Gilgit-Baltistan of Pakistan. Journal of Medicinal Plants Research, 6(29):4540-4549.

Arshad AS, Ming X, Bibi G. 2014. Traditional medicinal uses of plants in Gilgit-Baltistan, Pakistan. Journal of Medicinal Plants Research, 8(30):1-13.

Amjad MS, Qaeem Mf, Ahmad I, Khan SU, Chaudhari SK, Malik NZ, Shaheen H, Khan AM. 2017. Descriptive study of plant resources in the context of the ethnomedicinal relevance of indigenous flora: A case study from Toli Peer National Park, Azad Jammu and Kashmir, Pakistan. PLoS ONE 12(2).

Bahadur S, Ahmad M, Zafar M, Begum N, Yaseen M, Ali M, Kumar T. 2023. Ethnomedicinal relevance of selected monocot taxa from different geographical regions of Pakistan. Ethnobotany Research and Applications, 26:1-17.

Bano A, Ahmad M, Hadda TB, Saboor A, Sultana S, Zafar M, Khan MPZ, Arshad M, Ashraf MA. 2014a. Quantitative ethnomedicinal study of plants used in the skardu valley at high altitude of Karakoram-Himalayan range, Pakistan. Journal of Ethnobiology and Ethnomedicine, 10(1):10-43.

Bhat P, Hegde G, Hegde GR. 2012. Ethnomedicinal practices in different communities of Uttara Kannada district of Karnataka for treatment of wounds. Journal of Ethnopharmacology, 143(2):501-514.

Caroe O, Biddulph J. 1972. Tribes of the Hindoo Koosh. The Geographical Journal, 138(3).

Cavendish W. 2012. Quantitative methods for estimating the economic value of resource use to rural households. Uncovering the Hidden Harvest: Valuation Methods for Woodland and Forest Resources.

Cooper R, Morré DJ, Morré DM. 2005. Medicinal benefits of green tea: Part I. Review of noncancer health benefits. Journal of Alternative and Complementary Medicine, 11(3):521-528.

Gemedo-Dalle T, Maass BL, Isselstein J. 2005. Plant biodiversity and ethnobotany of Borana pastoralists in southern Oromia, Ethiopia. Economic Botany, 59(1):43-65.

Goodman SM, Ghafoor A. 2011. The ethnobotany of southern Balochistan, Pakistan: with particular reference to medicinal plants, 31:1-84

Guo CA, Ding X, Hu H, Zhang Y, Bianba C, Bian B, Wang Y. 2023. A comparison of traditional plant knowledge between Daman people and Tibetans in Gyirong River Valley, Tibet, China. Journal of Ethnobiology and Ethnomedicine, 19(1)

Hanif U. (2012). Distributional pattern of Asteraceae along a spatial gradient in urban and suburban areas of Lahore City, Pakistan. African Journal of Plant Science, 6(11)

Hankiso M, Warkineh B, Asfaw Z, Debella A. 2023. Ethnobotany of wild edible plants in Soro Dsitrict of Hadiya Zone, southern Ethiopia. Journal of Ethnobiology and Ethnomedicine, 19(1)1-23.

Heinrich M. 2000. Ethnobotany and its role in drug development. Phytotherapy Research, 14(7):479-488.

Horackova J, Chuspe Zans ME, Kokoska L, Sulaiman N, Clavo Peralta ZM, Bortl L, Polesny Z. 2023. Ethnobotanical inventory of medicinal plants used by Cashinahua (Huni Kuin) herbalists in Purus Province, Peruvian Amazon. Journal of Ethnobiology and Ethnomedicine, 19(1):1-26.

Hyder S, Khatoon S, Imran M. 2013. Ethnobotanical studies on plants of district Hunza-Nagar (Gilgit-Baltistan), Pakistan, 10(1):91-99.

Ikramullah K, Razzaq, Islam M. 2007. Ethnobotanic al studies of some medicinal and aromatic plants at higher altitudes of Pakistan. American Eurasian Journal of Agricultural and Environmental Science, 2(5):470-473.

Jan M, Mir TA, Khare RK. 2022. Traditional use of medicinal plants among the indigenous communities in Baramulla district, Jammu and Kashmir, India. Nordic Journal of Botany, e03387):1-21

Jan M, Khare RK, Mir TA. 2021a. Medicinal plants used during Pregnancy and Childbirth in Baramulla District of Jammu and Kashmir, India. Ethnobotany Research and Applications, 22(23):1-19.

Jan, M, Mir TA, Ganie AH, Khare RK. 2021b. Ethnomedicinal use of some plant species by Gujjar and Bakerwal community in Gulmarg Mountainous Region of Kashmir Himalaya. Ethnobotany Research and Applications, 21(38):1–23

Jan HA, Jan S, Bussmann RW, Wali S, Sisto F, Ahmad L. 2020. Complementary and alternative medicine research, prospects, and limitations in Pakistan: A literature review. Acta Ecologica Sinica, 40(6):1-13.

Jimenez-Arellanes A, Meckes M, Ramirez R, Torres J, Luna-Herrera J. 2003. Activity against multidrug-resistant *Mycobacterium tuberculosis* in Mexican plants used to treat respiratory diseases. Phytotherapy Research, 17(8):903-908.

Karima, Hyder S, Khadim S, Zehra N, Shahnaz, Zeeshan M, Ali R, Abbass A. 2024. Analyzing phytoecological significance of floral biodiversity in Rahim Abad, District Gilgit, Pakistan. International Journal of Agriculture & Biology, 31(4):235–242.

Kayani S, Ahmad M, Zafar M, Sultana S, Khan MPZ, Ashraf MA, Hussain J, Yaseen G. 2014. Ethnobotanical uses of medicinal plants for respiratory disorders among the inhabitants of Gallies - Abbottabad, Northern Pakistan. Journal of Ethnopharmacology, 156:47-60.

Khadim S, Hyder S, Zuhra T, Abbas H. 2024. Ethnobotanical inventory and indigenous therapeutic applications of wild medicinal plants in Parishing valley, District Astore, Gilgit- Baltistan, Pakistan. Ethnobotany Research and Applications, 28(32):1-26.

Khan B, Abdukadir A, Qureshi R, Mustafa G. 2011. Medicinal uses of plants by the inhabitants of Khunjerab national park, Gil git, Pakistan. Pakistan Journal of Botany, 43(5):2301-2310.

Khoja AA, Waheed M, Haq SM, Bussmann RW. 2024. The role of plants in traditional medicine and current therapy: A case study from North part of Kashmir Himalaya. Ethnobotany Research and Applications, 27(5):1-23.

Kunwar RM, Bussmann RW. 2008. Ethnobotany in the Nepal Himalaya. Journal of Ethnobiology and Ethnomedicine, 4(24):1746-4269.

Leduc C, Coonishish J, Haddad P, Cuerrier A. 2006. Plants used by the Cree Nation of Eeyou Istchee (Quebec, Canada) for the treatment of diabetes: A novel approach in quantitative ethnobotany. Journal of Ethnopharmacology, 105(1–2):55-63.

Noor A, Khatoon S, Ahmed M. 2012. Enumeration of the ethnobotaniacal uses of some herbs in Astore valley, gilgit-baltistan, pakistan with particular reference to health cure purposes. Fuuast Journal of Biology, 2(2):31-48.

Noor A, Khatoon S, Ahmed M, Razaq A. 2014. Ethnobotanical study on some useful shrubs of Astore valley, gilgit-baltistan, pakistan. Bangladesh Journal of Botany, 43(1):19-25.

Mir TA, Khare RK, Jan M. 2022. Ethnomedicinal Studies on Wild Medicinal Plants of Yusmarg Valley of District Budgam (Western Himalaya), in Jammu and Kashmir. Indian Forester, 148(8): 663-669.

Pradhan SP, Chaudhary RP, Sigdel S, Pandey BP. 2020. Ethnobotanical knowledge of khandadevi and gokulganga rural municipality of ramechhap district of Nepal. Ethnobotany Research and Applications, 20:1-32.

Salim MA, Ranjitkar S, Hart R, Khan T, Ali S, Kiran C, Parveen A, Batool Z, Bano S, Xu J. 2019. Regional trade of medicinal plants has facilitated the retention of traditional knowledge: Case study in Gilgit-Baltistan Pakistan. Journal of Ethnobiology and Ethnomedicine, 15(1).

Shah IA, Burni T, Badshah L, Uza NU, Bussmann RW. 2023. Quantitative ethnobotanical study and conservation status of herbal flora of Koh-e-Suleman range, Razmak valley, North Waziristan, Pakistan. Ethnobotany Research and Applications, 25:1-18.

Shinwari ZK, Gilani SS. 2003. Sustainable harvest of medicinal plants at Bulashbar Nullah, Astore (Northern Pakistan). Journal of Ethnopharmacology, 84(2–3):289-298.

Tahir M, Asnake H, Beyene T, Van Damme P, Mohammed A. 2023. Ethnobotanical study of medicinal plants in Asagirt District, Northeastern Ethiopia. Tropical Medicine and Health, 51(1):1-13.

Teklehaymanot T. 2009. Ethnobotanical study of knowledge and medicinal plants use by the people in Dek Island in Ethiopia. Journal of Ethnopharmacology, 124(1):69-78.

Usman KA, Egigu MC, Sasikumar JM. 2022. Ethnobotanical study on traditional medicinal plants used by Oromo ethnic people of Goro district, Bale zone of Oromia region, Ethiopia. Ethnobotany Research and Applications, 24:1-21.

Vijayakumar S, Prabhu S, Yabesh JEM, Pragashra R. 2015. A quantitative ethnozoological study of traditionally used animals in Pachamalai hills of Tamil Nadu, India. Journal of Ethnopharmacology, 171:51–63.

Wali R, Khan MF, Mahmood A, Mahmood M, Qureshi R, Ahmad KS, Mashwani Z ur R. 2022. Ethnomedicinal appraisal of plants used for the treatment of gastrointestinal complaints by tribal communities living in Diamir district, Western Himalayas, Pakistan. PLoS ONE, 17(6).

Zareef H, Sarim FM, Qureshi R. 2023. Quantitative ethno-gynecological survey of traditional medicinal plants from Punjab province, Pakistan. Ethnobotany Research and Applications, 26:1-20.

Zhou H, Zhang J, Kirbis BS, Mula Z, Zhang W, Kuang Y, Huang Q, Yin L. 2023. Ethnobotanical study on medicinal plants used by Bulang people in Yunnan, China. Journal of Ethnobiology and Ethnomedicine, 19(1):38.