Revitalizing traditional wisdom: Exploring medicinal, plant-based healthcare practices in Kalatop-Khajjiar Wildlife Sanctuary, Himachal Pradesh, India

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Research

Abstract

Background: The Kalatop-Khajjiar Wildlife Sanctuary in the Western Himalayas is home to rich biodiversity and indigenous communities with deep-rooted ethnomedicinal traditions. These communities have relied on local flora for generations to treat common ailments using sustainable, plant-based healthcare practices. However, rapid socio-cultural changes and habitat pressures threaten the continuity of this traditional knowledge. Ethnobotanical documentation of such practices is crucial for conservation, cultural preservation, and potential pharmacological exploration. This study seeks to explore, record, and revitalize plant-based healing traditions within this ecologically and culturally significant landscape.

Methods: Twelve field surveys were conducted in the 11 villages in and around Kalatop-Khajjiar Wildlife Sanctuary. A total of 140 informants (74 males and 66 females) between the ages of 21-80 years were interviewed using semi-structured questionnaires. The collected ethnomedicinal data was analyzed using the use-value (RFC) and informant consensus factor (ICF).

Results: The present study reported 114 medicinal plants to treat 60 ailments. The results indicated herbs (75%) as the dominantly used growth form and leaves (40.1%) as the most frequently used plant parts. The herbal preparations were consumed mostly in paste form (33.3%) followed by decoction (27.1%), powder (12.2%), juice (6.9%), eaten raw (5.6%), poultice and infusion (4.9% each), cooked (2.1%), rubbed and oil (1.4%) and smoke (0.7%). *Acorus calamus* L. and *Viola canescens* Wall, were among the most highly cited plant species. Informant Consensus Factor (ICF = 0.90) was highest for parasitic conditions, followed by urological problems (ICF= 0.87), respiratory diseases (ICF= 0.86), digestive disorders (ICF= 0.85) and eye diseases (ICF= 0.85). New uses were reported for several plant species such as *Adiantum venustum* D.Don (Hair fall, Piles), *Arisaema jacquemontii* Blume (Knee Pain), *Artemisia indica* L. (Jaundice, Headache), *Berberis lycium* Royle (Kidney stones, Sore throat), *Neolitsea pallens* (D.Don) Momiy. & H.Hara. (Body ache).

Conclusions: This study provides valuable information regarding the traditional knowledge associated with the medicinal use of plant species. While the medicinal efficacy of several widely utilized plant species such as *Acorus calamus*, *Artemisia*

absinthium, *Berberis lycium*, *Podophyllum hexandrum*, *Valeriana jatamansi*, *Malaxis muscifera*, *Urtica dioica*, and *Viola canescens* have already been scientifically validated. However, species such as *Anaphalis triplinervis*, *Arisaema jacquemontii*, *Cautleya spicata*, *Neolitsea pallens*, *Primula denticulata*, *Ranunculus distans*, *Reinwardtia indica*, *Rosularia rosulata*, *Solidago virgaurea*, and *Verbascum thapsus* require comprehensive pharmacological and phytochemical investigations.

Keywords: Kalatop Khajjiar Wildlife Sanctuary, Indigenous medicine, Ethnobotany, Chamba

Background

Plants have been utilized to cure and manage many health issues globally for millennia, and they are exploited for multiple reasons, such as fiber, food, and shelter (Dutt *et al.* 2014; Singh *et al.* 2021; Izah *et al.* 2024). Traditional Knowledge encompasses the accumulated knowledge, skills, and practices rooted in the concepts, beliefs, and experiences indigenous to various cultures (Che *et al.* 2024). In rural and economically challenged populations, especially in the Himalayan region, herbal remedies continue to be the primary option for healthcare. This is so because they are cost-effective, have few adverse effects, and are much supported by spiritual and cultural traditions (Balamurugan *et al.* 2019; Chauhan *et al.* 2020).

The World Health Organization (WHO) has listed a total of 21,000 plants that are used globally for medicinal purposes (Kumar *et al.* 2021). In recent years, there has been a growing interest in ethnomedicinal studies aimed at exploring the curative potential of plants and documenting traditional oral knowledge (Chikowe *et al.* 2020). Traditional knowledge transferred orally from generation to generation (Batool *et al.* 2023) is at high risk due to the losses raised by urbanization, modern healthcare, and declining interest among the young generation (Bhatia *et al.* 2014). Therefore, documenting traditional knowledge is essential for preserving cultural heritage, advancing drug development, and promoting sustainable resource management.

India has a rich heritage of herbal medicine and indigenous healthcare practices such as Ayurveda, Unani, and Siddha, which are recognized worldwide. India, acknowledged as one of the 17 megadiverse countries, has an exceptional abundance of species and ecological variety, including around 7-8% of the world's documented species (Sharma & Thokchom, 2014). India, spread across ten biogeographic zones, is home to approximately 55,048 plant species (NBA, 2024), of which around 7,000 to 7,500 are known to be used for medicinal purposes (Bhuyan, 2021). Among the 10,452 plant species listed by Rana and Rawat (2017) from the Indian Himalayan Region, 1,748 species are used for medicinal purposes (Khajuria *et al.* 2021). The traditional knowledge, accumulated over centuries through direct experiences and observations, serves as a foundation for the sustainability of natural resources and protection of cultural heritage and the adaptation to rapidly changing environmental and social conditions (Saslis-Lagoudakis *et al.* 2014; UNDP, 2025). Elders, being the principal stewards of this wisdom often pass away without sharing their knowledge with the younger generations. Additionally, socioeconomic transformations like modernization, changes in lifestyle, declining dependence on forests, and migration are reshaping rural livelihoods, and at the same time, traditional medicinal knowledge is rapidly declining. The loss of indigenous knowledge is closely linked with the decline of biodiversity, highlighting the intricate link between culture and the natural world (Malapane, 2024). Therefore, the conservation of traditional knowledge has become a critical and immediate priority, not merely to protect cultural diversity but also to utilize the rich insights and sustainable practices that these traditions encompass (Sudipta, 2024). The present study will record and authenticate these age-old practices, providing a scientific and cultural connection between traditional and modern healthcare strategies. By focusing on the importance of plant-based healing and its ecological context, this research can support biocultural conservation, help create sustainable healthcare alternatives, and enable local communities to reclaim and be proud of their ethnobotanical legacy. It will play a vital role in the preservation and revitalization of the indigenous knowledge systems that have sustained local communities for many generations. Thus, this study will play a vital role in the preservation and revitalization of the indigenous knowledge systems that have sustained local communities for many generations.

Himachal Pradesh serves as a significant reservoir of medicinal plants. Number of ethnobotanical studies have been conducted in Himachal Pradesh (Kumari *et al.* 2018; Sharma & Samant 2014; Thakur *et al.* 2014; Rana *et al.* 2019; Kumar *et al.* 2021; Chander & Sharma, 2020; Radha *et al.* 2021; Kumari &Verma 2022; Thakur *et al.* 2024) and its Chamba District (Dutt *et al.* 2014; Thakur *et al.* 2014; Thakur *et al.* 2016; Arora *et al.* 2018; Rana *et al.* 2019; Kumar *et al.* 2021; Rana *et al.* 2021). However, very few ethnomedicinal studies have been conducted in the Kalatop Khajjiar Wildlife Sanctuary of the Chamba district. The available information is sparse and is limited to either a description of the floristic diversity or a specific group of diseases (Verma & Kapoor, 2012; Verma, 2015; Verma & Kapoor, 2016; Kumar *et al.* 2018) leaving a significant gap in comprehensive documentation of traditional medicinal uses of plants in the area.

The present study hypothesizes that the indigenous people living in and around Kalatop-Khajjiar Wildlife Sanctuary have extensive, under-documented ethnomedicinal knowledge, including the utilization of plant species with either new or hitherto undocumented therapeutic uses. Apart from augmenting the current database, systematic and quantitative ethnobotanical research in this area would assist in the identification of culturally important species with possible medicinal relevance. Unlike other studies, the present study employs a quantitative ethnobotanical method comprising relative frequency of citation (RFC), and informant consensus factor (ICF), to evaluate the cultural relevance and consistency of the claimed plant uses. It also incorporates a thorough cross-verification with existing ethnomedicinal literature, aiming to identify species with new or lesser-known uses. This approach ensures a more exhaustive, validated, and current understanding of the region's medicinal plant resources. Therefore, the present study has been carried out to (i) To document the traditional knowledge associated with the utilization of indigenous flora in healthcare practices among local communities (ii) To find out species that exhibit novel or previously undocumented uses based on a comprehensive review of ethnobotanical literature).

Materials and Methods

Study area

The Kalatop-Khajjiar Wildlife Sanctuary is located in the Chamba district of Himachal Pradesh (Fig. 1). The total area of the Sanctuary is about 17.17 km^2 (WII, 2023), with altitudinal variations ranging from 1,185 meters to 2,800 meters. Geographically, it is located between longitudes of 76° 32' east and latitudes of 32° 26' north (Kumar *et al.* 2018). This Wildlife Sanctuary can be primarily divided into three distinct ecological types: dense forests, lake meadows, and a limited section of alpine pastures (Kumar *et al.* 2019). The sanctuary is characterized by a diverse range of flora that thrives in sub-temperate to alpine climatic conditions (Verma & Kapoor, 2012).

The region receives an average annual precipitation of around 672.3 millimeters, with temperatures between -10°C and 35°C throughout the year (Kumar *et al.* 2018). The sanctuary is recognized for its rich and varied plant life. Within the Kalatop Khajjiar sanctuary, three dominant habitat types can be identified: thick forests, a meadow surrounding a lake, and a small section of alpine pasture. The dense forests primarily consist of mature mixed species, including fir, spruce, and deodar trees, interspersed with oak and Rhododendron. The Sanctuary harbors significant plant species such as Pinus wallichiana, *Cedrus deodara*, *Abies pindrow*, *Ulmus wallichiana*, *Dioscorea deltoidea*, *Polygonatum verticillatum*, *Paris polyphylla*, *Podophyllum hexandrum*, *Taxus wallichiana,* among others.

Data collection

Twelve extensive field surveys were conducted in 11 villages of the study area from July 2023 to December 2024. The surveyed villages included Bagga, Bainska, Bhathli, Khajjiar, Kakeda, Kalatop, Lakkadmandi, Malhodu, Mayari Galaa, Pukhri, and Rohta. Information was gathered after obtaining oral informed consent from the informants, adhering to the ethical standards set forth by the International Society of Ethnobiology (ISE, 2008). A total of 140 informants, aged 21 to 80 years, were selected for the interviews (Table 1). Of these, 124 were chosen using the snowball sampling method, recognized for its effectiveness in accessing concealed or specialized knowledge networks (Bernard, 2006; Goodman, 1961). This method allowed for the identification of community members knowledgeable about traditional medicinal plant usage through referrals from initial participants. Additionally, 16 key informants were deliberately and methodically selected based on the suggestions of respected village elders, following an established ethnobotanical research protocol (Tongco, 2007). The expertise of five local herbal healers in traditional practices positioned them as key informants, highlighting their crucial role in preserving indigenous knowledge about medicinal flora.

The informants primarily belonged to two major tribal communities—Gaddis and Gujjars—and commonly spoke Chambiyali and Bharmouri dialects. In terms of occupation, the majority were farmers (38.57%) and housewives (24.28%), followed by laborers (17.14%), small business owners (9.28%), government employees (7.14%), and a small proportion of traditional herbal healers (3.57%). They were asked questions like, ‘Which plants have been utilized traditionally for medicinal purposes in your community?’, ‘Which ailments or diseases are frequently treated with these plants?’, and ‘What methods (boiling, crushing, drying, making a paste, or decoction) are used to prepare these plants for medicinal purposes?’ The collected information during the study includes local plant names, parts utilized, herbal preparation methods, and routes of administration. The interviews were conducted in the local dialects, viz., Chambiyali and Bharmauri (Gaddiyali). The first author's native background from the Chamba region facilitated effective communication with the informants.

Identification of all the plant specimens was done by utilizing resources such as various regional floras (Chowdhery & Wadhwa, 1984; Polunin & Stainton, 1984; Stainton, 1988; Singh & Sharma, 2006), eFloras (http://www.efloras.org/) and

various online herbaria, including Kew Herbarium, Janaki Ammal Herbarium (Acronym: RRLH) of Council of Scientific and Industrial Research–Indian Institute of Integrative Medicine (CSIR–IIIM), CSIR-National Botanical Research Institute (NBRI) Herbarium, Forest Research Institute (FRI) Herbarium along with the Herbarium of the Department of Botany at the Career Point University, Hamirpur (CPU). The verification of species and family names was conducted through the online database "World Flora Online" (https://www.worldfloraonline.org/). All the identified plant specimens with voucher numbers were submitted to the herbarium of the Department of Botany, Career Point University, Hamirpur, Himachal Pradesh.

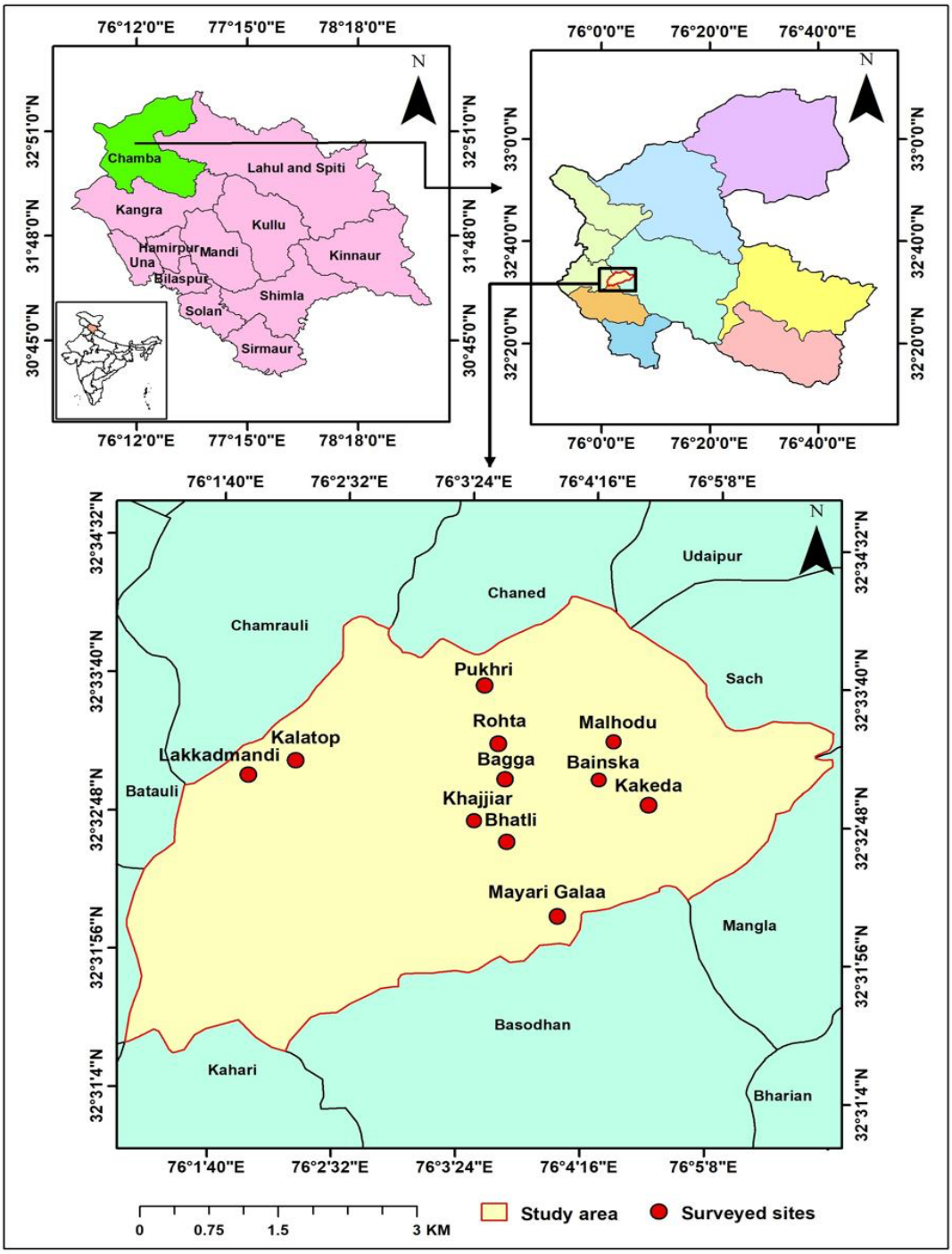

Figure 1. Map of District Chamba, Himachal Pradesh, showing the survey sites.

Data Analysis

Relative Frequency of Citation (RFC)

It is calculated using the formula RFC=FC/Nas suggested by Tardío and Santayana (2008) where 'FC' is the number of informants who mentioned the species use and 'N' is the number of informants interviewed in the study.

Informant Consensus Factor (ICF)

To identify potentially effective medicinal plants, the Informant Consensus Factor (ICF) was calculated following the methodologies established by Trotter and Logan (1986) and Heinrich (1998). It is calculated as: ICF = N_{ur}-N_t/N_{ur}-1, where 'N_{ur}' is the number of use-reports in each category (Nur) and 'N_t' is the number of taxa used in that category. The range of this value is from 0 to 1. A number approaching 1 indicates that the plant species is commonly cited by a large number of informants, reflecting a higher level of agreement among them. Conversely, a value approaching zero indicates a lack of consensus among the informants.

Ailment categories

The diseases were classified into broad categories based on the ICPC–2 classification (Staub et al. 2015). All medical conditions were classified into 18 distinct categories, including GAS-D, MET-T, DER-S, RES-R, SKE-L, ORA, BLOOD-B, EYE-F, CAR-K, PAR, LIV, URO-U, NER-N, OTH-A, ANT, GYN-X, and GNT.

Assessment of new use reports

To find out the new uses of plants, the use reports documented in the present study were compared with those existing in the literature. For this, a comprehensive literature search was done consulting various databases, including PubMed, SciFinder, Science Direct, and Google Scholar.

Results and Discussions

Demographics of the informants

In the present study, 140 informants, 74 males (52.9%) and 66 females (47.1%), between the age group of 21-80 years, were interviewed. Among them, 41 (29.3%) informants lack formal schooling, 54 (38.6%) individuals are engaged in farming, 34 (24.3%) are homemakers, 24 (17.1%) working as laborers, 13 (9.3% businessmen), 10 (7.1%) as Govt. personal and 5 (3.6%) serving as a local healer (Table 1).

Table 1. Details of the informants of the present study.

Variables	Number of informants	Percentage of informants
Gender		
Male	74	52.9
Female	66	47.1
Educational level		
Illiterate (Never attended school)	41	29.3
Primary level (Class 1st to 5th)	38	27.1
Middle level (Class 6st to 8th)	11	7.9
Secondary level (Class 9th to 12th)	21	15.0
Graduate (>12th)	29	20.7
Age groups (in years)		
21-30	28	20.0
31-40	22	15.7
41-50	34	24.3
51-60	24	17.1
61-70	22	15.7
71-80	10	7.1
Occupation		
Govt personals	10	7.1
Herbal healers	5	3.6
Farmers	54	38.6
Casual labourer	24	17.1
Homemaker	34	24.3
Businessmen	13	9.3

Diversity of Medicinal Plants

The present study reported 114 medicinal plant species belonging to 54 families (Table 2). Asteraceae was represented by 13 species followed by Lamiaceae (10 spp.), Rosaceae (8 spp.), Rubiaceae (5 spp.), Gentianaceae and Polygonaceae (4 spp.

each), Amaranthaceae, Berberidaceae, Brassicaceae, Plantaginaceae, Ranunculaceae, Urticaceae and Zingiberaceae (3 spp. each), Betulaceae, Boraginaceae, Fabaceae, Hypericaceae, Lauraceae, Liliaceae, Orchidaceae, Pinaceae and Pteridaceae (2 spp. each) and the remaining 32 families were represented by single species each (Table 2). These results corroborate prior ethnomedicinal investigations in Himachal Pradesh (Kumari *et al.* 2018; Rani *et al.* 2014; Kumar *et al.* 2019; Thakur *et al.* 2024) as well as outside India (Awan *et al.* 2023; Jaric *et al.* 2024; Maiyo *et al.* 2024).

Habit of medicinal plants

The study revealed herbs (75%; 86 species) as the most commonly utilized plant form, followed by shrubs and trees (11%; 12 species each) and climbers (3%; 4 species) (Fig. 2). The frequent use of herbs for therapeutic purposes seems to correlate with the prevalence of herbaceous plant forms in the Kalatop Khajjiar Wild Life Sanctuary (Kumar et al. 2018). This dominance of herbs is a recognized and common phenomenon observed in cold temperate zones worldwide (Kermavnar *et al.* 2022; Taylor *et al.* 2023).

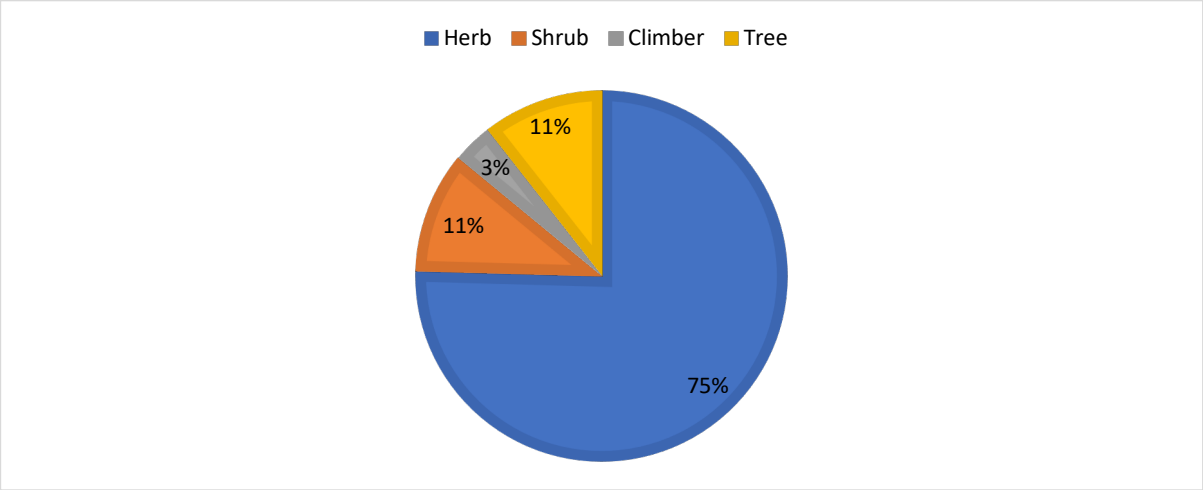

Figure 2. Habit of the medicinal plants in the study area.

Plant parts used

The findings indicated that leaves were the most commonly used parts of the plant, comprising 40.1 % of the total, followed by roots (15.3%), whole plant (11.7%), fruits (7.3%), flower (5.8%), seeds and rhizomes (5.1% each), bark (3.6%), stem (2.2%), bulb (1.5%), aerial parts (1.5), pseudobulb (0.7%) and rhizome (Fig. 3). The frequent use of leaves in herbal preparations is consistent with previous investigations in India (Sahu *et al.* 2014; Batool *et al.* 2023; Singh *et al.* 2024). The majority of participants indicated that leaves are conveniently accessible, abundant, and quickly obtainable. From a scientific standpoint, leaves serve as active sites for the synthesis of various secondary metabolites (Ozyigit *et al.* 2023). Most of the plants are used to address single ailments, while some plants have multiple applications and can be classified into various categories of use.

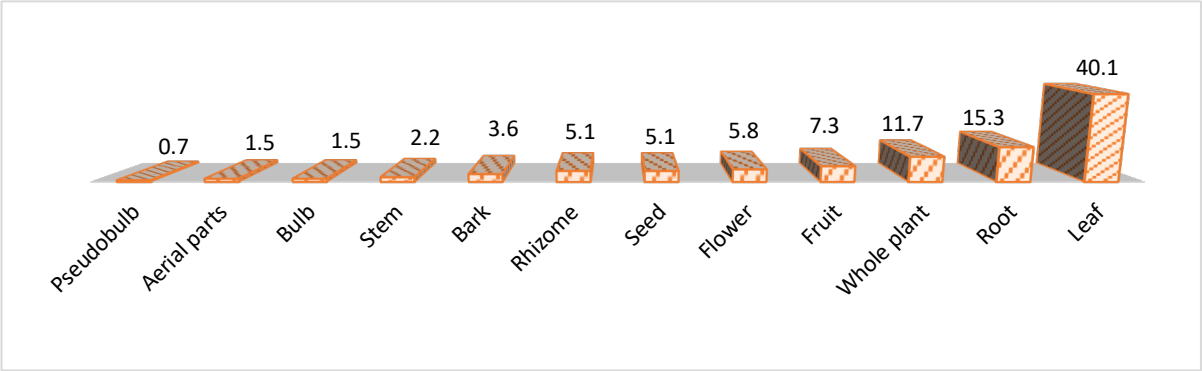

Figure 3. Percentage of plant parts used in herbal preparations in the study area.

Mode of drug preparation and route of administration

The preparation of folk medicine involved diverse methods utilizing different forms of herbal preparations. Use of herbal preparation in paste form (33%) was the dominant mode followed by decoction (27%), powder (13%), juice (7%), eaten raw (6%), poultice and infusion (5% each), cooked (2%), rubbed, oil and smoke (1% each) (Fig. 4). The practice of using preparations in paste for treating ailments concurs with earlier reports from Himachal Pradesh (Thakur *et al.* 2024), other parts of India (Rajakumar & Shivanna, 2009; Tushar *et al.* 2010; Chauhan *et al.* 2020) and neighboring countries (Khakurel *et al.* 2022; Jan *et al.* 2022). The primary mode of drug administration among the local populace was oral (59%) followed by topical (40%) and inhalation (1%). The findings of this study support the earlier studies from Himachal Pradesh (Thakur *et al.* 2023), other parts of India (Sharma *et al.* 2023; Ralte & Singh, 2024) and neighboring countries (Sharif *et al.* 2022). The present study reported the use of 51 plant species for more than one ailment treatment. This may be due to the occurrence of multiple metabolites in a single plant (Wang *et al.* 2019), along with the ability of same chemical compound to target different pathogens (Khameneh *et al.* 2021).

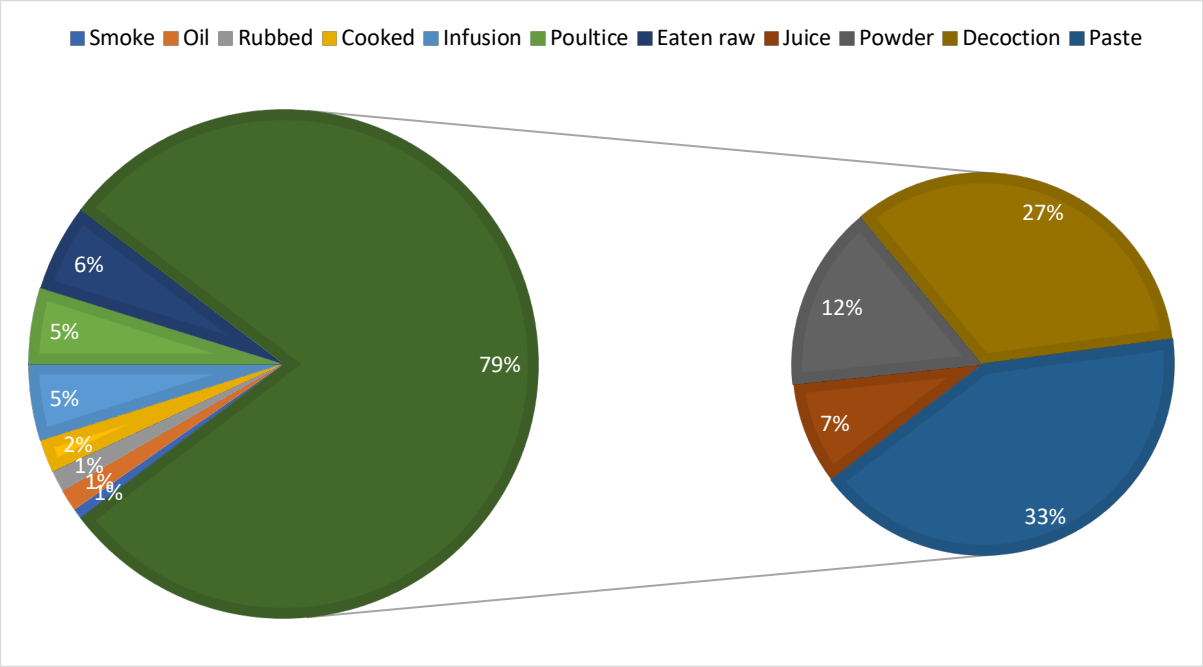

Figure 4. Mode of herbal preparation in the study area.

Relative Frequency of Citation (RFCs)

Out of 1031 use reports for 114 plant species from the study area (Table 2), *Acorus calamus* L. had the maximum number of use reports (RFC =0.20) followed by *Viola canescens* Wall and Taxus contorta Griff. (RFC=0.19 each), *Berberis lycium* Royle (RFC=0.17), *Oxalis corniculata* L., and *Urtica dioica* L. (RFC=0.16 each), *Rhododendron arboreum* Sm. (RFC=0.15), *Verbascum thapsus* L. and *Galinsoga parviflora* Cav. (RFC=0.14). The high reported usage of the aforementioned medicinal plants may be attributed to their widespread availability and the knowledge possessed by local people, rendering them the preferred choice for treating health issues.

The use of *Acorus calamus* L. for treating cough and cold, bronchitis and rheumatism is in line with previous findings from Himachal Pradesh (Table 2). Similar uses have been reported from other parts of India (Yabesh *et al.* 2014; Kumar *et al.* 2019) and from neighboring countries (Dhami, 2008; Shu *et al.* 2018). In addition, Acorus is used to treat stomach ache (Rawat *et al.* 2023). A study by Jain (1989) showed that in Bihar, the paste of rhizome of Acorus is used as protection from smallpox. In the Unani system of medicine, it is used in the treatment of epilepsy, insanity and paralysis (Shah, 2024). The dried rhizome of *A. calamus* contains yellow aromatic volatile oils that are rich in a variety of compounds at different concentrations including a-asarone, b-asarone, c-asarone, calamene, calamenenol, a-pinene, camphene, p-cymene, eugenyl acetate, eugenol, isoeugenol, calamol, azulene, dipentene, methyleugenol, asaron aldehyde, terpinolene, 1,8-cineole, camphor, a-caryophyllene, and various hydrocarbons. β-asarone exhibits potential anti-tumor properties through its ability to hinder the proliferation and invasion of cancer cells, induce apoptosis, suppress tumor angiogenesis, and promote cell cycle arrest (Zhao *et al.* 2023). β-asarone found in *Acorus* has also been shown to exhibit neuroprotective properties (Bai *et al.* 2020). The extract of the rhizome possesses antioxidant, anti-inflammatory, and bronchodilator properties (Mukherjee *et al.* 2007).

Table 2. List of medicinal plants traditionally used by people living near Kalatop Khajjiar Wildlife Sanctuary, Chamba, Himachal Pradesh, India.

Family	Botanical name/Voucher No. (CPU)	Local Name	Life form	Part used	Form of usage	Route of administration	Medicinal uses (URs)	ICPC	FC	Similar uses reported previously/New Report	IUCN status
Acoraceae	*Acorus calamus* L./CPUH14232	Barya	Herb	Rhizome	Paste, decoction	Topical	Joint pain (10) Cough and cold (12) Bronchitis (6)	SKE-L RES-R	28	Guleria & Vasishth (2009), Vidyarthi *et al.* (2013), Kumar & Kumar (2014), Kumari *et al.* (2018), Kumar *et al.* (2019), Sharma *et al.* (2020), Rawat *et al.* (2023), Thakur *et al.* (2024)	LC
Amaranthaceae	*Achyranthes aspera* L./CPUH14192	Umbal Kanda	Herb	Seeds, Roots	Powder, Paste	Oral, Topical	Cough and cold (15) Joint pain (3)	RES-R SKE-L	18	Guleria & Vasishth (2009), Thakur (2011), Kumari *et al.* (2018), Kumar *et al.* (2019), Kumari & Verma (2022), Thakur *et al.* (2025)	NE
	Achyranthes bidentata Blume/CPUH14096	Puthkanda	Herb	Whole plant	Decoction	Oral	Mouth ulcers (4)	ORA	4	Kumari *et al.* (2018), Kumar *et al.* (2019)	NE
	Cyathula tomentosa (Schult.) Moq./CPUH14177	Litra	Herb	Leaves	Decoction	Oral	Digestive problems (7)	GAS-D	7	Kumar *et al.* (2019)	NE
Apiaceae	*Chaerophyllum reflexum* Lindl. /CPUH14097	Bhai	Herb	Roots, Seeds	Powder, Infusion	Oral	Cough and cold (6) Stomach problems (8)	RES-R GAS-D	14	Thakur *et al.* (2014) Kumar *et al.* (2019)	NE
Apocynaceae	*Vincetoxicum hirundinaria* Medik. /CPUH14188	Kadvibooti	Herb	Whole plant	Juice	Oral	Boils (7)	DER-S	7	Kumari *et al.* (2018), Kumar *et al.* (2019)	NE
Araceae	*Arisaema jacquemontii* Blume /CPUH14083	Kiderikukdi	Herb	Bulbs	Paste	Topical	Paralysis in cattles (2) Knee Pain (1) Sprain (1) Ring worm (5)	NER-N SKE-L SKE-L DER-S	9	NR NR Kumar *et al.* (2019) Kumar *et al.* (2019)	LC
Asparagaceae	*Polygonatum verticillatum* (L.) All. /CPUH14203	Salam Mishri	Herb	Rhizome	Powder	Oral	Kidney problems (8) General weakness (2)	URO-U MET-T	10	Negi & Chauhan (2009), Samant *et al.* (2007), Kumar *et al.* (2019), Bhardwaj *et al.* (2020), Thakur *et al.* (2020)	EN

Asteraceae	*Achillea millefolium* L./CPUH14159	Gandhana	Herb	Leaves	Decoction	Oral	Cough and cold (7)	RES-R	7	Sharma & Lal (2005), Thakur *et al.* (2014), Kumari *et al.* (2018), Radha *et al.* (2019), Kumar *et al.* (2019), Chauhan *et al.* (2020), Sharma *et al.* (2020) Thakur *et al.* (2020), Radha *et al.* (2022)	LC
	Ageratum conyzoides L./CPUH14189	Ukalbooti	Herb	Leaves	Juice	Oral	Cuts and Wounds (11)	DER-S	11	Kumari *et al.* (2018)	NE
	Ainsliaea aptera DC. /CPUH14019	Mukhnihani	Herb	Roots	Powder	Oral	Stomach-ache (9)	GAS-D	9	Sharma *et al.* (2005), Samant *et al.* (2007), Boktapa & Sharma 2010, Thakur *et al.* (2014), Kumar *et al.* (2019), Thakur *et al.* (2024)	NE
	Anaphalis triplinervis (Sims) C.B.Clarke/CPUH14178	Bhoo	Herb	Leaves, Roots	Paste	Oral, Topical	Menstrual problems (3), Skin problems (2) Wounds (2)	GYN (X) DER-S DER-S	7	NR NR Kumar *et al.* (2020) Kumar *et al.* (2020)	NA
	Artemisia absinthium L./CPUH14099	Afsantee n	Herb	Leaves	Juice	Oral	Intestinal worms (10)	PAR	10	Sharma & Samant (2017)	NE
	Artemisia indica Willd. /CPUH14153	Charmar	Herb	Leaves	Juice	Oral	Knee pain (2) Jaundice (5) Headache (2)	SKE-L LIV NER-N	9	NR NR NR	NE
	Bidens Pilosa L./CPUH14191	Gumber	Herb	Leaves	Powder	Oral	Cough and cold (5)	RES-R	5	Kumar *et al.* (2019)	LC
	Cirsium wallichii DC./CPUH14125	Bungsee	Herb	Leaves	Powder	Oral	Stomachache (16)	GAS-D	16	Kumari *et al.* (2018), Thakur *et al.* (2024)	NE
	Galinsoga parviflora Cav./CPUH14185	Banmara	Herb	Leaves	Paste	Topical	Snakebite (7) Wounds (12)	ANT DER-S	19	Kumari *et al.* (2018), Kumar *et al.* (2019)	NE
	Oreoseris gossypina (Royle) X.D. Xu & V.A.Funk/CPUH14038	Kupdugha a	Herb	Roots	Powder	Oral	High blood pressure (3) Gastric problems (6)	CAR-K GAS-D	9	Kumari *et al.* (2018), Kumar *et al.* (2019)	NE
	Pseudognaphalium hypoleucum (DC.) Hilliard & B.L.Burtt/CPUH14112	Goiphul	Herb	Leaves	Paste	Topical	Boils (2)	DER-S	2	Kumari *et al.* (2018)	NE

	Senecio graciliflorus DC. /CPUH14107	Zerjum	Herb	Flowers, Roots	Paste	Topical	Headache (NR) (7) Insect bite (4)	ANT NER-N	11	NR Sharma & Samant (2017), Kumar *et al.* (2019), Thakur *et al.* (2020)	NE
	Solidago virgaurea L./CPUH14208	Pinjaphool	Herb	Whole plant	Decoction	Oral	Bladder stones (2)	URO-U	2	NR	NE
Balsaminaceae	*Impatiens sulcata* Wall. /CPUH14057	Mehndi	Herb	Seeds	Paste	Topical	Skin problem (8)	DER-S	8	Kumari *et al.* (2018)	NE
Berberidaceae	*Berberis lycium* Royle/CPUH14058	Kemalu	Shrub	Fruits, Roots	Eaten raw, Powder, Decoction	Oral	Kidney stones (7) Sore throat (3) Toothache (2) Diabetes (3) Cough (9)	URO-U ORA ORA MET-T RES-T	24	NR NR Thakur (2011), Rani *et al.* (2013), Vidyarthi *et al.* (2013), Singh & Thakur (2014), Thakur *et al.* (2016), Kumari *et al.* (2018), Singh *et al.* (2018), Radha *et al.* (2019), Kumar *et al.* (2019), Chander & Sharma (2020), Raghuvanshi *et al.* (2021), Radha *et al.* (2022), Thakur *et al.* (2025)	LC
	Berberis napaulensis(DC.) Spreng. /CPUH14005	Jharor	Shrub	Flowers, Fruits	Eaten raw, Paste	Oral	Fever (4)	LIV	4	NR	NE
	Podophyllum hexandrum Royle/CPUH14041	Bankakru	Herb	Rhizome, Fruits	Paste, Eaten raw	Topical, Oral	Skin diseases (4) Constipation (6) Cancer (2)	DER-S GAS-D CAN	12	Samant *et al.* (2007), Guleria & Vasishth (2009), Sharma *et al.* (2017), Sharma & Samant (2014), Thakur *et al.* (2014), Kumari *et al.* (2018), Kumar *et al.* (2019), Bhardwaj *et al.* (2020), Thakur *et al.* (2020)	EN
Betulaceae	*Alnus nitida* (Spach) Endl./CPUH14217	Piak	Tree	Leaves	Paste	Topical	Cuts and Wounds (6)	DER-S	6	Kumari *et al.* (2018), Kumar *et al.* (2019)	LC
	Betula alnoides Buch. - Ham. ex D.Don/CPUH14002	Bhujpatra	Tree	Leaves	Paste	Topical	Skin problems (5) Cuts (8)	DER-S	13	Kumari *et al.* (2018)	LC

Boraginaceae	*Cynoglossum lanceolatum* Forssk. /CPUH14204	Gumbri	Herb	Leaves	Decoction	Oral	Cough and cold (3)	RES-R	3	Kumar *et al.* (2019)	NE
	Cynoglossum zeylanicum (Sw. ex Lehm.) Thunb. ex Brand/CPUH14084	Gumbri	Herb	Leaves	Decoction	Oral	Respiratory problems (6)	RES-R	6	Kumari *et al.* (2018), Kumar *et al.* (2019)	NE
Brassicaceae	*Cardamine impatiens* L./CPUH14020	Saag	Herb	Leaves	Paste	Topical	Joint pain (6)	SKE-L	6	Kumar *et al.* (2019)	NE
	Circaea alpina L./CPUH14119	Kaya	Herb	Whole plant	Paste	Topical	Sores (10)	DER-S	10	Kumari *et al.* (2018)	NE
	Nasturtium officinale W.T.Aiton/CPUH14147	Paaniras aag	Herb	Leaves	Cooked	Oral	Constipation (7)	GAS-D	7	Kumar *et al.* (2019)	LC
Buxaceae	*Sarcococca saligna* (D.Don) Müll.Arg./CPUH14174	Chirindu /Dium	Shrub	Leaves	Paste	Topical	Burns (6) Rheumatism (2)	DER-S SKE-L	8	Rani & Rana (2014), Kumar *et al.* (2019)	NE
Cannabaceae	*Celtis australis* L./CPUH14224	Khirk	Tree	Fruits	Eaten raw	Oral	Stomach ache (11)	GAS-D	11	Attri (2013)	LC
Caprifoliaceae	*Valeriana jatamansi* Jones ex Roxb./CPUH14045	Mushkbala	Herb	Roots	Decoction	Oral	Urinary problems (8) Stomachache (7)	URO-U GAS-D	15	Sharma & Lal (2005), Sharma *et al.* (2005), Samant *et al.* (2007), Rani *et al.* (2013), Vidyarthi *et al.* (2013), Kumar *et al.* (2019)	CR
Celastraceae	*Parnassia nubicola* Wall. ex Royle/CPUH14201	Futka	Herb	Root	Paste	Topical	Cuts and Wounds (5)	DER-S	5	Vidyarthi *et al.* (2013), Kumar *et al.* (2020)	NE
Caryophyllaceae	*Acanthophyllum cerastioides* (D.Don) Madhani &Zarre/CPUH14036	Koku	Herb	Whole plant	Decoction	Oral	Cough (6)	RES-R	6	Kumar *et al.* (2019)	NE
Crassulaceae	*Rosularia rosulata* (Edgew.) H. Ohba/CPUH14211	Hieun sail	Herb	Whole plant	Paste	Topical, Oral	Headache (6) Gangrene (2) Skin diseases (6)	NER-N DER-S	14	NR NR Sharma & Samant (2017), Kumari *et al.* (2018), Kumar *et al.* (2019)	NE

Dioscoreaceae	*Dioscorea deltoidea* Wall. ex Griseb. /CPUH14059	Khaldri	Climber	Rhizome	Paste, Juice	Topical, Oral	Roundworms (8) Rheumatism (4) Piles (2)	SKE-L GNT PAR	14	Samant *et al.* (2007), Guleria & Vasishth (2009), Attri (2013), Negi & Sharma (2016), Kumari *et al.* (2018), Kumar *et al.* (2019), Rana *et al.* (2021)	EN
Ericaceae	*Rhododendron arboreum* Sm./CPUH14061	Chiu	Tree	Flowers, Leaves	Juice, Paste	Oral, Topical	High Blood Pressure (7) Diabetes (3) Nose bleeding (7) Headache (4)	CAR-K MET-T BLOOD-B NER-N	21	NR Kumar *et al.* (2013), Singh & Thakur (2014), Sharma & Samant (2017), Thakur & Sarika (2016), Arora *et al.* (2018), Kumari *et al.* (2018), Kumar *et al.* (2019), Negi & Chauhan (2009), Chauhan *et al.* (2021), Attri (2023), Thakur *et al.* (2025)	LC
Fabaceae	*Indigofera heterantha* Wall. ex Brandis/CPUH14160	Kathi	Shrub	Leaves	Decoction	Oral	Diarrhea (4) Dysentery (9)	GAS-D	13	Sharma & Samant (2017), Kumari *et al.* (2018), Kumar *et al.* (2019)	LC
	Sunhangia elegans (DC.) H.Ohashi & K.Ohashi/CPUH14136	Pre	Shrub	Leaves	Powder	Oral	Stomachache (7)	GAS-D	7	Mehta *et al.* (2021)	LC
Fagaceae	*Quercus leucotrichophora* A.Camus/CPUH14006	Ban	Tree	Bark	Decoction	Oral	Asthma (9)	RES-R	9	Sharma & Samant (2017), Arora *et al.* (2018), Sharma *et al.* (2018)	NE
Gentianaceae	*Gentiana argentea* (Royle ex D.Don) Royle ex D.Don/CPUH14054	Pungen karpo	Herb	Whole plant	Decoction	Oral	Fever (11)	LIV	11	Kumar *et al.* (2019)	NE
	Swertia cordata (G.Don) Wall. ex C.B.Clarke/CPUH14179	Pahadi Chirayata	Herb	Whole plant	Decoction	Oral	Constipation (6)	GAS-D	6	Kumar *et al.* (2019)	NE
	Swertia purpurascens (D.Don) C.B.Clarke/CPUH14023	Pahadi Chirayata	Herb	Leaves	Decoction	Oral	Fever (11)	LIV	11	Kumari *et al.* (2018), Kumar *et al.* (2019)	NE

Geraniaceae	*Geranium lucidum* L./CPUH14018	Chhota Geranium	Herb	Whole plant	Decoction	Oral	Fever (9)	LIV	9	Kumar *et al.* (2019)	NE
	Geranium wallichianum D.Don ex Sweet/CPUH14128	Lal jari	Herb	Roots	Decoction, Infusion	Oral, Topical	Cold (6) Dysentery (5) Eye problem (2)	RES-R GAS-D EYE-F	13	Sharma *et al.* (2005), Samant *et al.* (2007), Kumar *et al.* (2019), Thakur *et al.* (2024)	LC
Hypericaceae	*Hypericum perforatum* L./CPUH14055	Basanti	Herb	Roots	Paste	Topical	Wounds (7)	DER-S	7	Singh & Thakur (2014), Sharma & Samant (2017), Kumari *et al.* (2018), Thakur *et al.* (2024)	LC
	Hypericum uralum Buch. -Ham. ex D.Don/CPUH14155	Basant	Shrub	Flowers	Infusion	Topical	Joint Pain (3)	SKE-L	3	Kumari *et al.* (2018)	NE
Hypoxidaceae	*Hypoxis aurea* Lour. /CPUH14170	Bansiru	Herb	Whole plant	Infusion	Topical	Oedema (5)	DER-S	5	Kumari *et al.* (2018)	NE
Lamiaceae	*Ajuga parviflora* Benth. /CPUH14014	Neelkanthi	Herb	Leaves	Cooked, Juice, Paste	Oral, Topical	Liver problem (6 Toothache (4) Headache (2) Diabetes (3) Piles (3)	LIV ORA NER-N MET-T GNT	18	NR NR NR Thakur *et al.* (2016), Singh *et al.* (2018), Radha *et al.* (2021), Rawat *et al.* (2023)	NE
	Clinopodium umbrosum (M.Bieb.) K.Koch/CPUH14035	Birchee	Herb	Whole plant	Decoction	Oral	Heart problem (5)	CAR-K	5	Kumar *et al.* (2019)	NE
	Isodon coetsa (Buch. -Ham. ex D.Don) Kudô/CPUH14164	Chichri	Herb	Leaves	Infusion	Oral	Gastric problems (4)	GAS-D	4	Kumari *et al.* (2018)	NE
	Isodon lophanthoides (Buch. -Ham. ex D.Don) H.Hara/CPUH14132	Shainl	Herb	Leaves	Infusion	Oral	Gastric problems (4)	GAS-D	4	Kumari *et al.* (2018)	NE
	Isodon rugosus (Wall. ex Benth.) Codd/CPUH14070	Kuthal	Herb	Leaves	Powder	Oral	Gastric problems (6) Fever (5)	GAS-D LIV	11	Kumari *et al.* (2018), Kumar *et al.* (2019)	NE
	Mentha longifolia (L.) L./CPUH14131	Jangli Pudina	Herb	Leaves	Paste, Decoction	Oral	Joint pain (3) Stomach-ache (4)	SKE-L GAS-D	7	Attri (2013), Vidyarthi *et al.* (2013), Pal *et al.* (2014), Sharma *et al.* (2014), Thakur *et al.* (2014), Sharma & Rana (2016), Kumari *et al.* (2018), Thakur *et al.* (2020), Thakur *et al.* (2024)	LC

	Micromeria biflora (Buch. -Ham. ex D.Don) Benth./CPUH14090	Ban Ajwain	Herb	Leaves	Decoction, Paste	Oral, Topical	Cold (4), Wounds (7)	RES-R DER-S	11	Thakur *et al.* (2016), Kumari *et al.* (2018), Kumar *et al.* (2019), Kumari & Verma (2022)	NE
	Origanum vulgare L./CPUH14142	Ban Tulsi	Herb	Leaves	Decoction, Paste	Oral, Topical	Cold (8) Fever (3) Cuts and burns (5)	RES-R LIV DER-S	16	Sharma & Lal (2005), Vidyarthi *et al.* (2013), Dutt *et al.* (2014), Rani& Rana (2014), Sharma *et al.* (2014), Pandey & Singh (2016), Thakur *et al.* (2016,) Singh *et al.* (2018), Kumar *et al.* (2019), Chauhan *et al.* (2020), Thakur *et al.* (2020)	NE
	Prunella vulgaris L./CPUH14194	Udal	Herb	Whole plant	Powder,	Oral	Fever (3) Cold (2) Headache (1)	LIV RES-R NER-N	6	Negi & Chauhan (2009), Samant *et al.* (2007), Sharma & Samant (2017), Kumar *et al.* (2019), Thakur *et al.* (2024)	LC
	Salvia nubicola Wall. ex Sweet/CPUH14105	Makhiar	Herb	Leaves	Decoction	Oral	Cough and cold (2)	RES-R	2	Kumari *et al.* (2018), Kumar *et al.* (2019)	NE
Lauraceae	*Machilus duthiei* King ex Hook.f./CPUH14071	Chaan	Tree	Bark, Leaves	Decoction, Paste	Oral, Topical	Skin ulcers (3) Asthma (5)	RES-R DER-S	8	NR	LC
	Neolitsea pallens (D.Don) Momiy. &H.Hara/CPUH14202	Chirindi	Tree	Seeds	Oil	Topical	Body ache (3)	OTH-A	3	NR	LC
Liliaceae	*Lilium polyphyllum* D.Don/CPUH14214	Kakoli	Herb	Bulbs	Powder	Oral	Fever (5) General weakness (2)	LIV MET-T	7	Samant *et al.* (2007), Kumar *et al.* (2019), Radha *et al.* (2019), Mehta *et al.* (2021)	CR
Linaceae	*Reinwardtia indica* Dumort. /CPUH14060	Basant	Shrub	Leaves, Stem	Paste, Powder	Topical, Oral	Syphilis (2) Wounds myiasis (3)	GNT DER-S	5	NR Kumar *et al.* (2021)	NE
Onagraceae	*Epilobium royleanum* Hausskn./CPUH14093	Gulabiphul	Herb	Leaves	Paste	Topical	Ringworm (6)	DER-S	6	Kumar *et al.* (2019)	NE
Orchidaceae	*Epipactis helleborine* (L.) Crantz/CPUH14102	Jadi booti	Herb	Stem, Leaves	Decoction	Oral	Toxins in Blood (2)	MET-T	2	Sharma & Samant (2017), Kumar *et al.* (2019)	NE
	Malaxis muscifera (Lindl.) Kuntze/CPUH14088	Rishbhak	Herb	Pseudobulb	Powder	Oral	General weakness (3)	MET-T	3	Sharma & Samant (2017), Kumar *et al.* (2019)	VU

Orobanchaceae	*Pedicularis pectinata* Wall. ex Benth. /CPUH14167	Ganesh Phul	Herb	Leaves	Decoction	Oral	Alopecia (4)	DER-S	4	NR	NE
Oxalidaceae	*Oxalis corniculata L./CPUH14175*	Amlori	Herb	Leaves	Paste, Juice	Topical, Oral	Urtica Sting (2) Nosebleed (3) Cuts and burns (13) Loss of appetite (2) Vomiting (3)	ANT BLOOD-B DER-S GAS-D	23	NR NR Thakur *et al.* (2014), Sharma & Samant (2017), Kumar *et al.* (2019), Kumari and Verma (2022), Thakur *et al.* (2024), Thakur *et al.* (2025)	NE
Papaveraceae	*Corydalis cornuta* Royle/CPUH14184	Chitra jhar	Herb	Roots	Poultice	Topical	Inflammation (6)	DER-S	6	Kumar *et al.* (2019)	NE
Phrymaceae	*Phryma leptostachya* L/CPUH14076	Ladbad eGhaas	Herb	Roots	Poultice	Topical	Boils (4)	DER-S	4	Kumar *et al.* (2019)	NE
Pinaceae	*Abies pindrow* (Royle ex D.Don) Royle/CPUH14111	Rai	Tree	Needles	Decoction	Oral	Respiratory problems (9)	RES-R	9	Sharma & Samant (2017), Kumari *et al.* (2018)	LC
	Cedrus deodara (Roxb. ex D.Don) G.Don/CPUH14221	Diyar	Tree	Bark	Decoction	Oral	Gastric problems (5)	GAS-D	5	Chaudhary *et al.* (2011)	LC
Plantaginaceae	*Plantago himalaica* Pilg. /CPUH14025	Isbgol	Herb	Leaves, Seeds	Cooked	Oral	Dysentery (3)	GAS-D	3	Samant *et al.* (2007), Kumar *et al.* (2019)	NE
	Plantago lanceolata L./CPUH14040	Isbgol	Herb	Leaves	Infusion, Paste	Oral, Topical	Asthma (5) Wounds (3) Sores (1)	RES-R DER-S	9	Sharma *et al.* (2018), Rawat *et al.* (2023)	NE
Polygonaceae	*Bistorta amplexicaulis* (D.Don) Greene/CPUH14101	Masloon	Herb	Roots	Decoction	Oral	Cough and cold (2)	RES-R	2	Sharma & Samant (2017), Kumar *et al.* (2019)	NE
	Persicaria capitata (Buch.-Ham. ex D.Don) H.Gross/CPUH14077	Lal Gha	Herb	Whole plant	Decoction	Oral	Snakebite (1) Insect bite (3) Acidity (3) Indigestion (6)	ANT GAS-D GAS-D GAS-D	13	Kumar *et al.* (2019), Chauhan *et al.* (2021)	NE
	Persicaria nepalensis (Meisn.) H.Gross/CPUH14081	Trod	Herb	Whole plant	Poultice	Topical	Swelling (3)	DER-S	3	Kumari *et al.* (2018), Kumar *et al.* (2019)	NE
	*Rumex hastatus*D.Don/CPUH14163	Amlora	Herb	Leaves	Rubbing, Poultice	Topical	Insect bite (7) Boils (6)	ANT DER-S	13	Sharma & Samant (2017)	NE
	Rumex nepalensis Spreng. /CPUH14075	Albala	Herb	Leaves, Roots	Rubbed	Topical	Skin warts (4) *Urtica* bite (3)	DER-S ANT	7	Vidyarthi *et al.* (2013), Kumar *et al.* (2019), Pal *et al.* (2020)	NE

Primulaceae	*Primula denticulata* Sm./CPUH14069	Guna	Herb	Leaves and flowers	Decoction	Oral	Cough and Cold (6)	RES-R	6	NR	NE
Pteridaceae	*Adiantum venustum* D.Don/CPUH14022	Chirota	Herb	Leaves	Paste, Decoction	Topical, Oral	Piles (6) Hair fall (8)	GNT DER-S	14	NR	NE
	Onychium lucidum (D.Don) Spreng./CPUH14053	Sulu	Herb	Rhizome	Powder	Oral	Fever (2)	LIV	2	NR	NE
Ranunculaceae	*Aquilegia pubiflora* Wall. ex Royle/CPUH14026	Thandi buti	Herb	Aerial parts	Paste	Topical	Skin problems (10)	DER-S	10	Kumari *et al.* (2018)	NE
	Ranunculus distans D.Don/CPUH14235	Jaldaru	Herb	Leaves	Poultice, Paste, Powder	Topical, Oral	Cuts and wounds (5) Alopecia (2) Swollen testicles (2)	DER-S DER-S GNT	9	NR	NE
	Thalictrum foliolosum DC. /CPUH14051	Machhar Mar	Herb	Root	Paste	Topical	Skin diseases (6)	DER-S	6	Sharma *et al.* (2014), Sharma & Samant (2017), Kumar *et al.* (2019)	NE
Rosaceae	*Agrimonia pilosa* Ledeb./CPUH14011	Kshiri	Herb	Leaves	Juice	Oral	Wounds (11)	DER-S	11	Kumari *et al.* (2018)	NE
	Fragaria nubicola (Lindl. ex Hook.f.) Lacaita/CPUH14029	Kaphal	Herb	Fruits, Leaves	Eaten raw, Paste	Oral, Topical	Constipation (4) Gangrene (3)	GAS-D DER-S	7	NR	NE
	Potentilla indica (Andrews) Th.Wolf	Kaphal	Herb	Leaves	Paste	Topical	Itching (3)	DER-S	3	Pandey & Singh (2016)	NE
	Prinsepia utilis Royle/CPUH14106	Kangora	Shrub	Roots	Poultice	Topical	Rheumatism (9)	SKE-L	9	Boktapa & Sharma 2010, Vidyarthi *et al.* (2013), Singh &Thakur (2014), Thakur & Sarika (2016), Rawat *et al.* (2023)	NE
	Rosa macrophylla Lindl. /CPUH14138	Karer	Shrub	Fruits, flowers	Eaten raw, Decoction	Oral, Topical	Skin rashes (3) Cough and cold (4)	DER-S RES-R	7	NR Rani *et al.* (2013)	NE
	Rosa moschata Herrm. /CPUH14010	Kojai	Climber	Flowers, Fruits	Paste, Eaten raw	Topical, Oral	Burns (3)	DER-S	3	Attri (2023)	NE
	Rubus ellipticus Sm./CPUH14212	Akhre	Shrub	Fruit	Eaten raw	Oral	Diarrhea (3)	GAS-D	3	Radha *et al.* (2021)	LC
	Rubus paniculatus Sm./CPUH14233	Akhre	Climber	Fruit	Eaten raw	Oral	Stomachache (5)	GAS-D	5	Kumari *et al.* (2018), Kumar *et al.* (2019)	NE

Rubiaceae	*Galium acutum* Edgew. /CPUH14143	Kura	Herb	Whole plant	Paste	Topical	Skin problems (9)	DER-S	9	Kumar *et al.* (2019)	NE
	Galium asperifolium Wall. /CPUH14127	Vilayatish ami	Herb	Whole plant	Decocti on	Oral	Kidney Problems (8)	URO-U	8	Sharma & Samant (2017)	NE
	Galium rotundifolium L./CPUH14168	Tara Booti	Herb	Aerial parts	Decocti on	Oral	Jaundice (4)	LIV	4	Sharma & Samant (2017)	NE
	Leptodermis lanceolata Wall. /CPUH14049	Bilan	Shrub	Leaves	Decocti on	Oral	Diarrhea (6)	GAS-D	6	Kumari *et al.* (2018)	NE
	Rubia cordifolia L./CPUH14031	Majithu	Climb er	Leaves, Stem	Paste, Decocti on	Topical, Oral	Parasitic worms (3) Bleeding from injury (3) Boils (6)	PAR BLOOD-B DER-S	12	Negi & Chauhan (2009), Kumar *et al.* (2013), Vidyarthi *et al.* (2013), Singh & Thakur (2014)	NE
Rutaceae	*Boenninghausenia albiflora* (Hook.) Rchb. ex Meisn. /CPUH14079	Pisssumar Buti	Herb	Leaves	Paste	Topical	Infestation with lice and fleas (4)	DER-S	4	Kumar *et al.* (2019), Singh & Thakur (2014)	NE
Sapindaceae	*Aesculus indica* (Wall. ex Cambess.) Hook. /CPUH14052	Goon	Tree	Fruit, seeds	Powder, Paste, Oil	Oral, Topical	Pneumonia (NR) (15) Rheumatism (3)	RES-R SKE-L	18	NR Samant *et al.* (2007), Guleria & Vasishth (2009), Sharma & Samant (2017), Kumar *et al.* (2019), Chauhan *et al.* (2020)	LC
Saxifragaceae	*Bergenia ciliata* (Haw.) Sternb.	Saprotri	Herb	Leaves, Roots	Paste, Powder	Topical, Oral	Urinary problems (5) Kidney Stone (3) Cuts and Burns (6)	URO-U URO-U DER-S	14	NR Kumar *et al.* (2013), Thakur *et al.* (2016), Kumar *et al.* (2018), Singh *et al.* (2018), Kumar *et al.* (2019), Chouhan *et al.* (2020), Chauhan *et al.* (2021), Kumari & Verma (2022), Rawat *et al.* (2023)	LC

Scrophulariaceae	*Verbascum thapsus* L./CPUH14100	Jangli Tambaku	Herb	Seeds, Leaves	Paste, Smoke	Oral, Inhalation	Menstrual problem (4) Indigestion (5) Constipation (4) Boils (7)	GYN (X) GAS-D GAS-D DER-S	20	Negi & Chauhan (2009), Sharma *et al.* (2005), Vdyarthi *et al.* (2013), Thakur *et al.* (2016), Sharma & Samant (2017), Kumari *et al.* (2018), Kumar *et al.* (2021), Thakur *et al.* (2025)	NE
Taxaceae	*Taxus contorta* Griff. /CPUH14015	Barmi	Tree	Bark	Decoction	Oral	High blood pressure (5) Toothache (2) Sore throat (4) Blood purifier (2) Cough and Mouth ulcers (9) Cancer (4)	CAR-K ORA ORA BLOOD-B RES-R CAN-C	26	NR NR NR Singh & Thakur (2014), Sharma & Samant (2017), Sharma *et al.* (2020), Rana *et al.* (2021), Thakur *et al.* (2024)	EN
Thymelaeaceae	*Daphne papyracea* Wall. ex G.Don/CPUH14238	Niggi	Shrub	Leaves	Decoction	Oral	Cough and cold (2)	RES-R	2	Rana *et al.* (2019)	NE
Ulmaceae	*Ulmus wallichiana* Planch. /CPUH14144	Maral	Tree	Leaves, bark	Paste	Topical	Skin Infections (8)	DER-S	8	Kumari *et al.* (2018)	VU
Urticaceae	*Girardinia diversifolia* (Link) Friis/CPUH14149	Ain	Herb	Leaves, Roots	Paste	Topical	Boils (7)	DER-S	7	Chauhan *et al.* (2020), Rana *et al.* (2021)	NE
	Pilea umbrosa Wedd. ex Blume/CPUH14039	Chala	Herb	Leaves	Paste	Topical	Skin Problems (7)	DER-S	7	Kaushal *et al.* (2016)	NE
	Urtica dioica L./CPUH14085	Ain	Herb	Leaves, Roots	Paste	Topical	Mumps (3) Rheumatism (19)	ORA SKE-L	22	NR Uniyal *et al.* (2011), Singh & Thakur (2014), Kumari *et al.* (2018), Kumar *et al.* (2019), Chauhan *et al.* (2021), Rana *et al.* (2021), Kumari & Verma (2022), Thakur *et al.* (2024), Thakur *et al.* (2025)	LC

Violaceae	*Viola canescens* Wall. /CPUH14046	Napalu	Herb	Flowers	Decoction , Juice	Oral	Cough and cold (21) Burning sensation in eyes (6)	RES-R EYE-F	27	Negi & Chauhan (2009), Rani *et al.* (2013), Vidyarthi *et al.* (2013), Rani &Rana (2014), Thakur (2014), Thakur et al. (2016), Sharma & Samant (2017), Kumar *et al.* (2018), Kumari *et al.* (2018), Kumar *et al.* (2019), Chauhan *et al.* (2020), Sharma *et al.* (2020), Kumar *et al.* (2021), Rana *et al.* (2021), Kumari & Verma, (2022), Rawat *et al.* (2023)	NE
Zingiberaceae	*Cautleya spicata* (Sm.) Baker/CPUH14108	Jadhaldu	Herb	Rhizome	Juice	Oral	Stomach problems (9)	GAS-D	9	NR	LC
	Hedychium spicatum Sm./CPUH14089	Ban Haldi	Herb	Rhizome	Decoction	Oral	Asthma (6) Inflammation (2) Pain (2)	RES-R OTH-A DER-S	10	Samant *et al.* (2007), Singh & Thakur (2014), Thakur & Sarika (2016), Sharma & Samant 2017, Sharma *et al.* (2018), Singh *et al.* (2018); Radha *et al.* (2019), Kumar *et al.* (2019; Kumari & Verma, (2022)	LC
	Roscoea alpina Royle/CPUH14121	Musli	Herb	Roots	Paste	Topical	Cuts and Wounds (3)	DER-S	3	Samant *et al.* (2007, Sharma & Samant 2017, Kumar *et al.* (2019)	VU

Inhabitants of the study area use *Viola canescens* Wall. to treat cough and cold, which agrees with earlier studies in Himachal (Chauhan *et al.* 2020; Rawat *et al.* 2023), from other parts of India (Bhat *et al.* 2013), and outside India (Hussain *et al.* 2021). The whole plant extract is utilized for the treatment of leucorrhoea, the regulation of menstrual cycles, and the alleviation of headaches in Uttarakhand. In Nepal, the leaf paste of *V. canescens* is used to treat joint pain and gout (Adhikari *et al.* 2019). Further, flowers are used in epilepsy and cancer (Hamayun *et al.* 2006). Flower Infusion is used as a diuretic and a mild laxative in Italy. The plant possesses antimalarial, analgesic, antispasmodic, and hepatoprotective activity (Abdullah *et al.* 2017). In addition, *V. canescens* is also documented for its antioxidant and antimicrobial properties (Kaundal *et al.* 2024). The plant exhibits anticancer and antifungal properties and is utilized in the treatment of neurological disorders (Rawal et al.2015). *Viola* contains saponins, alkaloids (violin), glucosides, quercitrin, and methyl salicylate as major compounds. The compounds such as emetine, quercetin, and violanthin, isolated from *V. canescens*, are most likely the key contributors to the plant's antioxidant potential (Ahmad *et al.* 2024).

Taxus contorta Griff.) is an invaluable medicinal plant in the Himalayan region and is recognized for its anti-cancerous properties (Singh *et al.* 2017). It is presently classified as an endangered species according to the IUCN Red Data List (Thomas, 2011). The local populace of the Kalatop Khajjiar region uses the bark of *T. contorta* to treat cough, toothache, mouth ulcers, sore throat, and high blood pressure, and as a blood purifier. The results support the previous works from Himachal Pradesh (Sharma *et al.* 2020; Thakur *et al.* 2024) and from neighboring countries (Haq, 2012). Additionally, people of Pakistan use leaves of *T. contorta* in the treatment of rheumatism (Haq, 2012). The leaves and bark of *T. contorta* are used in the extraction of Paclitaxel, a compound recognized for its anti-neoplastic properties. This substance effectively inhibits the proliferation of cancerous cells and is utilized in the therapeutic management of breast and ovarian cancers (Sharma *et al.* 2020). Apart from its significant role, the plant exhibits a range of additional benefits, such as anticonvulsant, analgesic, antipyretic, antibacterial, antifungal, anti-tuberculosis, and hypoglycaemic effects (Majeed *et al.* 2019).

The fruits and roots of *Berberis lycium* Royle are used in the treatment of kidney stones, sore throat, diabetes, cough, jaundice, and toothache. These reports follow the results of previous investigations (Table 2). Besides, it is employed to treat stomach disorders in Gilgit, Pakistan (Hussain *et al.* 2021). In Jammu and Kashmir, local people use bark powder in the treatment of fractured bones, and the stem is used in eye diseases (Singh *et al.* 2024; Thakur *et al.* 2025). The plant possesses antidiabetic, hepatoprotective, antifungal, antihyperlipidemic, antibacterial, anticoccidial, antimutagenic, pesticidal, and wound-healing properties (Shabbir *et al.* 2012). The roots yield an extract known as 'rasaunt,' which is used for treating eye infections (Chopra *et al.* 1976). The principal alkaloid in *B. lyceum* is berberine, belonging to the class of isoquinoline alkaloids and an umbellitine (George *et al.* 2016). Berberine exhibits several biological applications, including its roles as an antioxidant, anticancer, antimicrobial, anti-inflammatory, antidiabetic, antihyperlipidemic, and hepatoprotective (Anjum *et al.* 2023). Punitha *et al.* (2005) have shown that barberine exerts hypoglycemic effects in Type II diabetic rats. Studies have also shown that berberine is a potential drug against Alzheimer's disease (Ismail *et al.* 2023).

Leaves of *Oxalis corniculata* L. are employed for cuts and burns, loss of appetite, vomiting, nosebleed, and to get relief from the burning sensation caused by Urtica Sting. Similar uses were recorded by many researchers from the Himalayan region (Kumar *et al.* 2019; Kumari & Verma, 2022; Thakur *et al.* 2024). In Nepal, *O. corniculata* is used for stomach aches (Badwaik *et al.* 2011). The Boro Tribals of Assam utilize the juice of *O. corniculata* as eye drops to treat conjunctivitis (Srikanth *et al.* 2012). The primary bioactive constituents include flavonoids, alkaloids, terpenoids, saponins, cardiac glycosides, steroids, and tannins (Sarfraz *et al.* 2022). The polyphenolic compounds, flavonoids, and glycosides have been shown to exhibit antibacterial, anticancer, antioxidant, antidiabetic, wound healing, and cardioprotective effects (Bharti *et al.* 2024). Herwin and Nuryanti (2012) found that *O. corniculata* showed antibacterial activity against *Staphylococcus aureus*, *S. mutans*, *S. epidermidis*, *Escherichia coli*, *Salmonella thypi*, *Vibrio* sp., and *Candida albicans* L.

The inhabitants of the study area cook *Urtica dioica* L. as a vegetable and utilize its leaves and roots for the treatment of rheumatism, which is in line with previous reports (Kumari *et al.* 2018; Kumari & Verma, 2022; Thakur *et al.* 2025). The primary chemical constituents of *U. dioica* L. include flavonoids, volatile substances, fatty acids, tannins, sterols, terpenes, polysaccharides, isolectins, proteins, as well as vitamins and minerals (Joshi *et al.* 2014). *U. dioica* L. exhibits diverse pharmacological properties, which encompass anti-inflammatory, antioxidant, anticancer, antibacterial, and antifungal effects (Taheri *et al.* 2022). In traditional Russian folk medicine, the powdered form of the root and seeds has been employed as a remedy for conditions such as dropsy, diarrhoea, and intestinal worms. Similarly, in African medicinal practices, nettle root is utilized to address diarrhoea and serves as an anthelmintic agent to eliminate intestinal parasites (Seliya & Kothiyal, 2014).

Informant consensus factor (ICF)

This index assesses the consensus among the informants regarding the use of medicinal plants for a particular ailment (Heinrich *et al.* 1998). To calculate the ICF, all documented ailments were organized into 11 different disease categories, as presented in Table 3. This study reveals the ICF range of 0.64 (Endocrine/Metabolic and Nutritional) to 0.90 (Parasites). The highest ICF value (0.90) was obtained for the category Parasites (PAR) (Table 3). This result agrees with previous studies conducted in Himachal Pradesh (Singh *et al.* 1991; Barda *et al.* 2014), other parts of India (Singh *et al.* 2024; Bansal *et al.* 2018), and outside India (Fuhrimann *et al.* 2016). The occurrence of parasitic infestations in the study area may be due to inadequate personal hygiene practices, substandard sanitation conditions, the non-utilization of toilet facilities, farming occupations, and a significant degree of illiteracy within the community.

Table 3. Informant consensus factor for the disease categories.

Ailment categories	Description of ailments	N_t	N_{ur}	ICF
Skin (DER-S)	Cuts, Skin burns, Warts, Hair fall, Skin swelling, Wounds, Skin itching, Boils, Skin problems, Ringworm, Sores, Gangrene, Oedema, Skin ulcers, Alopecia, Wounds myiasis, Scurvy, Skin infections, Infestation with lice and fleas	48	294	0.83
Respiratory (RES-R)	Cold, Cough, Bronchitis, Respiratory problems, Asthma, Pneumonia	27	190	0.86
Digestive (GAS-D)	Diarrhea, Constipation, Dysentery, Indigestion, Digestive problems, Stomach ache, Stomach problems, Vomiting, Loss of appetite, Gastric Problems, Acidity	28	186	0.85
Skeleto-muscular system (SKE-L)	Joint pain, Rheumatism, Knee Pain, Paralysis, Sprain	12	66	0.83
Oral (ORA)	Toothache, Mouth ulcer, Sore throat, Mumps	5	22	0.80
Blood, Blood Forming Organs and Immune Mechanism (BLOOD-B)	Nose bleeding, Blood purifier, Bleeding from Injury	4	15	0.78
Endocrine/Metabolic and Nutritional (MET-T)	Diabetes, General weakness	7	18	0.64
Cardiovascular (CAR-K)	Hypertension, Heart problems	4	20	0.84
Parasites (PAR)	Round worms, Intestinal Worms, Parasitic worms	3	21	0.90
Liver complaints (LIV)	Liver problems, Jaundice, Fever	12	68	0.83
Urological (URO-U)	Kidney problems, Kidney stones, Urinary problems, Bladder stones	6	41	0.87
Nervous system (NER-N)	Headache	6	24	0.78
General and Unspecified (OTH-A)	Body ache	2	5	0.75
Female Gynecological (GYN-X)	Menstrual problems	2	5	0.75
Antidote (ANT)	Snakebite, *Urtica* sting, Insect bite	6	27	0.80
Genital (GNT)	Swollen testicles, Piles, Syphilis	5	15	0.71
Cancer (CAN-C)	Cancer	2	6	0.80
Ophthalmic (EYE-F)	Eye problem, Burning sensation in eyes	2	8	0.85

The high ICF value (0.87) for another important category i.e. Urological problems (URO-U), concurs with earlier studies from Himachal Pradesh (Radha *et al.* 2022; Rawat *et al.* 2023) and other parts of India (Singh *et al.* 2023; Panmei *et al.* 2019). The increased incidence of urological problems in the study area may be attributed to a changed lifestyle, diabetes, obesity, etc. A previous study stated that the severity of the urological condition is found in 50-year-old or older people (Duncan *et al.* 1996). The Respiratory diseases (RES-R), including cough and cold, bronchitis, asthma, pneumonia, etc., are identified as a disease category with a notable ICF of 0.86 (UR=190). These results concur with earlier reports from Himachal Pradesh (Thakur et al. 2024) and other states of India (Batool *et al.* 2023; Singh *et al.* 2024). A significant prevalence of respiratory

problems may be ascribed to the moist and cold environmental conditions characteristic of mountainous regions (Kayani *et al.* 2014) and the inhalation of smoke from fuelwood and coal by the local people.

A strong level of agreement was recorded for the ailments categorized as Digestive disorders (GAS), with an ICF of 0.85 (UR=186). The prevalence of digestive issues among the population can be linked to the practice of open defecation, use of contaminated water, poor hygiene, alcohol consumption, and specific dietary habits. Existing literature also indicates the common occurrence of gastrointestinal problems in Himachal Pradesh (Kumari *et al.* 2022; Thakur *et al.* 2024) and other regions of India (Lal *et al.* 2023; Singh *et al.* 2024). The high ICF (0.85) for the ophthalmic category in the present study may be attributed to aging, dust and smoke, diabetes, and other factors. The strong level of consensus among the informants reflects that the current knowledge and use of traditional practices remain well-established in the study area. The high values of ICF are crucial for identifying plant species that are particularly significant in the search for bioactive compounds (Gazzaneo *et al.* 2005).

Conservation status of the medicinal plants

Six species out of 114 species fall within different threat categories, according to the International Union for Conservation of Nature (IUCN, 2024). The critically endangered species include *Lilium polyphyllum* D.Don. The endangered category encompasses *Podophyllum hexandrum* Royle, *Polygonatum verticillatum* (L.) All., Taxus contorta Griff. *Malaxis muscifera* (Lindl.) Kuntze and *Ulmus wallichiana* Planch are classified as vulnerable (Table 2).

New use reports

A thorough examination of existing literature (Table 2) has identified new uses for certain plant species, including *Adiantum venustum* D.Don (Hair fall, Piles), *Aesculus indica* (Wall. ex Cambess.) Hook (Pneumonia), *Ajuga parviflora* Benth (Liver Problem, Toothache, Headache), *Anaphalis triplinervis* (Sims) C.B.Clarke (Menstural problems, Skin problems), *Arisaema jacquemontii* Blume (Paralysis in cattle, Knee Pain), *Artemisia indica* Willd., Knee pain, Jaundice, Headache), *Berberis lycium* Royle (Kidney stones, Sore throat), *Berberis napaulensis* DC. (Fever), *Bergenia ciliata* (Haw.) Sternb., (Urinary problem in cattle, *Cautleya spicata* (Sm.) Baker (Stomach problems), *Dioscorea deltoidea* Wall. ex Griseb. (Round worms), *Fragaria nubicola* (Lindl. ex Hook.f.) Lacaita (Constipation, Gangrene), *Machilus duthiei* King ex Hook.f. (Skin Ulcers, Asthma), *Neolitsea pallens* (D.Don) Momiy. & H.Hara (Body ache), *Onychium lucidum* (D.Don) Spreng. (Fever), *Oxalis corniculata* L. (Urtica Sting, Nosebleed), *Pedicularis pectinata* Wall. ex Benth. (Alopecia), *Primula denticulata* Sm. (Cough and Cold), *Ranunculus distans* D.Don (Cuts and wounds, Alopecia, Swelling of testicles), *Reinwardtia indica* Dumort. (Syphilis), *Rhododendron arboreum* Sm. (High Blood Pressure), *Rosa macrophylla* Lindl (Scurvy), *Rosularia rosulata* (Edgew.) H.Ohba (Headache, Gangrene), *Rumex hastatus* D.Don (Insect bite), *Senecio graciliflorus* DC. (Headache), *Solidago virgaurea* L (Bladder stones), *Taxus contorta* Griff. (High blood pressure, Toothache, Sore throat), *Urtica dioica* L. (Mumps), *Verbascum thapsus* L. (Menstural problem).

Educational implications of Indigenous medicinal plant knowledge

The present study provides a valuable resource for contextualizing science education through culturally relevant and inquiry-based pedagogies. Frequently cited plant species such as *Acorus calamus*, *Berberis lycium*, *Oxalis corniculata*, *Rhododendron arboreum*, *Viola canescens* can be grown in the school herbal gardens and hands-on classroom projects can be undertaken to teach plant science, health science, and environmental conservation. The plant species with new reported medicinal uses like *Artemisia indica*, *Bergenia ciliata*, *Dioscorea deltoidea Berberis lyceum* offer scope for student-led investigations and community-based learning activities. The inclusion of critically endangered (*Lilium polyphyllum*) and vulnerable species (*Malaxis muscifera*, *Ulmus wallichiana*) will create awareness among students about the conservation issues and understand the urgency of preserving biodiversity. Students can also learn about herbal preparation methods, including paste, decoction, and infusion, to link classroom learning with indigenous healthcare practices. Incorporating this content into science and social studies curricula promotes ecological awareness, respect for Indigenous Knowledge Systems (IKS), and encourages sustainable values as envisioned in NEP 2020. This approach not only builds scientific thinking but also empowers students to take care of cultural and ecological heritage.

Conclusion

The present study reported 114 plant species utilized in primary health care within the Kalatop Khajjiar Wildlife Sanctuary. *Acorus calamus*, *Viola canescens*, *Taxus contorta*, *Berberis lycium*, *Oxalis corniculata*, and *Urtica dioica* are the frequently cited plant species. The present research documented new medicinal uses for 29 plant species, highlighting the practice of herbal medicine based on traditional knowledge in villages around Kalatop Khajjiar Wildlife Sanctuary. Species with new uses include *Adiantum venustum* to control hair fall (UR=8), *Artemisia indica* to treat jaundice (UR=5), *Ajuga parviflora* to treat

liver problems (UR=6), *Berberis lycium* to treat kidney stones (UR=7), *Ranunculus distans to* treat swelling of testicles, *Reinwardtia indica* to treat syphilis (UR=2). It is recommended to conduct phytochemical and pharmacological investigations to provide the necessary scientific proof of their traditional uses, which would enable their consideration for clinical trials.

Declarations

List of abbreviations: CR-Critically Endangered; EN-Endangered; VU-Vulnerable; LC-Least concern; NE-Not evaluated.
Ethics approval and consent to participate: Verbal prior informal consent was obtained before the survey.
Availability of data and material: All the supporting data is available in the article.
Declaration of competing interest: The author declared no competing interest.
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Author's Contribution: SS and KS conceptualized the study. SA and GK conducted the field study. SA, KS and SS wrote the manuscript. KS and SS revised and edited the manuscript.

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