Ethnomedicinal appraisal of the medicinal flora among the sub-alpine and alpine Iindigenous communities of Palas Valley Kohistan, Northern Pakistan

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Research

Abstract

Background: The contemporary research was conducted to explore the ethnomedicinal potential of wild flora exploited by the indigenous communities of Palas valley of Kohistan, Northern Pakistan. It constitutes an important contribution to the knowledge of biological resources used for treatment of ailments through traditional practices.

Methods: Rapid appraisal approach (RAA), semi-structured interviews, and personal monitoring, group discussion with community and interviews with herbalist were carried out to obtain information of ethnomedicinal values. The data gathered from the site was examined using quantitative ethnobotanical indices, viz., informant consensus factor (ICF), use value (UV), and Fidelity level (FL).

Results: The current study recorded 102 plants with medicinal values which belong to 48 families which were described by 243 informants of area (female informants 87, male informants 137 and herbal specialists 19). Family Rosaceae was the abundantly utilized family with 10 reported plants species with medicinal values. Wild herbs were the prime source of herbal medicines (40.19%), followed by wild shrubs (39.21%). Leaves (23%) were the most frequently used plant part, followed by roots (12%) and whole plants (10%), and decoctions were the most preferred preparations.

Conclusions: Indigenous herbal medicines play a major role in the system of local healthcare of Palas valley. The native people prefer to utilize the traditional preparations of herbal plants as remedies for various diseases. The plant with greater UV and FL% is playing vital role in the basic healthcare system. This outcome suggests further phytochemical studies to discover novel biological compounds for the exploration of drugs in future.

Keywords: Ethnomedicinal appraisal, Subalpine, Alpine, Indigenous communities, Palas valley

Background

Ethnobotanical research is the scientific study of how indigenous societies use plants for medical purposes, with a focus on traditional knowledge and cultural practices related with these botanical resources (Tefera & Kim, 2019). Naturalists, pharmacists, and wildlife managers can use medicinal plant information to improve the well-being of their communities, with great preference for those plants with high utilization among mountainous communities for basic healthcare (Ibrar *et al.* 2007). Individuals developed different expertise in various fields in the past by practicing traditional medicine and need to preserve that knowledge for future generations (Khuankaew *et al.* 2014). It takes an active role in understanding the relationship between biodiversity, social norms, and cultural systems (Hussain *et al.* 2022). Every geographic area on the planet has its own therapeutic traditions and practices involving the consumption of medicinal plants (Bartam, 1995). Herbal treatments from various locations are used to treat a variety of human problems (Qayum *et al.* 2016, Jain *et al.* 2007).

As underlined by Cox (2000), the documentation of ethno-medicinal knowledge, emphasizing the importance of native flora, provides essential information for the development of new medications. Qualitative data from many populations demonstrates the therapeutic characteristics of plants, demonstrating their efficiency in treating various illnesses (Norscia & Borgognini, 2006). In the discipline of ethnobotany, quantitative methods for data collection have recently emerged. These methods entail analyzing numerical data in order to analyze cultural variables such as plant flavor and the importance of plant families across communities (Benz *et al.* 2000, Phillips, 1996).

Ethnobotany has far-reaching consequences in a variety of fields. These include its research into the complicated interactions between humans and plants, its participation in biodiversity conservation (particularly in protecting and encouraging indigenous and local botanical knowledge), and its careful recording of data pertaining to regionally prevalent plant species (Gras *et al.* 2019). These species have the potential to be part of different kinds of natural treatments, providing alternative to their pharmaceutical counterparts. Numerous ethnobotany studies have been done in the past few decades with the purpose of comprehensively recording traditional knowledge related with both indigenous and cultured medicinal plants (Guo *et al.* 2022). These study projects delve into the intricate web of societal, cultural, and economic factors (Kumar *et al.* 2021).

The northern part of Pakistan is recognized for its hilly scenery, which features distinct climatic zones, diversified vegetation, and altitude-dependent land use patterns. Given the primarily rural community, wild plants and their derivatives are heavily relied on to meet basic requirements such as shelter, medicine, and food. Because of their easy availability, the need for these assets is continuously increasing (Sundriyal & Sundriyal, 2004, Shaheen *et al.* 2023). Palas, like adjacent valleys, relies on cattle rearing and herd raising as the foundations of the local economy. Seasonally, residents relocate to high-altitude pastures (>3000 m a.s.l.) to graze their animals in the summer, returning to their permanent dwellings (1800-2400 m a.s.l.) in the winter. Because agriculture is underutilized, the population relies on wild plants to support a variety of demands, including food, financial, medicinal, and housing needs (Saqib & Sultan, 2005). Indigenous communities are heavily dependent on traditional healthcare systems for the treatment of various diseases. These communities hold a significant amount of knowledge that needs to be documented and conserved for future generations because, due to the availability of modern healthcare facilities, ethnobotanical knowledge is diminished among indigenous communities. This study seeks to put a light on the potential implications for the livelihoods of local communities in Palas Valley Kohistan, Pakistan, by analyzing the ethnobotanical data. Furthermore, this knowledge has the potential to aid in the creation of novel medical treatments. It is critical to emphasis the lack of studies on the ethnomedicinal qualities of native plants in the defined location. Keeping in view the medicinal plant diversity and therapeutic potential of Palas Valley, this study was designed and conducted to systematically document the indigenous traditional knowledge about numerous plant utilization patterns among the sub-alpine and alpine indigenous communities of Palas Valley, Kohistan, Northern Pakistan.

Materials and Methods

Ethnobotanical field survey and demographic information

This survey of field was conducted in Palas valley Northern Pakistan (Figure 1) with the help of the 25 communities during April 2013 to September 2015. About 243 informants including 15 herbalists were selected randomly with different age groups for interviews (Table 1). Interviews with 137 males, 19 herbalists, and 87 females were conducted in the native language. Initially, data was gathered by regular conversation with informants selected randomly and then local inhabitants were focused who collect plants to use as medicine. Repeated questions were asked to different people to authenticate the data. Further, confirmation of recorded information was made through the Participatory Rural Appraisal (PRA) method involving local people through interviews, discussions with groups and administration of semi-structured questionnaires to

herbalists (Cotton, 1996) Collected data for every plant consist of the local name, parts of plants used, preparation methods, application and administration pathway and plants collection were done in the flower blooming season during April 2013 to September 2014. The vernacular names of plants were gathered with the aid of native people. The method used during the study was planned with only purpose for eliciting the valuable wealth of native knowledge on use of medicinal plant**.**
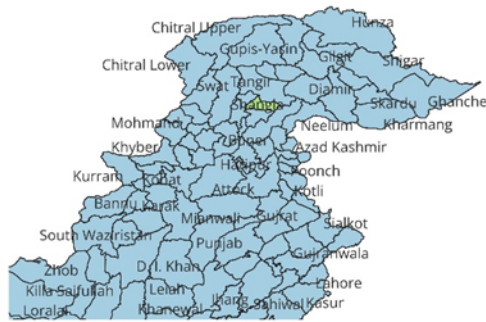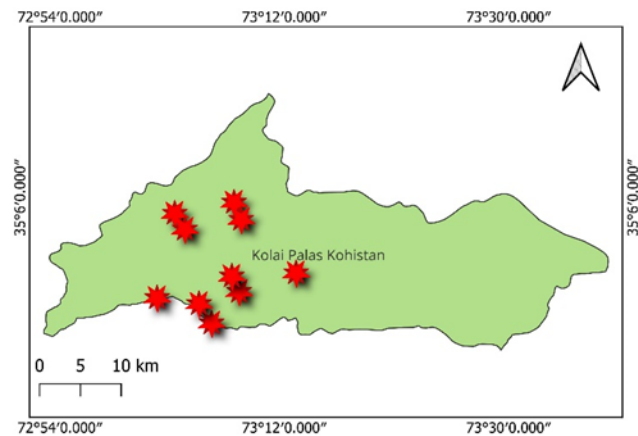

Figure 1. Study area map of Palas valley Northern Pakistan

Table 1. Demographic data of informants.

Demographic Features Gender	Number of Persons	Percentage
Female	91	37.44
Male	152	62.55
Informant category		
Indigenous people	224	92.18
Hakims	19	7.818
Age of Informants		
25-40 years	54	22.22
41-55 years	62	25.51
56-70 years	69	28.39
71 and above	58	23.86
Educational background		
Illiterate	98	40.32
Elementary School level	69	28.39
Secondary School level	36	14.81
High School level	19	7.81
Higher education	21	21.39
Marital Status		
Married	182	74.89
Unmarried	43	17.69
Widowed	18	7.40
Employment Status		
Employed	61	25.10
Farmer	76	31.27
Unemployed	106	43.62

Plant specimen collection and preservation
Specimens of plants were gathered in flowering season or fruiting stage in triplicate. The collected specimens of plants were desiccated and preserved as per routine techniques of herbarium recommended by Jain & Rao (1977) and assessed. Prof. Dr. Manzoor Hussain and Dr. Mushtaq Ahmad identified and confirmed the herbarium specimen with the help of available literature Nasir & Ali, (Eds.) 1970-1979, Nasir & Ali, (Eds.) 1980-1989, Ali & Nasir, 1989-2001, Ali & Qaiser, 1993-2007).

Data analysis
Informant consensus factor (ICF)
The Informant Consensus Factor (ICF) measures informant agreement and plant utilization in respect to several disease categories (Heinrich *et al.* 1998). It is computed by formula given below:

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

The term "Nur" refers to the number of use reports inside a particular use category, whereas "Nt" refers to the number of taxa utilized in that category by all informants. The Indigenous Knowledge Factor (ICF) has a range of 0 to 1. Lower numbers (near to 0) indicate random plant selection or a lack of information exchange among informants about their use. Higher values (nearing 1), on the other hand, imply a defined selection criterion in the community and/or intensive exchange of data among informants.

Use value (UV)
The relative importance of species of plants for indigenous medicinal utilization by native communities was concluded by the use values for plants and was calculated by following (Phillips *et al.* 1994).

$$UVi=\Sigma\ Ui/Ni$$

Where N is the total number of informants and Ui is the total number of uses that an informant has claimed for a given species. Use value for plants provide a quantitative measure for the relative importance of species used medicinally, high use value indicates when there are many use reports for a plant, indicating that the plant is important and low (approach to 0) when there are less reports related to its utilization, however, use report doesn't discriminate whether a plant is used for single or multiple purposes.

The frequency (FC) and relative frequency citation (RFC)
The frequency (FC) was used as percentage and proportions for determining the most preferred and most utilized plants. Each reported species of plants by informants with respect to the indigenous data was computed as frequency of citation and the Relative Frequency of Citation (RFC) of reported species was obtained by following formula.;

$$RFC =FC/N \qquad (0< RFC <1).$$

The index indicates the local importance of each species and it is given by the frequency of citation (FC), the number of informants reporting the utilization of the species divided by the total informants taking part in the field survey (N). (Ugulu *et al.* 2009, Vitalini *et al.* 2013). RFC value varies from 0 (when nobody reports a plant as useful) to 1 (when all the informants refer it as useful).

Fidelity level (FL)
Fidelity level (FL) index was determined by the most preferred species used for the cure of a peculiar health disorder as more than one species of plants are utilized in treatment in the same category following Friedman *et al.* (1986) by using the following formula:

$$FL=Np/N\times100$$

Where Np is the number of informants reporting the utilization of the plant for a peculiar disease and N is the sum of informants refers the species for any disease.

Family importance value (FIV)
Family importance value (FIV) was obtained by taking the percentage of informants indicating the family.

$$FIV= FC \text{ (family) } /N \times 100$$

Where, FC is the informant's number showing the family while N is the sum of informants involve in the study.

Family use value (FUV)
Family Use Value (FUV) was used to recognize the importance of families with medicinal plants. It was obtained as:

$$FUV=UVs/ns$$

Where UVs is using values of the species and ns is sum of species within each family (Cadena-González *et al.* 2013). The family use value is an index of cultural significance which can be applied in ethnobotany to evaluate biological plant taxon value (Gakuubi & Wanzala, 2012).

Results & Discussion

Demographics of study Participants
Demographic features of informants (Table 1) are documented and analyzed during group discussions and face to face meetings. About 243 informants were interviewed which comprises of 87 females. Informants, 137 male's informants' and 19 herbal specialists. Because there are restrictions on females' talks and interactions with strangers and outside community members in the study region, the majority of informants (62.55%) were male. Females are typically barred from entering markets, cities, or other ceremonial locations. As a result, females contribute less in the current study. It has been determined that older persons have a greater understanding of plant therapeutic benefits. People with a high level of education are frequently uninterested in the folk use of medicinal plants. Almost 90% of respondents felt that the transmission of traditional knowledge from generation to generation is inefficient due to a lack of interest among younger generations to study and practice. The main factor contributing to the decline of traditional knowledge among the local populations of Palas Valley is the availability of modern healthcare facilities.

Medicinal Plant Diversity
According to the findings of the field investigation, there are 102 plant species divided into 48 families. Four of them are Gymnosperms, while the remaining 98 are Angiosperms, which are further classified as 93 dicots and 5 monocots. Table 2 has a full list organized alphabetically by taxonomic names, as well as family and related information. The Family Importance Value (FIV) is shown in Figure 2. Notably, the Rosaceae family is the most commonly mentioned, with ten species mentioned in the survey.
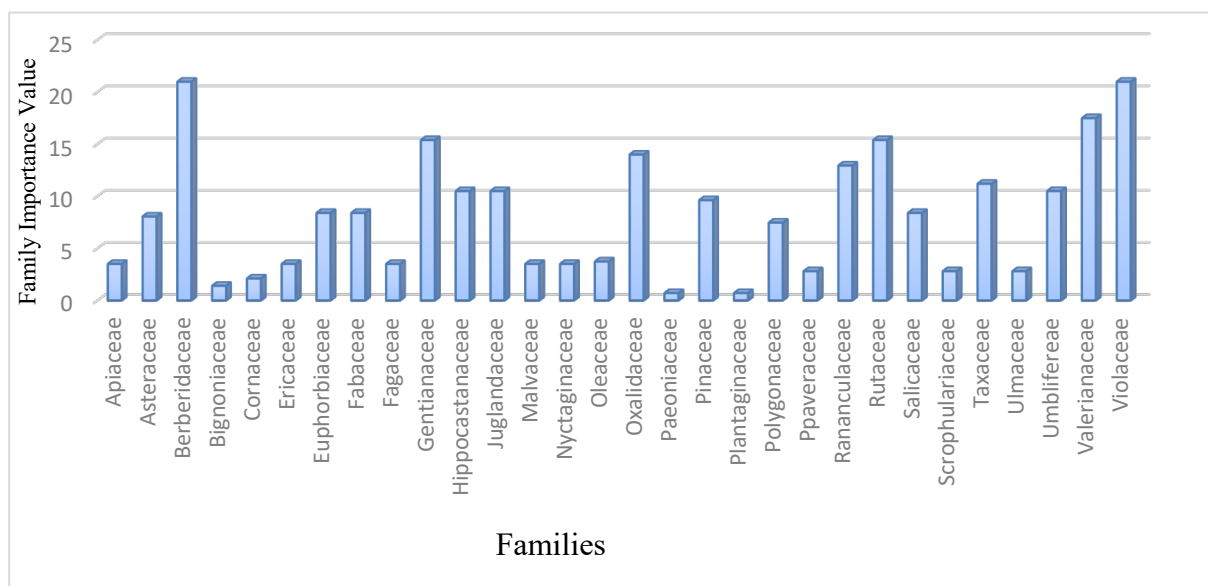

Figure 2. Family importance value of different species

Table 2. List of plant species with their Ethno-medicinal uses.

Family	Taxonomic Name, Voucher Number	Local Name	Life Form	Flowering	Part Used	Folk Use	Mode Of Utilization	FL	FC	UR	UV	RFC	Previous Use
Acerearceae	*Hedra nepalense* K. Koch. PV 119	Arbambal	Shrub	September-October	Leaves, Fruit	Pulmonary infections, Fever, Antidiabetic, Joint pain, Anticancerous, Increase perspiration	Decoction	75	41	6	0.75	0.032	1△, 2▤, 3△, 4△, 5 , 6△, 7△, 8△, 9▤, 10△, 11△, 12△, 13△, 14 , 15△, 16△, 17△, 18△
Acerearceae	*Acer caesium* (Reinw.ex Blume) Kosterm. PV 47	Traikana, Traikan	Tree	March-May	Leaves, Bark, Young twigs	Induce urination, Astringent, Dysentery, Diarrhea	Fresh Leaves, Bark Powder	76	38`	4	1. 66	0.024	1△, 2△, 3 , 4△, 5△, 6△, 7 , 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Anacardiaceae	*Cotinus coggyra* Scop. PV 70	Parnh	Shrub	April-June	Whole Plant	Eye ailments, Coagulant, Fever	Powder, Maceration	80	37	3	0.5	0.024	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11 , 12△, 13△, 14△, 15△, 16△, 17△, 18△
Anacardiaceae	Pistacia integerrima (J.Stewart.)Rech.f. PV 20	Kanghar	Tree	March-May	Gall	Skin diseases, Reducing inflammation from body	Decoction, Paste	100	55	2	0.25	0.032	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Apiaceae	*Apium graveolens* L. PV 01	----	Herb	June-July	Roots	Tonic, relieve pain, Induce urine	Powder	80	48	3	0.6	0.020	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10▤, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Asteraceae	*Achilla millefolium* L. PV 33	Gandana	Shrub	April-July	Rhizome, Flowers	Toothache, Dysentery, Tonic, Inflamed gums, Excessive menstrual flow, Check bleeding	Powder	80	34	6	0.33	0.074	1△, 2△, 3 , 4△, 5△, 6▤, 7 , 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15 , 17 , 18△
Asteraceae	*Artemisia absinthium* L. PV 12	Chaw	Herb	July-September	Leaves	Carminative, Cold, Fever, Antiseptic, Purgative, Anti-malarial, Expel intestinal worms	Powder, Decoction	82.60	35	7	0.5	0.05	15 , 2△, 3△, 4△, 5△, 6△, 7△, 8▤, 9△, 10 , 11△, 12△, 13△, 14△, 16△, 17△, 18△
Asteraceae	*Cichorium intybus* L. PV 47	Hand	Herb	May-June	Whole Plant, roots	Carminative, Sudorific, Stimulant, Stomach	Powder, decoction	88.23	37	7	0.77	0.037	1△, 2 , 3△, 4△, , 5△, , 6△, 7△, 8△, 9 , 10▤,

Family	Botanical name	Local name	Habit	Flowering period	Part used	Uses/Ailments	Mode of preparation						Informant consensus
						disorder, Appetizer, Jaundice, leprosy							11△, 12▮, 13△, 14△, 15, 16△, 17, 18△,
Asteraceae	*Matricaria chammomilla* L PV 120.	Baboona	Herb	June-July	Roots	Heart stroke, Fever, Colic, Dyspepsia	Decoction, Crude Powder with water	97.95	48	4	1	0.016	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8 , 9△, 10 , 11△, 12△, 13△, 14△, 15△, 16△, 17▮, 18△,
Asteraceae	*Sassurea costus* (Falc) Lipsch. PV 60	Kuth	Herb		Roots	Throat infection, Bilious affection, Astringent	Powder	70.58	63	3	0.37	0.032	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14 , 15△, 16△, 17△, 18△
Asteraceae	*Taraxicum officinales* Weber ex Wigger. PV 159	Hand	Herb	February-April	Whole Plant	Astringent, Kidney disorder, Tonic, Aperient, Induce urine, Liver disorder, Pain killer	Decoction, Juice	76.47	41	7	0.43	0.065	1△, 2△, 3△, 4△, 5▮, 6△, 7 , 8 , 9▮, 10△, 11△, 12▮, 13△, 14▮, 15, 16△, 17△, 18△
Berberidaceae	*Berberis kunawurensis* Royle. PV 99	Zirishk, Sumbal	Shrub	March-June	Roots, Bark	Induce urine, treat mouth sore, Astringent, Cool the body, Brain PV affections, Anti-bilious, Scarlet fever, Tonic	Powder, Crude form, Decoction	73.68	36	8	0.32	0.102	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Berberidaceae	*Berberis lycium* Royle. PV 10	Kashmal, Sumbal	Shrub	March-June	Roots, Bark	Chronic, Menorrhagia, Diarrhea, Piles, Eye diseases, Reduce fever	Powder, Crude form, Decoction, Maceration	100	32	6	0.17	0.144	1△, 2 , 3▮, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11▮, 12△, 13▮, 14▮, 15△, 16△, 17△, 18△
Bignoniaceae	*Incarvillea emodi* (Royle ex Lindl.) PV 107	Patakgarhi	Shrub	March-April	Leaves	Anti-inflammatory, Relieve pain, Deafness, Exudation of pus, Pain in the auditory apparatus, Epilepsy	Powder, Juice	86.66	36	6	3	0.008	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Buddlejaceae	*Buddleja asiatica* Lour. PV 55	Booi	Shrub	November-April	Leaves, Flowers	Treat asthma, Abortifacient, Skin complaints, Insecticide, Night blindness, Eyes strain, Coughing with blood	Crude form, Powder, Decoction	82.35	36	7	1.16	0.024	1△, 2△, 3△, 4△, 5△, 6△, 7 , 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△

Family	Species	Local name	Habit	Flowering	Part used	Uses	Preparation						Informants
Buxaceae	*Sarcococca saligna* (Don) Muell.Arg. PV 173	Shela,	Shrub	September-May	Leaves	Muscular pains, Laxative, Blood purifier	Decoction	85	51	3	0.6	0.020	1△, 2▉ , 3△, 4△, 5△, 6△, 7 , 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14 , 15△, 16△, 17△ 18△
Caprifoliaceae	*Abelia triflora* R.Br. PV 36	Puth	Shrub	May-July	Young twigs	Antibacterial, Treat boils, Fever, Measles, Dysentery	Juice, Decoction	1080 80	28	5	1	0.020	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△,15△, 16△, 17△, 18△
Caprifoliaceae	*Lonicera quinquelocularis* Hardw. PV 123	Puth	Shrub	May-July	Stem, Leaves, Bark	Digestive, Horses for colic, Remedy for venereal diseases, Kill worms, Stomach tonic	Decoction, Powder	88.88	33	5	1	0.020	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13 , 14 , 15△, 16△, 17△, 18△
Caprifoliaceae	*Lonicera caucasica* Pall. PV 132	Puth	Shrub	June-July	Leaves, Flowers	Stomach disorder, Venereal diseases, Boils, joint pain	Decoction	91.42	47	4	1	0.016	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Caprifoliaceae	*Viburnum foetens* Dene. PV 02	Guch	Shrub	April-May	Fruits, leaves	Tonic, Astringent, induce urine, Sedative, relieve colic, Uterine disorder, Facilitate removal of placenta in animals after delivery	Fresh Fruit, powder	100	49	7	0.7	0.041	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14 , 15△, 16△, 17△, 18△
Cornaceae	*Cornus macrophylla* Wall. PV 89	Kandar,	Tree	April-June	Stem, Leaves, bark	Malaria, Indigestion, Diabetes	Crude form	87.5	37	3	1	0.012	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Ericaceae	*Rhodendron arboreum* Sm. PV 114	Rantol, Ramtol	Shrub	February-May.	Flowers, Leaves	Skin diseases, Tonic, Headache	Fresh Petals, Smoke, Paste	66.66	62	3	0.6	0.020	1▉ , 2△, 3△, 4△, 5 , 6△, 7▉, 8△, 9△, 10△, 11▉ , 12△, 13△, 14 , 15△, 16△, 17△, 18△
Euphorbiaceae	*Andrachine cordifolia* (Dene) Muell PV 100	Kurkun	Herb	June-July	Leaves Fruits	Induce vomiting, Nervous disorders, Purgative, Convulsions	Powder	97.14	43	4	0.33	0.049	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9▉, 10△,

Family	Species	Local name	Habit	Flowering	Parts used	Uses	Preparation						
													11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Fabaceae	*Indigoferra heterantha* Wall.ex Brand. PV 14	Kainthi	Shrub	May-June	Leaves, Flowers, Stem	Anti-Cancerous, Cooling, Relieving abdominal pain, Demulcent, chest pain, Fever	Decoction	93.75	42	6	0.5	0.049	1△, 2 , 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Fagaceae	*Quercus baloot* Griffth. PV 07	Reen, Birtha, Baloot.	Tree	April-May	Stem, Leaves	Astringent, Induce urine, Asthma, Sore throat	Decoction, Smoke, Infusion	55.55	43	4	0.66	0.024	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13 , 14△, 15△, 16△, 17△, 18△
Fagaceae	*Quercus dilatata* Lind. ex Royle. PV 87	Barungi	Tree	April-May	Fruits, Stem, Leaves, Young twigs	Urinary problems, Sexual disease, Infectious diseases, piles,	Decoction, Powder	100	43	4	0.8	0.020	1△, 2△, 3 , 4△, 5△, 6△, 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Fagaceae	*Quercus incana*. Roxb. PV 95	Reen Shah baloot	Tree	April-May	Fruits	Diarrhea, Astringent, Induce urine, Asthma, Indigestion, Gonorrhea	Decoction, Smoke	75	36	6	1.5	0.016	1△, 2△, 3∎, 4△, 5△, 6△, 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Gentianaceae	*Swertia Chiraiyta* (Roxb. ex Fleming.)H.Karst. PV 31	Chiraiyta	Herb	July-September	Whole Plant	Induce urine, Anti-inflammatory, Anti-tubercular, Anti-oxidative, Typhoid fever, Antifungal activities, Narcotic, Pain killer, dilate pupil of eye, Induce sleep	Decoction	66.66	38	10	0.45	0.090	1△, 2△, 3△, 4△, 5△, 6△, 7 , 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Geraniaceae	*Geranium wallichianum* D.Don.ex. PV 88	Ratanjot	Herb	June-September	Stem, Roots	Toothache, Astringent, Applied externally to the eyes, Tonic, Joint pain, Backache	Crude Root, Root, Paste	85.71	38	6	0.85	0.028	1△, 2 , 3△, 4△, 5 , 6△, 7 , 8△, 9△, 10△, 11 △, 12△, 13△, 14 △, 15△, 16 , 17△, 18△,
Grossulariaeae	*Ribes alpestre* Dene.ex Jacq. PV 17	Kag Dakh	Shrub	May-June	Fruits	Purgative, Cold, Flu, Increase immunity	Powder, Crude Berries	96	37	4	0.57	0.028	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△

Family	Botanical Name / Voucher	Local Name	Habit	Flowering Period	Part Used	Uses	Preparation						Informant consensus
Grossulariaeae	*Ribes glaciale* Wall. PV 133	Karn, Jangli Angoor	Shrub	April-May	Leaves, Fruits	Reduce fever, induce urine, Cool body, Relieve Constipation, Cooling, Detergent, Sore throat	Decoction, Fresh Fruit	100	27	7	1	0.028	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Hippocastanaceae	*Aesculus indica* Wall. Ex Camb. Hk.f. PV 98	Bankhore	Tree	April-June	Fruits, Seeds	Relieve pain, Horses in colic, Joint pain, Cure frostbite	Tincture	60	38	4	0.26	0.061	1 , 2▮, 3△, 4△, 5△, 6△, 7▮, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15△, 16▮, 17△, 18△
Hypericaceae	*Hypericum oblongifolium* Choisy. PV 08	Chamba	Shrub	February-April	Whole Plant	Antidepressant, relieve colic, Stimulate bile flow, Antiviral	Decoction	83.33	34	4	0.8	0.020	1△, 2△, 3△, 4△, 5 , 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△ 17▮, 18△
Hypericaceae	*Hypericum perforatum* L. PV 12	Dodal booti	Herb	May-August	Leaves Flowers	Anti-inflammatory, Antibacterial, Antidepressant, Induce sleep	Powder, decoction	95.16	30	4	0.26	0.061	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8 , 9▮, 10△, 11△, 12△, 13△, 14△, 15▮, 16 , 17△, 18△
Juglandaceae	*Juglans regia* L. PV 78	Akhor, Akhori	Tree	February-April	Leaves, Fruits, Roots, Bark	Astringent, Antiseptic, expel intestinal worms, Anti-syphilitic, cleaning teeth, Children as relieve colic, Checking the sickness of pregnancy, Stop mammary secretion, As gargle in sore throat, Brain tonic	Decoction, Tincture, Crude Bark, Unripe Fruit and kernel of Fruit, Husk	71.42	32	10	0.66	0.061	1 , 2▮, 3▮, 4△, 5 , 6△, 7△, 8 , 9▮, 10 , 11▮, 12 , 13 , 14△, 15▮, 16△, 17 , 18△
Lamiaceae	*Ajuga bracteosa* Wall. ex Benth. PV 101	Manji booti	Herb	June-September	Whole Plant	Relieve malarial fever, Aromatic, Astringent, Tonic, Stomach pain	Extract	72	40	5	0.83	0.024	1△, 2 , 3△, 4△, 5 , 6△, , 7△, , 8△, , 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16▮, 17△, 18△
Lamiaceae	*Isodon regosus* (Wall. ex Benth.) Codd. PV 03	Booi .	Shrub	May-September	Leaves, Young twigs	Kill insects, Blood purifier	Decoction, Maceration	97.14	47	2	0.25	0.322	1△, 2 , 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Lamiaceae	*Mentha arvensis* L. PV 156	Podina	Herb	May-July	Fruits	Soft skin, Aperient, Sooth alimentary canal	Juice, Paste	75	49	3	0.25	0.49	1 , 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9 , 10△, 11△,

Family	Species	Local Name	Habit	Flowering	Part Used	Uses	Preparation						Informants
													12△, 13 , 14△, 15△, 16△, 17△, 18
Lamiaceae	*Mentha piperita* L. PV 65	Podina	Herb	May-July	Whole Plant	Stomach disorder, Relieve spasm, Carminative, Antibacterial	Powder, Decoction.	71.42	49	4	0.36	0.45	1△, 2△, 3△, 4 , 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Lamiaceae	*Nepta hindostana* Haims. PV 40	Pisho boty	Herb	June- August	Seeds	Seed tonic, Induce urine, Against constipation, Stomach disorder, Carminative, Leaf appetizer	Decoction, Powder, Fresh Leaves,	80	48	6	1.2	0.020	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Lamiaceae	*Origanum vulgare* L. PV 82	Ban Ajwain	Herb	June- October	Tubers	Epilepsy, Colic, Uterine disorder	Decoction	83.33	48	3	0.5	0.024	1△, 2 , 3▮, 4△, 5 , 6 , 7 , 8▮, 9 , 10▮, 11△, 12△, 13△, 14 , 15 , 16 , 17 , 18△,
Lamiaceae	*Salvia lanata* Roxb. PV 157	Choti Kalijari	Herb	April-June	Roots	Antiseptic, Reduce sweating, Menses problem	Powder, Decoction	80	37	3	0.6	0.020	1△, 2 , 3△, 4△, 5△, 6△, 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Leguminosae	*Desmodium elegans* DC. PV 31	Chamra	Shrub	July- September	Roots, Leaves	Diarrhea, Carminative, Abscesses, Tonic, Induce urine, Astringent, Chronic Fever, Biliousness, Cough, Vomiting, Asthma, Snake bite, Wounds, Dysentery, Convulsion	Root Powder, Fresh Leaves	76.92	38	15	2.5	0.024	1△, 2△, 3△, 4△, 5△, 6△, 7▮, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Leguminosae	*Erythrina glabrescens* (Prain.) Parker. PV 109	Dhak	Tree	March-April	Bark, Leaves	Induce urine, Eye diseases, Laxative, induce menses, expel mucus, Expel and kill intestinal worms, Antibilious, reduce fever, Dysentery, Cathartic, increase flow milk, Dressing ulcer	Decoction	74.07	38	12	2.4	0.020	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△

Family	Botanical Name	Local Name	Habit	Flowering Period	Part Used	Medicinal Uses	Mode of Use					Informants
Leguminosae	*Medicago sativa* L. PV 05	Sinji	Herb	June-July	Whole Plant	Menopause, Tonic, Menstruation, Diuretic, Earache, Jaundice, Clotting of blood, Kidney pain, Cough, Antidiabetic	Cooked Leaves	92.59	49	10	2	0.020	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10 , 11△, 12△, 13△, 14△, 15 , 16△, 17△, 18△
Leguminosae	*Sophora mollis* (Royle)Baker *ssp mollis.* PV 115	Kathi	Tree	March-April	Leaves, Seeds, Stem	Relieve headache, to kill lice in hair, Skin diseases, Sore- eye	Decoction, Juice, Powder, Ointment	100	46	4	0.44	0.037	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Liliaceae	*Asparagus officinale* L. PV 22	Shahghandal, Nanoor		May-June	Leaves	Kill and expel Intestinal worms, Tonic	Crude form, Powder	90	38	2	0.4	0.020	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15 , 16△, 17△, 18△
Liliaceae	*Asparagus racemoss* Willd. PV 28	Shahghandal/ Nanoor	Shrub	June-August	Roots, Whole Plant	Induce urine, Fever, Relieve stomach pain	Powder, Crude form	82.60	40	3	0.3	0.041	1 , 2△, 3△, 4 , 5 , 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15 , 16△, 17△, 18▮
Liliaceae	*Colchicum luteum* Baker PV 104	Qiamat Gul, suranjan	Herb	Feruary-June	Corm, Seeds	Carminative, Laxative, increase sexual desire, Gout, Joint pain, Liver, Spleen diseases, Reduce inflammation, Blood purifier	Powder, Paste	79.16	33	9	0.6	0.037	1△, 2▮, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Malvaceae	*Althea rosea* L. PV 118	Gulkhaira	Herb	June-September	Roots, Leaves, Flowers	Ointment for boils and abscesses, Mouthwash for inflammation, soft skin, Sooth alimentary canal, Bronchial disorder	Maceration, decoction	88.23	42	5	1	0.020	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15▮, 16△, 17 , 18△
Moraceae	*Ficus carica* L. PV 53	Phagwar	Tree	April-December	Fruits, Latex	Laxative, An ingredient in confection of *"Senna"* and compound syrup of *"Fig"*. Constipation, Renal and vesical calculi, Piles, External ulcers,	Crude Fruit, Syrup of Fruit, Latex from Leaves	100	42	9	0.5	0.074	1△, 2△, 3▮, 4△, 5△, 6△, 7△, 8△, 8▮, 9▮, 10▮, 11△, 12△, 13△, 14△, 15 , 16△, 17△, 18△

Family	Botanical name	Local name	Habit	Flowering period	Part used	Ethnomedicinal uses	Preparation						Informants
						Boils, Cracks in mouth, Against warts							
Moraceae	*Ficus foveolata* Wall.ex.Miq. PV 72	Bat Phagwar	Shrub	May-September	Whole Plant, Latex	Latex sooths the bee sting, Gastrointestinal disorders, Fever, Remove wart, Haemorrhoids	Latex	83.33	48	5	1.66	0.012	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Moraceae	*Ficus palmata* Forssk. PV 84	Phagwar	Tree	June-December	Fruit, Ash	Lung's bladder diseases, Laxative, Demulcent, Constipation, Ash is used in snuff	Crude Fruit, Ash of wood	83.33	44	5	0.41	0.049	1△, 2▮, 3△, 4△, 5 , 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13▮, 14△, 15△, 16△, 17△, 18△
Nyctaginaceae	*Boerhavia diffusa* Engelm and A.Gray. PV 103	Itsit	Herb	June-August	Leaves	Hepatic, Antidiabetic, Stimulant	Powder, Decoction	68.96	33	3	0.6	0.20	1△, 2△, 3△, 4 , 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Oleaceae	*Fraxinus excelsior* Boiss. PV 97	Sum	Tree	May-June	Seed, leaves, bark	Digestive, Antidiabetic, Tonic, Induce urine	Powder	82.75	41	4	0.8	0.020	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10 , 11△, 12△, 13△, 14△, 15 , 16△, 17△, 18△
Oleaceae	*Jasminum humile* L. PV 116	Chambeli, Chamba	Shrub	April-June	Flowers, Roots	Tonic to heart and bowels, Astringent, Ringworms, Destroying the unhealthy lining walls of chronic sinuses and fistulas	Decoction, Juice	80	42	4	0.8	0.020	1△, 2 , 3△, 4△, 5△, 6△, 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Oleaceae	*Jasminum officinale* L. PV 27	Chambeli	Shrub	May-July	Roots, Flowers, Leaves, Seeds, Whole Plant	Headache, Scorpion sting, Ringworm, induce urine, promote menses, Kill intestinal worms, Skin diseases, Weak eye, Ulceration, Eruption in the mouth, Ear infection	Decoction of Root, Paste of Flower, Juice, Crude Leaves, Oil	84.61	30	11	1.83	0.024	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9▮, 10△, 11△, 12△, 13△, 14 , 15△, 16△, 17△, 18△
Oxalidaceae	*Oxalis corniculata* L. PV 130	Khat kurla	Herb	June-August	Whole Plant	Antidiabetic, Aperient, induce sweat, induce	Juice	60	48	8	0.4	0.82	1 , 2 , 3△, 4 , 5 , 6 , 7△, 8△, 9 , 10△, 11△,

Family	Botanical Name	Local Name	Habit	Flowering Period	Parts Used	Uses	Mode of Administration						References
						urine, used to kill and expel intestinal worms, reduce vomiting, Heal fractured bones, Vaginal discharge							12△, 13△, 14△, 15 , 16▮, 17△, 18▮
Paeoniaceae	*Paeonia emodi* Wall ex Hk.f PV 138.	Mamaikh	Shrub	April-May	Tubers, Seeds	Purgative, induce urine, Uterine diseases, Nervous disorders, Emetic, Sooth alimentary canal, Cool the body, Cardiovascular diseases, Tonic, piles	Cooked Roots (Halwa), Powder	77.77	23	10	0.45	0.09	1△, 2 , 3△, 4△, 5△, 6△, 7 , 8△, 9▮, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△,
Papaveraceae	*Argemone mexicana* L. PV 07	Peeli kindiari	Herb	March-April	Leaves, Roots, Seeds	Leucorrhea, Skin diseases, Narcotic, Diuretic, Ophthalmic	Decoction	86.66	49	5	1.25	0.016	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Papilionaceae	*Astragalus candolleanus* Royle ex Benth. PV 39	Bankantha	Shrub	May-June	Seeds	Soften alimentary canal, soften skin, Relieve colic, Leprosy	Paste, Powder	80	42	4	1.33	0.012	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11▮, 12△, 13△, 14△, 15 , 16△, 17△, 18△
Papilionaceae	*Astragalus grahamianus* Royle ex Benth. PV 42	Chitti Bin, Kanthi	Shrub	May-August	Young twigs, Leaves	Skin disease, Leprosy, Fever, Mouth infection	Crude form	66.66	42	4	0.8	0.020	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Papilionaceae	*Trigonella foenum-graecum* L. PV 124	Methray	Herb	March-June	Seeds	Joint pain, Chest infections, Tonic, Stomach problem	Powder	100	50	4	0.2	0.082	1△, 2△, 3△, 4▮, 5△, 6△, 7△, 8△, 9△, 10 , 11△, 12 , 13△, 14△, 15△, 16 , 17△, 18△,

Pinaceae	Abies pindrow Royle. PV 21	Paludar, Rewar	Tree	April-May	Leaves	Asthma, Cough, Tuberculosis, Chronic bronchitis, Pulmonary affections, Catarrh of the bladder	Tincture, Decoction, Juice, Powder	100	24	6	0.3	0.823	1△, 2△, 3 , 4△, 5△, 6△, 7 , 8△, 9△, 10△, 11△, 12△, 13△, 14△,15△, 16△, 17△, 18△
Pinaceae	*Cedrus deodara* (Roxb.ex. D.Don) G.Don. PV 71	Diar,	Tree	October	Stem, Gum/ Resin	Carminative, Complexion, reduce fever, Relieve flatulence, Pulmonary disorders, Urinary disorders, Joint pain, Piles, Stone in kidney, Astringent, Diarrhea, Dysentery, Skin diseases of goats and camels, Ulcers, Horses and sore feet of cattle	Powder, Paste	80	37	14	0.77	0.074	1△, 2△, 3▮, 4△, 5△, 6△, 7△, 8△, 9▮, 10△, 11△, 12△, 13△, 14△, 15△, 16▮, 17△, 18△
Pinaceae	*Picea smithiana* (Wall) Bois. PV 15	Kachal	Tree	April-May	Stem	Stomach pain, Joints pain	Powder, Decoction	66.66	28	2	0.25	0.032	1△, 2△, 3 , 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Pinaceae	*Pinus wallichiana* A.B.Jackson. PV 19	Biar, Kail	Tree	April-June	Stem	Fever, Cough, Asthma, Scorpion and snake bite	Infusion, Powder	72	52	4	0.44	0.037	1△, 2△, 3 , 4△, 5△, 6△, 7△, 8△, 9 , 10△, 11▮, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Plantaginaceae	*Plantago ovata* Forss k. PV 57	Chmchi pattar	Herb	June-September	Seeds	Induce urine, Soften the skin, relieve constipation, Sooth alimentary canal, Relieve mucus, Astringent, Cool body, Anti-	Powder, Maceration	78.94	50	11	0.733	0.061	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9▮, 10 , 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△

					inflammatory, Tonic, Dysentery, Dry cough						
Polygonaceae	*Polygonatum multiflorum* (Linn.)All. PV 50	Adbis	Herb	May-June	Rhizome	Skin trouble, Nausea, Piles, Excite vomiting, Bleeding of the lungs, Demulcent, Stomach inflammations, Respiratory disorders	Paste, Decoction, poultice	75	48	8	2.66	0.012	1△, 2 , 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Polygonaceae	*Polygonatum verticillatum* (L) All. PV 66	Mahameda	Herb	May-July	Roots stock, Rhizome	Increase sexual desire, Cooling, induce urine, Increase milk flow, Fever	Decoction, Powder	83.33	48	5	1.25	0.016	1△, 2 , 2△, 3△, 4△, 5△, 6△, 7 , 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Polygonaceae	*Polygonum bistorta* L. PV 08	Masloorn	Herb	July-August	Roots, Rhizome	Gastrointestinal disturbances, Stomachic, Cough, Fever, Sedative activities, Excessive menstruation, Bleeding piles,	Decoction, Syrup	72	43	7	0.77	0.037	1△, 2△, 3△, 4△, 5△, 6 , 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17 , 18△
Polygonaceae	*Rumex hastatus* D.Don. PV 103	Khatambal	Shrub	Summer	Whole plant	Wounds, reduce vomiting, Stop bleeding	Juice	85.71	43	3	0.15	0.078	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15△, 16 , 17△, 18△
Primulaceae	*Androsace rotundifolia* Hardw. PV 72	Thandi Jari	Herb	June-July	Whole Plant	Irregular menses, Avoiding conception, Ophthalmic diseases	Powder, Crude form	93.75	46	3	0.5	0.024	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Rananculaceae	*Aconitum hetrophyllum* Wall.ex.Royle. PV 49	Patris	Herb	August-September	Latex, Roots	Purgative, Induce vomiting, Toothache, Joint pain, Gastric disorder, High fever, Healing cough	Root Powder, Paste	86	38	7	0.23	0.123	1△, 2△, 3 , 4△, 5△, 6 , 7▉, 8△, 9△, 10△, 11△, 12△, 13△, 14▉, 15△, 16△, 17△, 18△
Ranunculaceae	*Caltha indica* Cambess. PV 52	Thutha	Herb	May-August	Leaves, whole plant	Removal of warts, Cough, Induce urine, Diabetes, Uterine cancer	Paste	75	38	5	0.71	0.028	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△

Rosaceae	*Cotoneaster nummularia* Fisch and Mey. PV 16	Luni	Shrub	April-June	Whole Plant	Expel mucus, Astringent, Aperients, Stomach disorder	Powder	82.60	32	4	0.8	0.020	1△, 2△, 3▮, 4△, 5△, 6△, 7△, 8△, 9 , 10 , 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Rosaceae	*Crataegus songarica* C.Koch. PV 77	Ban Sinjli, Bat Sinjli,	Tree	May-June	Fruits, Flowers, Seeds	Hypertrophy, Heart oppression, Cardiac	Crude form, Powder	90	36	3	0.16	0.074	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14 , 15△, 16▮, 17△, 18△
Rosaceae	Pyrus pashia Hamilt. PV 99	Batangi	Tree	March-April	Fruits, Leaves	Diarrhea, Laxative, Fever, Induce sleep	Juice, Crude Fruit	91.11	55	4	0.57	0.028	1▮, 2△, 3▮, 4△, 5△, 6△, 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Rosaceae	*Rosa brunonii* Lindl. PV 54	Jhal,	Shrub	April-June	Roots, Flower, Seeds	Astringent, increase sexual desire, Bilious affections, Burning of the skin, Eye diseases	Paste, Powder, Juice, Oil	90	49	5	0.5	0.041	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Rosaceae	*Rosa webbiana* Wall ex Royle. PV 63	Shingari	Shrub	June-August	Flowers	It is an ingredient of *"Gul Kand"* used in digestive ailments, Ulcer, Wounds, Sprain	Powder, Paste	100	27	4	0.26	0.061	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16 , 17△, 18△
Rosaceae	*Rubus ellipticus* Smith. PV 116	Guracha	Shrub	February-April	Leaves, Roots, Fruits	Diarrhea, Whooping cough, Cordial astringent, Looseness of bowels, Bleeding, Dysentery, Sore throat	Infusion, Decoction, Powder	88.88	51	7	0.87	0.032	1▮, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9 , 11△, 12△, 13△, 14▮, 15△, 16△, 17△, 18△
Rosaceae	*Rubus macilentus* Camb. PV 140	Guracha	Shrub	April- May	Leaves, Fruits	Induce urine, Urticarial, Diarrhea, Increase sperms	Powder, Fresh Fruit.	98.21	38	4	0.5	0.032	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Rosaceae	*Sorbaria tomentosa* (Lindl) Rehder. PV 121	Karli	Shrub	June-August	Leaves, Fruits,	Relieve colic, Against acne, Insect repellant	Decoction, Ointment in Butter	70	43	3	0.42	0.028	1△, 2△, 3△, 4△, 5△, 6△, 7 , 8△, 9 , 10△,

Family	Botanical Name	Local Name	Habit	Flowering	Part Used	Medicinal Uses	Preparation	RFC	FC	NU	UV	FL	References
					Young twigs								11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Rosaceae	*Spiraea hazarica* R.N.Parker. PV 100	Kurkun	Shrub	May-July	Leaves, Young twigs	Diarrhea, Dysentery, Tonic, Astringent	Infusion, Decoction	91.66	56	4	2	0.008	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Rosaceae	*Spiraea vaccinifolia* D.Don. PV 30	Kurkun	Shrub	May-July	Leaves, Young twigs	Wounds, Sores		70	39	2	0.18	0.045	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Rutaceae	*Skimmia laureola* (DC) Sieb and Zucc. ex Walp. PV 88	Ner, Nera	Shrub	April-May	Leaves	Small pox, Asthma, improve breathing, relax central nervous system, Repel evil sprit	Decoction, Smoke	87.5	36	5	0.22	0.090	1△, 2▮, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Salicaceae	*Populus ciliata* Wall ex Royle. PV 60	Palach	Tree	March-April	Bark, Leaves, Stem	Tonic, Stimulant, Purify blood, Anti-inflammatory, Urinary tract infection	Decoction	85.71	43	5	0.71	0.028	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11▮, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Salicaceae	*Salix denticulata* N.J.Andress. *var.hazarica* (Parker) Parker. PV 152	Baira	Shrub	March-May	Bark, Stem	Reduce fever, Kill intestinal worms, Astringent, Intermittent	Decoction	75	49	4	0.8	0.02	1△, 2△, 3 , 4△, 5△, 6△, 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15△, 16 , 17△, 18△
Sambucaceae	*Sambucus wightiana* Wall.ex Wight and Arn. PV 09	Ganula	Shrub	June-August	Bark, Fruits	Purgative, remove constipation, induce urine, Dropsy, relieve mucus, induce sweat, Fever, Anti-inflammatory	Decoction, Fresh Berries	76.92	49	8	1.14	0.028	1△, 2 , 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△

Family	Scientific name	Local name	Habit	Flowering period	Parts used	Uses	Mode of preparation						Respondents
Saxifragaceae	*Bergenia ciliata* (Haw.) Sternb. PV 17	Batpewa	Herb	March-July	Roots	Treatment of fevers, Pulmonary affections, Tonic, Diarrhea, Kidney stones, Cardiac tonic	Powder, decoction	71.42	35	6	0.4	0.061	1▮, 2△, 3△, 4△, 5▮, 6△, 7▮, 8△, 9 , 10▮, 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Saxifragaceae	*Bergenia Ligulata* (Wall.) Engl. PV 13	But pewa	Herb	June-August	Roots	Stomach disorder, Skin diseases, Induce urine, Cardio-tonic, Cure wounds	Powder, Paste	70.58	34	5	0.5	0.041	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14 , 15△, 16△, 17△, 18△
Scrophulariaceae	*Verbascum thapsus* L. PV 99	Gidar Tambaku	Herb	July-August	Leaves Flowers, Seeds	Skin burns, Cooling agent, Reduce fever, soft skin	Paste in Butter	90	33	4	1	0.016	1△, 2△, 3△, 4△, 5△, 6△, 7 , 8△, 9△, 10△, 11△, 12△, 13△, 14 ,15△, 16△, 17△, 18△
Solanaceae	*Atropa belladonna* L. PV 41	Cheela lubar, Angoor shifa	Herb	June-August	Seeds, Whole Plant	Anti-diabetic, induce sleep, induce urine, Dilate pupil of eye, Fever,	Powder, Decoction, root paste	76.66	41	5	0.45	0.045	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10 , 11△, 12△, 13△, 14△, 15△, 16△, 17△, 18△
Solanaceae	*Datura stramonuim* L. PV 19	Kala Datura,	Herb	Summer	Seeds, Leaves	Ulcers, Poisoning, Relieve Asthma, Boil	Fresh leaves, Smoke, Seed powder	78.94	38	4	0.33	0.049	1▮, 2△, 3△, 4△, 5△, 6 , 7△, 8△, 9△, 10 , 11△, 12△, 13△, 14 , 15 , 16△, 17△, 18△
Solanaceae	*Hyoscyamus niger* L. PV 108	Ajwain	Herb	May-September	Leaves, seeds	Dilate pupil of eye, relieve colic, Induce sleep, Fever	Decoction, Juice	93.33	30	4	0.57	0.028	1△, 2△, 3△, 4△, 5△, 6△, 7△, 8△, 9△, 10 , 11△, 12△, 13△, 14△, 15△, 16 , 17△ 18△
Solanaceae	*Solanum nigrum* L. PV 54	Kachmach	Herb	May-September	Fruits, Flowers	Dental problem, Skin infection, Antiseptic, Tonic in fever, Dyspepsia, Scabies	Decoction, Paste in Water	77.77	47	6	0.54	0.045	1△, 2△, 3△, 4△, 5▮, 6△, 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14△, 15 , 16△, 17 , 18△
Taxaceae	*Taxus wallichiana* Zucc. PV 160	Birmi	Tree	February-May	Leaves, Stem, Resin	Fever, Bronchitis, Hiccough, promote menstrual cycle, Indigestion, Epilepsy, Increase sexual desire,	Decoction	90.90	49	11	0.68	0.065	1△, 2△, 3▮, 4△, 5△, 6△, 7△, 8△, 9▮, 10△, 11▮, 12△, 13△, 14△, 15△, 16△, 17△, 18△

Family	Species	Local name	Habit	Flowering period	Parts used	Uses	Mode of preparation	FL	FC	UR	U.V	RFC	Comparison
						Sedative, Antiseptic, Asthma, Anti-cancerous							
Ulmaceae	*Ulmus villosa* Brandis ex Gamble. PV 136	Mannu	Tree	March-April	Leaves, Bark, Stem	Diarrhea, increase urine, reduce fever, Abscesses, remove stones from the bladder, Skin eruptions, Swellings, Backache, Ringing in the ear	Decoction	100	28	9	2.25	0.016	1△, 2△, 3 , 4△, 5△, 6△, 7△, 8△, 9△, 10△, 11△, 12△, 13△, 14 , 15△, 16△, 17△, 18△
Umblifereae	*Angelica glauca* Edgew. PV 21	Chora	Herb	July-August	Roots	Cordial stimulant, Indigestion, Stomachic, Constipation	Powder	67.85	46	4	0.26	0.061	1△, 2△, 3△, 4△, 5△, 6▮, 7△, 8△, 9▮, 10△, 11△, 12△, 13△, 14▮, 15△, 16△, 17△, 18△
Urticaceae	*Urtica dioca* L. PV 110	Bichubuti	Herb	May-September	Roots, Rhizome	Menorrhagia, Breast milk, Anemia, Cause severe irritation	Decoction	80	33	4	0.57	0.028	1▮, 2△, 3△, 4△, 5 , 6 , 7 , 8 , 10▮, 11△, 12▮, 13△, 14▮, 15 , 16▮, 17 , 18△,
Valerianaceae	*Valeriana jatamansi* Jones. PV 111	Mushk bala	Herb	February-August	Roots, Rhizome	Reduce pain, Tranquilizer, relieve spasm, Carminative, relax mucus, Nervine relaxant, induce sleep, Stimulant, Induce urine, Hair tonic, Hysteria	Decoction, Powder	73.33	38	11	0.44	0.102	1▮, 2△, 3△, 4△, 5 , 6 , 7△, 8△, 9 , 10△, 11△, 12△, 13△, 14 , 15△, 16△, 17△, 18△
Violaceae	*Viola canescens* Wall. ex Roxb. PV 11	Banafsha	Herb	Ferbraur-May	Whole Plant	Jaundice, Cough, Cold, Fever, Epilepsy, Nervous disorder, Induce perspiration	Decoction	87.5	61	7	0.23	0.123`	1△, 2△, 3△, 4△, 5△, 6△, 7 , 8△, 9▮, 10△, 11△, 12△, 13△, 14▮, 15△, 16△, 17△, 18△

Abbreviations: FL = Fidelity Level, FC = Frequency Citation, UR = Use reports, U.V = Use value, RFC = Relative frequency of Citation, Symbols indicate comparison of use with neighboring regions: (▮) Similar use, ( ) Different use, (△) Use not reported.

1= Acharya (2012), 2= Akhtar *et al.* (2013), 3= Gul Jan *et al* (2011), 4= Islam *et al.* (2014), 5= Singh *et al*, (2014), 6= Thakur *et al.* (2014), 7= Bhat *et al.* (2013), 8=Polat *et al.* (2015), 9= Ilyas *et al.* (2013), 10= Amiri *et al.* (2013), 11= Bhattarai *et al.* (2009), 12= Koleva *et al.* (2015), 13= Ajaib *et al.* (2014), 14= Rana *et al.* (2014), 15= Rigat *et al.* (2011), 16= Ali & Qaiser (2009), 17= Jari *et al.* (2007), 18= Joshi *et al.* (2010).

Disease categories

Overall, 541 disease use reports treated by medicinal plants were recorded. The gastrointestinal tract (GIT) diseases category has highest recommendations. (28.83%) followed by respiratory diseases. (10.72%) in indigenous communities (Figure 3). In case of plants utilized, the highest number was observed for GIT diseases. (84.34%) followed by. urinary disorders (35.29%). The recurring observation is that indigenous tribes rely mostly on herbal treatments to treat gastrointestinal (GI) and respiratory disorders. Furthermore, valuable plant species in these areas have a wide range of traditional therapeutic applications for these disorders. It is suggested that additional examinations and analyses of the plants stated to be highly recommended for the aforementioned diseases be conducted, with a focus on their pharmacological and biological capabilities (Schmeda-Hirschmann *et al.* 2002). Previous ethnobotanical studies in several countries demonstrated the widespread usage of medicinal herbs to treat gastrointestinal ailments (Frei *et al.* 1998, Hammond *et al.* 1998, Bennett & Prance, 2000, Macia *et al.* 2005, De-la-Cruz *et al.* 2007). Other remarkable ailments treated by medicinal plants in the locality are urinary problems (8.68%) followed by muscles and skeletal diseases (4.62%). The cause behind urinary disorders cited by local people might be the low consumption of water during winter season and tough agricultural work which results in water shortage in blood circulation. Walking and travelling in high altitudes without any transport facility was found to be cause for muscles and skeletal diseases (Schlage *et al.* 2000).

To the best of our observations in the present work, a number of disorders are treated by the precious medicinal flora due to a lack of health care facilities and transport because the area is only linked to other regions through small linked roads.
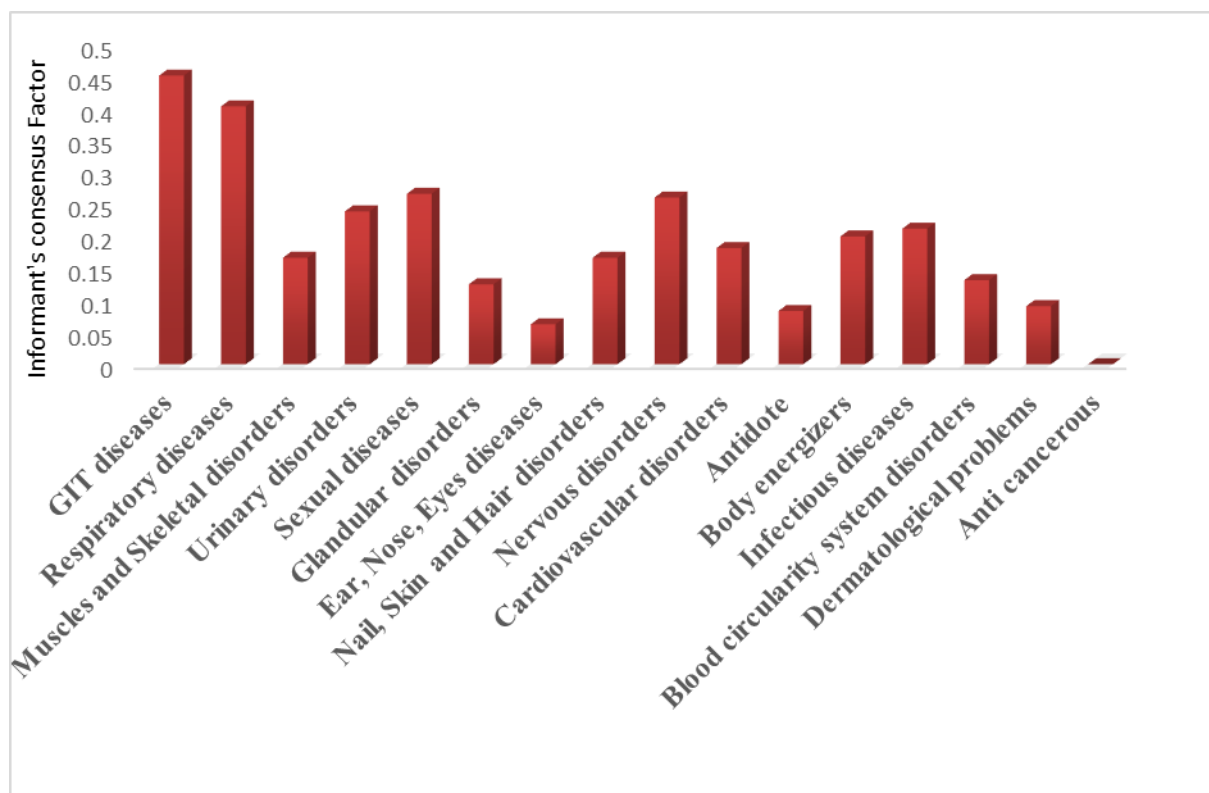
Figure 3. Informant's Consensus Factor (ICF) value of medicinal plants used for treatment of various diseases

Life Forms

In the current study, the primary source of medicine is herbs (41%), followed by shrubs (37%), and trees (22%) (Figure 4). Herbs were abundant in the research area due to their regular availability, which is a trait of the sub-alpine and alpine environments. This discovery was confirmed during fieldwork, with local residents also seeing an increase in herb use due to their abundance. Besides this, herbal extraction and preparations for bioactive substance are easy to attain (Shreshtha & Dhillion, 2003). Similar conclusions were obtained from other studies on medicinal plants carried out in central Nepal (Shrestha & Dhillion, 2003, Uprety *et al.* 2010) and west Nepal (Kunwar *et al.* 2006). Trees were in less percentage due to high altitude, high velocity of wind and other climatic and geographic factors.
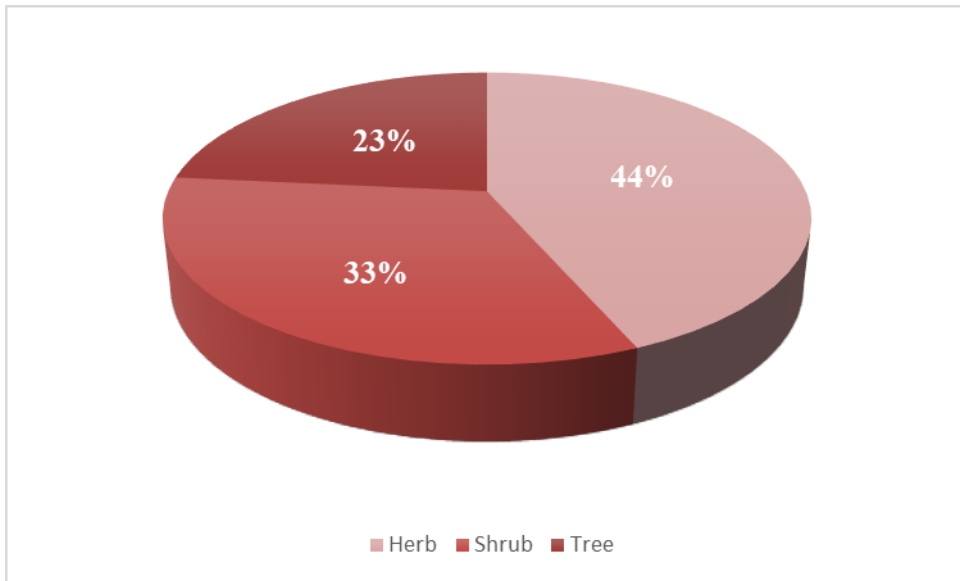
Figure 4. Percentage of plant life forms

Plant parts used

In present research, different plants parts were recorded for herbal medicine (Figure 5). Leaves are most commonly used plant parts. (42 reports) followed by underground parts of plants, the roots (24 reports). Leaves are often utilized in herbal preparations because of their active secondary components. It is considered that aerial parts, particularly the leaves carry more extractable phytochemicals, crude drugs and other active substances which may be valuable regarding phytotherapy. This fact is strengthened with field works carried out elsewhere in different areas of Pakistan (Ahmad *et al.* 2014, Manzoor *et al.* 2023b, Bano *et al.* 2014a, 2014b). Roots are often considered as important components, because they contain more bioactive chemicals than other plant sections in many cases (Basualdo *et al.* 1995, Srithiet *et al.* 2009, Manzoor *et al.* 2023a). The frequently utilized whole plants (17 reports) in these localities are usually herbs. Only herbaceous plants should be used as a whole. It is critical to understand that using roots can endanger the plant's existence and ability to regrow. As a result, when dealing with endangered or uncommon plant species, the usage of roots should be kept to a minimum. The leaves are the most widely used portion, as using the entire plant, roots, or relying too heavily on fruits or seeds for therapeutic purposes might have a negative impact on plant growth and population. This has the potential to significantly reduce the populations of many therapeutic plants in their natural settings (Ghimire *et al.* 2008, Giday *et al.* 2003).
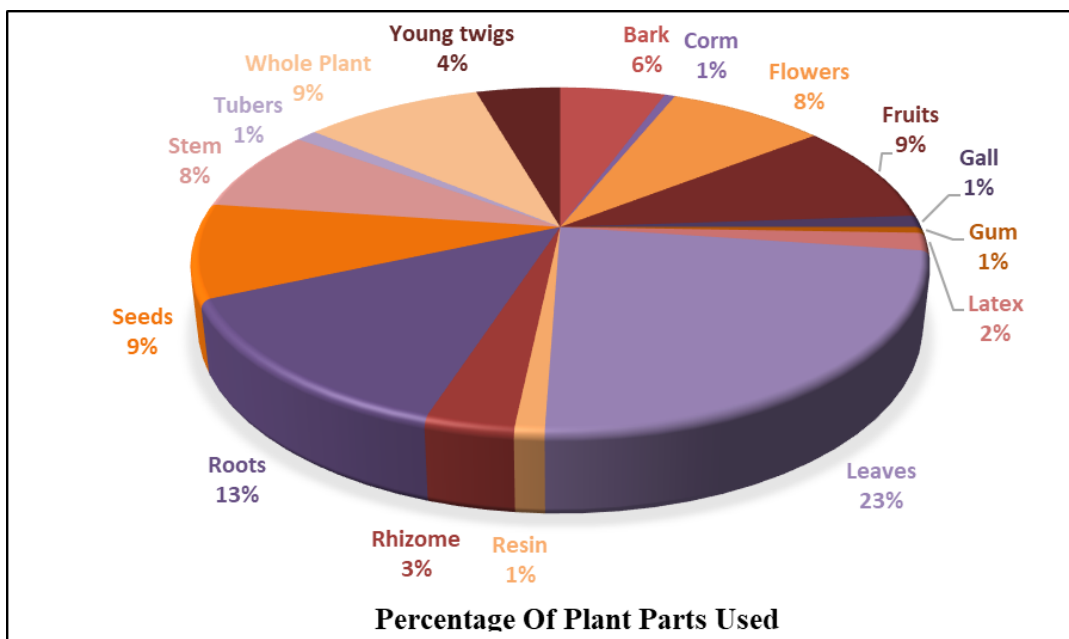
Figure 5. Percentage of plant parts used in study area

Modes of preparation and routes of administration

The current study documents a variety of preparation methods, including decoction, infusion, paste, powder, poultice, smoke, and raw forms (Figure 6). There was a total of 182 preparations reported, with decoction being the most often mentioned mode of preparation (51 reports), closely followed by powder (49 reports). Decoction is frequently used due to better efficacy of herbal drugs. It is natural phenomena that in several cases heat act as catalyst, as a result more active components are obtained (Zhang *et al.* 2005, Chen *et al.* 2008, Han *et al.* 2007). In high altitudes besides decoction, dried powder is preferred during winter season, possibly due to chill dry and snowy season (Kayani *et al.* 2014, Bano *et al.* 2014a, b, Ahmad *et al.* 2014). To the best of our knowledge, native communities use both decoction and powder according to diseases and their treatments.

The most common technique of giving herbal medicines was oral ingestion (70% of all instances), with topical application (30%) coming in second. Herbal preparations were seen to be applied in the form of paste, washings, or rubbing onto the affected areas of the body in the case of topical administration, as described in prior study (Hammond *et al.* 1998, De-la-Cruz *et al.* 2007). There is versatile medicinal plant diversity and their broad term utilization in study site; the administration of exact dosage is not recorded in present study. According to information provided by respondents, plant material used for preparation of herbal drugs is difficult to measure because measuring system is not available. Few of informants indicate that roughly 40-50 g of fresh plant material or 20-25 g of powdered material of plant may be taken on daily basis. Doses are taken two times a day, morning and evening time because people are present at home at that time. Besides above, some respondents suggest that the dosage depends on the age and physique of the individual and adults are given more dose than children. Same type of conclusions has been observed in previous studies (Liu *et al.* 2005).
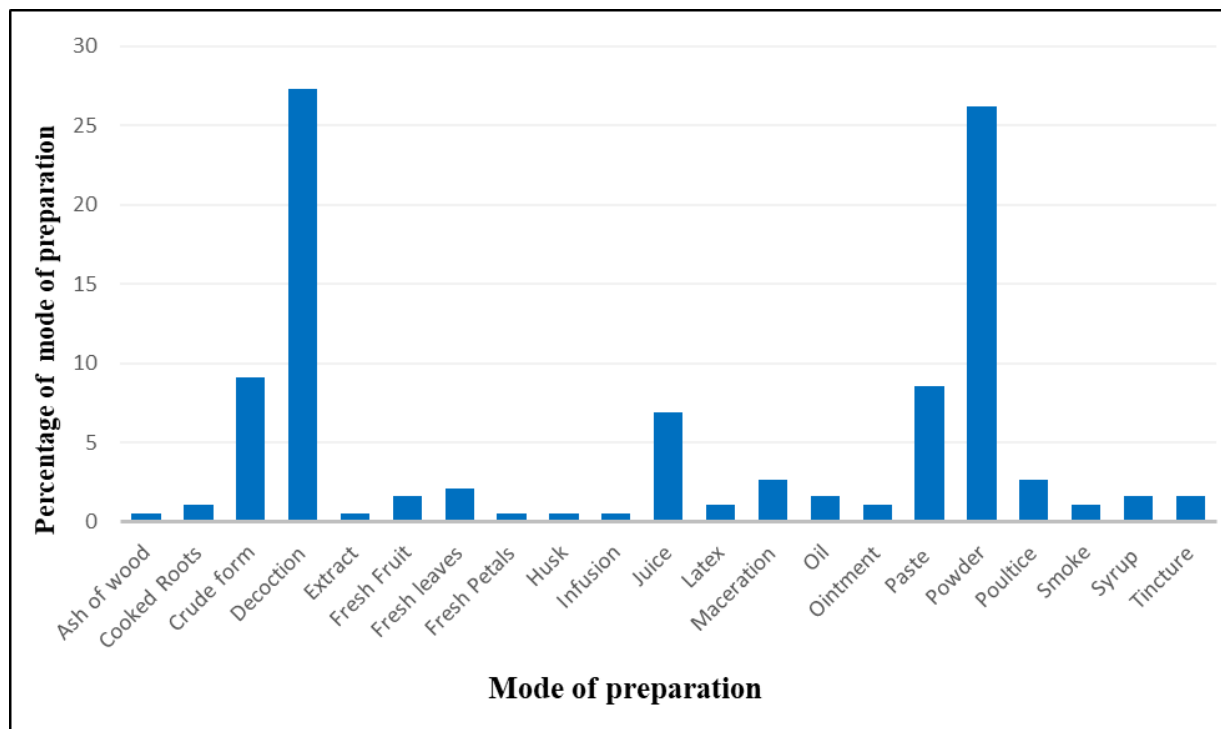
Figure 6. Percentage of plant parts used in herbal drug preparation in the study area

Quantitative data analyses

Informant's Consensus Factor (ICF)

The consensus of informants on medicinal plants recorded was quantitatively analyzed for treating various disease. All treated diseases are grouped into 16 categories to develop this consensus. According to current study, the ICF (Index of Cultural Fit) ranges from 0.06 to 0.68. The highest ICF value (0.45) is related with gastrointestinal (GIT) problems, with respiratory ailments close behind at 0.40 (Figure 7). The increased ICF values in the collected data are mostly related to the prevalence of GIT disorders. It may be due to the unavailability of pure water for drinking and food contaminated with many germs, particles of dust and spore's peculiar of herbs (more abundant in the mountain community) which may stick in these sensitive organs causing abnormalities. Respiratory diseases having second highest ICF may be due to cold, moist and high-altitude areas where low temperature remain more than high temperature (Kayani *et al.* 2014). According to few traditional

healers, the main causes of respiratory diseases are pollen prevalence and spores which get stuck into respiratory organs. The other more notable ICF (0.266) was indicated for sexual diseases and (0.260) for nervous disorders. This shows common occurrence of disorders in the study sites either due to contamination of water or poor hygiene (Adzu *et al.* 2003, Mirzaman *et al.* 2023, Schlage *et al.* 2000).
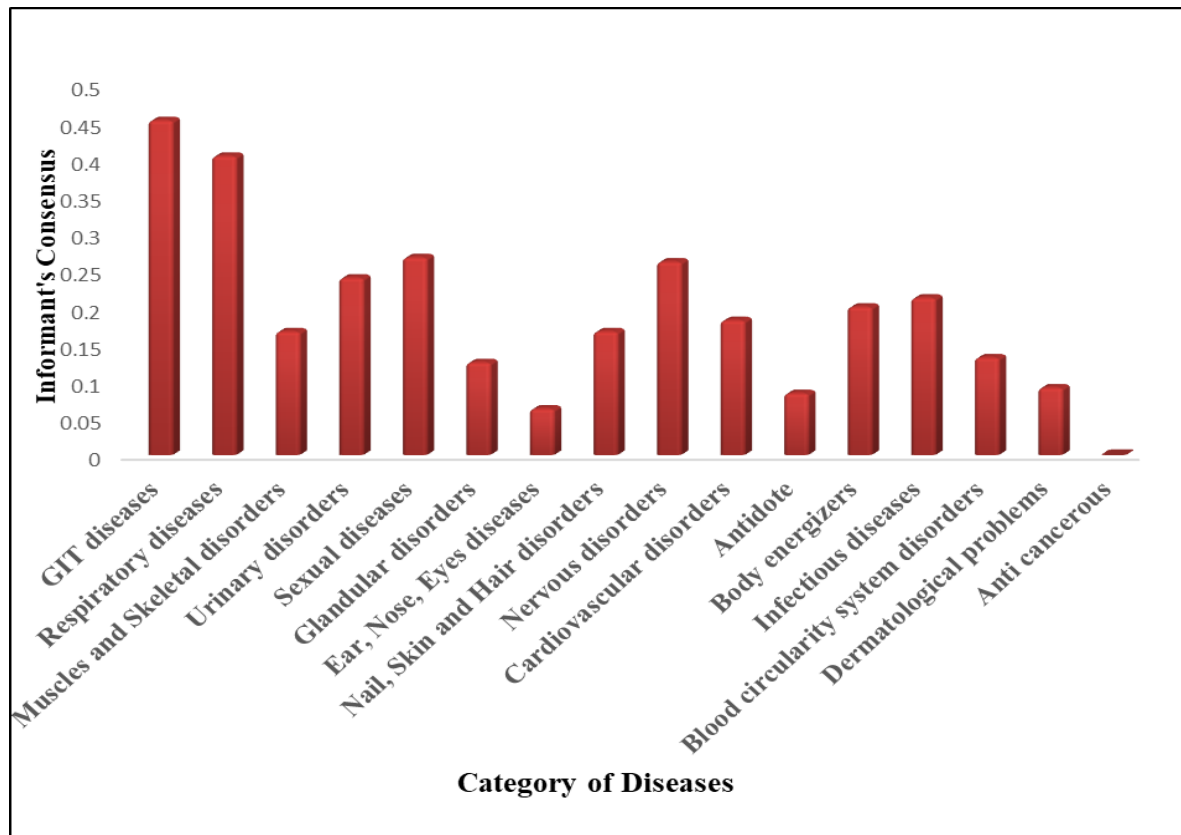

Figure 7. Informant's Consensus Factor (ICF) value of medicinal plants used for treatment of various diseases

This high ICF values shows reasonable respondents' reliability on the utilization of species of medicinal plant (Lin *et al.* 2002), the lower ICF value reported in urinary problems, body energizers, and infectious diseases such as chicken pox, measles, and dengue fever demonstrates a lack of homogeneity in the informants' knowledge. Conversely, a greater ICF is regularly connected with some plants that have large usage records in treating specific illness categories (Madikizela *et al.* 2012). Lower values, on the other hand, consistently correlate with several plants with approximately equal or high reports of use. This means that there is less agreement among informants about the use of plant species for treating a certain group of disorders.

Fidelity Level (FL)
In the study area, plant species utilized to treat certain ailments range from 23% to 100%. For such aims, we discovered 11 species of plants with a maximum frequency of 100%. *Abies pindrow* (Chronic bronchitis), *Berberis lycium* (Reduce pain), *Ficus carica* (Laxative), *Pistacia integerrima* (Reducing inflammation of body), *Quercus dilatata* (Sexual disease), *Ribes glaciale* (Cool body), *Rosa webbiana* (digestive ailments), *Sophora mollis* (Skin diseases), *Trigonella foenum-graecum* (Tonic), *Ulmus villosa* (Remove stones from the bladder), *Viburnum foetens* (Joint pain). Following additional inquiry involving phytochemical, pharmacological, and biological assessments, these plant species potentially reveal great utility as beneficial therapeutic plants. Plants with 80% or higher FL (Frequency of Citation Level) have been identified as very noteworthy. According to the FL results in Table 2, 15 plant species are specifically mentioned for treating gastrointestinal tract disorders, 12 for respiratory disorders, 8 for urinary disorders, 7 for blood circulatory system issues, 6 for boosting overall body energy, 4 for addressing infectious diseases, and 3 for managing nervous disorders. As stated, and proposed in prior studies, these organisms' merit additional study and research to determine their usefulness and validity (Street *et al.* 2008). Furthermore, plants with a low FL% should not be overlooked, but rather recognized. This acknowledgement helps to prevent the risk of progressive loss of vital knowledge (Chaudhary *et al.* 2006).

Relative frequency of citation (RFC) and use value (UV)

By evaluating informants who supplied information about various plants, the RFC reveals the inherent excellence of each plant species (Vitalini *et al.* 2013). The Relative Frequency of Citation (RFC) in our current study ranges between 0.823 to 0.008, as shown in Table 2. Plants with higher RFC scores are well-known and widely used in the local community. The high RFC could be due to their broad distribution, ease of access, and traditional cultural practices involving the treatment of numerous diseases with these plant species. These findings are critical for creating links and appraising research across important academic domains, opening the path for future discoveries in medication development and long-term plant use for therapeutic purposes (Mukherjee & Wahile, 2006). Plants with high Relative Fluorescence Capacity (RFC) should be used in pharmacological, medicinal plants, and biological studies to assess and validate their efficacy and authenticity (Mukherjee *et al.* 2012). In addition, it is critical to prioritize the conservation of these plants because overharvesting for particular applications may result in a population reduction.

Use vale evaluates the importance of a species based on the frequency with which native informants report using it. This value ranges from 0.15 to 0.3 in the current environment (see Table 2). According to the trend, plants with a higher number of usage reports (UR) consistently have higher UV, whereas plants with less UR reported by informants have lower UV. Furthermore, there is a link between plants that are used repeatedly and a higher possibility of demonstrating biological activity (Trotterand-Logan, 1986). As a result, plants with high RFC and UV values may have a high potential for curing specific illnesses.

Conclusion

Plants having therapeutic characteristics remain important in some communities, despite the lack of ethno-medicinal evidence for traditional medicine practices in those areas. The Alpine and Sub-Alpine regions of Palas Valley in Kohistan, Northern Pakistan, are rich in medicinal plants, although more research is needed. As a result, considerable and essential information about the ethno-medicinal use of indigenous flora in this area has been documented. The gastrointestinal tract (GIT) problem had the largest percentage at 28.83%, followed by respiratory system disorders at 10.72%. The majority of known plants are categorized as herbs, and the most widely used plant components are leaves, with roots coming in second. The most common form of preparation is decoction, which is closely followed by the usage of powder. The ICF demonstrates a high degree of concordance in GIT diseases, followed by respiratory ailments. About 11 plant species have been discovered to have a maximum FL% of 100%, with the majority of these having high UV and RFC values. Plants with exceptional FL%, UV, and RFC values that cannot be demonstrated by similarity indices are valuable in these areas. As a result, these should be studied further for phytochemical and pharmacological research to investigate their potential for future drug discovery. Therefore, policymakers and the forest department prioritize conservation measures by creating awareness among local communities for the preservation of medicinal plant diversity as well as indigenous traditional knowledge for future generations.

Declarations

Acknowledgements

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