



A quantitative exploration of traditional medicinal plants of Koh Valley Chitral, Hindukush Range, Pakistan

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Abstract

Background: This is the first quantitative study on the traditional use of important medicinal plants in Koh Valley Chitral, Hindukush range, Pakistan. This research explores the relationship between local communities and medicinal plants in their daily lives and provides practical knowledge for maintaining health.

Methods: A total of 160 informants were interviewed, including inhabitants of the study area of both genders and traditional healers. Visual assessment and rural appraisal methods were used together with semi-structured interviews and open-ended questionnaires. The data collected were analyzed quantitatively using the following parameters: Frequency of citation, relative frequency of citation, reports on the importance of using to family, parts used and their use.

Results: The ethnomedicinal study revealed that a total of 128 plant species belonging to 104 genera and 51 families were reported. The study showed that Asteraceae was the dominant family with 14 species. The life form showed that herbs were the leading group (82 species), while fruits (42 species), were the most commonly used plant parts. *Berberis lycium* is the most commonly medicinal plant in this area. Other plants were also used for the treatment of different diseases. Fifty two (52 species), are commonly used for diseases of the gastrointestinal tract. The RFC values ranges from 0.05 to 0.29. Asteraceae showed the highest FIV value (183.13), followed by Rosaceae (180.6). *Papaver somniferum* has the highest usage report (UR-16), indicates that, in a specific ethnobotanical study, this plant was cited for the most diverse applications among all the plants documented.

Conclusions: The identified plants showed strong therapeutic properties and this research will be the basic guideline for the preservation of ethnomedicinal knowledge, heritage and crude drug practices in the context of the development of new herbal medicines.

Keywords: Traditional Knowledge; Importance value; RFC; Use report; Koh Valley

Background

The Koh Valley in Chitral, Pakistan, is renowned for its vibrant cultural tapestry and historical significance. The Kho people, who speak Khowar and are well-known for their rich musical and dance traditions particularly the Chitrali sitar and traditional dances like the Chitrali dance are the main inhabitants of the valley. The area is also home to a diversity of ethnic groups, such as the small Kalash communities, who are distinguished by their own cultural traditions and polytheistic beliefs (Ali et al. 2002). Chitral's distinct blend of traditions influenced by Central Asian, Persian, and South Asian cultures can be attributed to its independent status as a princely state until its 1969 merger with Pakistan. Every year, the Jashn-e-Chitral festival honours the valley's history and brings in tourists from all around the area to see its crafts, music, and dancing (Holzwarth, 1996). Ethnomedicinal studies provide fundamental knowledge about specific inhabitants and communities and their traditional use of medicinal plants (Verpoorte et al. 2005). These practices are particularly prevalent in developing countries, as more than 4.5 billion people rely directly or indirectly on medicinal plants to cure various ailments, as they are considered part of their primary health care (Mussarat et al. 2014). In today's world, ethnobotanical studies on the use of medicinal plants have gained tremendous attention in the scientific community (Tripathi et al. 2017). Ethnobotany is the interdependence of plants and people (McClatchey et al. 2009), and the use of plants for medicinal purposes by the people is very common in the target area, and the inhabitants living in remote region are very well informed about the therapeutic value of plants for various ailments. In backward and mountainous areas of the world, medicinal plants are not only an important part of the culture and historical heritage but are also consumed as herbal remedies to treat numerous human ailments and diseases (Iyama & Idu 2015, Jamal et al. 2012). The local people traditionally consume medicinal plants for different ailments and remedies (Waheed et al. 2013). (Ali 2008), proved that out of about 5521 medicinal plants belonging to 1572 genera, most of them are confined to the hill country in Pakistan. The use of traditional medicine is not the same all over the world and varies according to philosophy and culture (Fabricant & Farnsworth 2001, Maruca et al. 2019). Nowadays, the use and knowledge of traditional medicinal plants is decreasing from generation to generation as valuable plant species are disappearing from their habitat due to modernization and lack of conservation practices (Tabuti et al. 2003, Musarella et al. 2019). Therefore, the conservation and documentation of medicinal plants of a particular valley and culture plays a crucial role in raising awareness among and sensitizing the masses and facilitates future medicinal plant research for the discovery of various medicines from these plants (Bunalema et al. 2014, Spampinato et al. 2018).

In recent decades, numerous ethnobotanical researches have been conducted with the aim of completely documenting the traditional knowledge of indigenous and cultivated medicinal plants in the Neelum Valley in the Himalayan region (Manzoor et al. 2024), on traditional medicinal plants in Muzaffarabad district of Kashmir Himalayan region (Gillani et al. 2024), on medicinal flora of subalpine and alpine indigenous communities in Palas Valley Kohistan, Northern Pakistan by Kayani et al. 2024, medicinal and aromatic plants from Kashmir Himalayan region by Gillani et al. 2024, medicinal plants practises of Makra Hills district Muzaffarabad by Mirzaman et al. 2023, ethnomedicinal exploration of genus *Nepeta* from Division Muzaffarabad by Manzoor et al. 2023, ethnobotany of weed flora of Charsadda by Khan et al. 2018, ethnomedicinal potential of Northern Balochistan, Pakistan by Ullah et al. 2024, and medicinal plants of Chamla Valley, Buner District, Pakistan by Ullah et al. 2024. Many researchers have studied the ethnomedicinal properties of plants in other parts of Chitral and KPK. Medicinal plants in Kalash valley Chitral by (Fazal et al. 2020), Medicinal plants in Terich valley Chitral by (Zaman & Badshah 2019), Chitral Gol National Park by (Khan et al. 2011), Zewar valley Upper Chitral by (Ullah & Rehman 2016), Chitral by (Ali & Qaiser 2009), Booni valley by (Ahmad et al. 2006), Rech valley by (Hadi et al. 2013) traditional knowledge of Mastuj valley by (Dastagir et al. 2022). Khan et al. 2010 investigated the medicinal plants from other locality of Chitral. Similarly various researchers documented the medicinal flora of KPK (Ahmad et al. 2022, Ali et al. 2019, Badshah & Hussain 2011, Hazrat et al. 2010, Khan et al. 2017, Naveed et al. 2012, Nazli et al. 2022, Uddin et al. 2016, Shah et al. 2021). Thus, the study should describe the following objectives to: i. conduct ethnobotanical surveys and talk to traditional healers to compile a comprehensive inventory of traditional medicinal plants utilised by local inhabitants in Koh Valley, Chitral, Hindukush Range, Pakistan, ii. assess the state of traditional medicinal plants in Koh Valley, Chitral, Hindukush Range, Pakistan and propose conservation measures that promote sustainable use and management of these priceless plant resources, iii. Promote conservation and sustainable use of traditional medicinal plants among the local people and relevant stakeholders.

Materials and Methods

Study Area Description

The Chitral Valley is located in the extreme North and North-west of Pakistan between 35° 15' 06" to 36° 55' 32" north latitudes and 71° 11' 32" to 73° 51' 34" east longitudes. This prestigious valley lies at an altitude of 1494m to 6500m. With an area of 14800 km², it was administratively the largest district of Khyber Pukhtunkhwa. Nowadays, Chitral is partitioned into two districts, Lower Chitral and Upper Chitral. The area is covered by dry, temperate high mountain

landscapes of the Hindukush ranges covered the area (Fazal *et al.* 2020). The Koh Valley is located at 72° 07' to 73° 97' East longitude and 35° 20' to 36° 55' North latitude. The valley lies between 1850 m at Kari village and 6485 m at Phasti village above sea level. It is centrally located in Chitral. The valley is characterized by uneven terrain (Fazal & Badshah 2023). The temperature variation ranges from -08 °C in winter to 42 °C in summer. The total area is 1075 Km² with a population of 20537 people as per the census (GOP 2017). This is the first exploration of medicinal plants of Koh Valley Chitral which is still unexplored. Phytogeographically, Koh is located in Irano-Turanian region and is floristically very rich due to its altitudinal variation and landscape features (Figure 1).

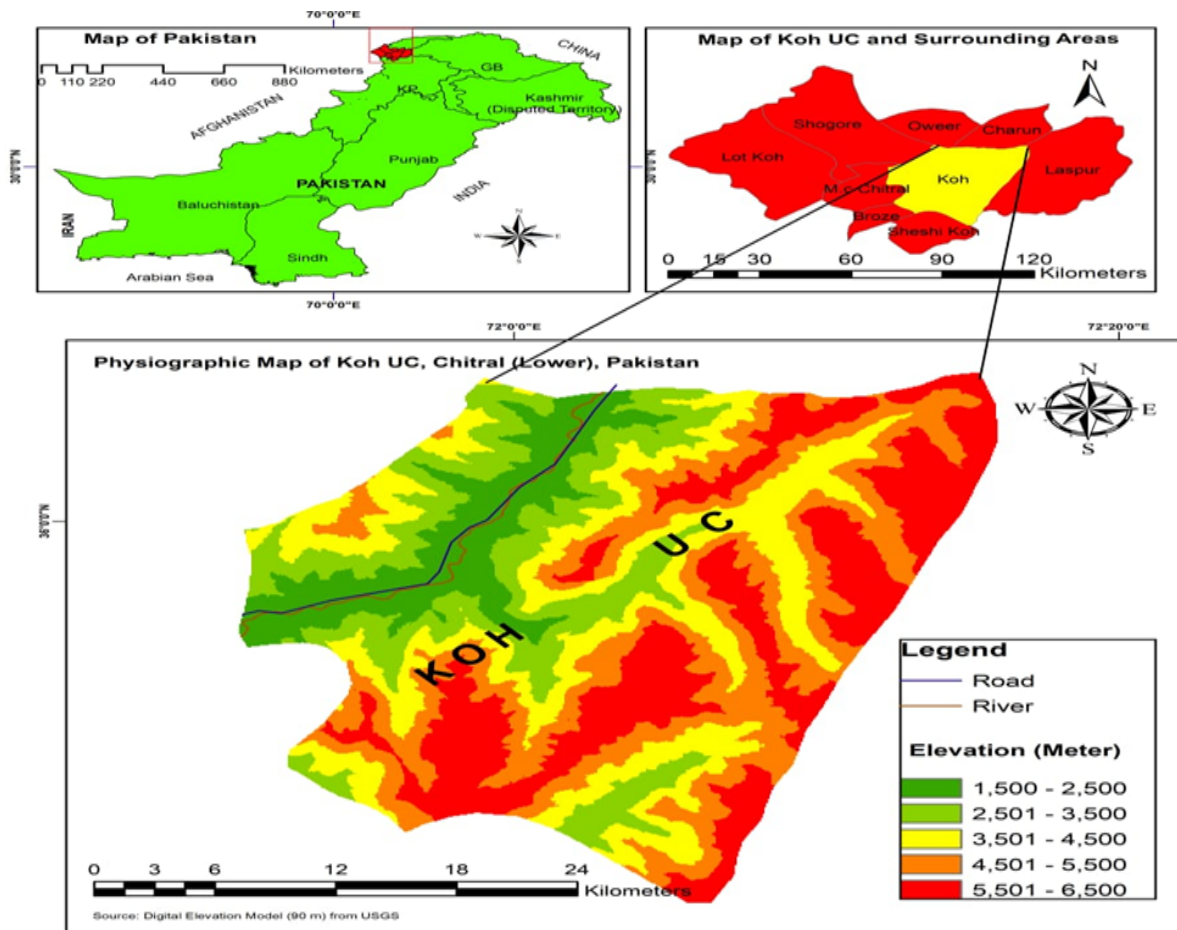


Figure 1. Map of the province of KP, Chitral, showing the study area

Data Collection, Identification and Herbarium Sheets Deposition

Complete surveys of medicinal plants were conducted by collecting information regarding medicinal plants use during March 2019 to October 2022 from six villages namey Koghuzi (altitude 1680m), Prayet (altitude 1825m), Golain (altitude 1840m), Kuju (altitude 1640m), Barenis (altitude 1880m), and Moroi (altitude 1780m). The collected plant specimens were hard pressed after identification according to Flora of Pakistan (Ali & Nasir 1989-1991, Ali & Qaiser 1993-2018, Nasir & Ali 1970-1989), and also confirmed from published literature (Ibrahim *et al.* 2019; Khan *et al.* 2019; Khan and Badshah, 2019; Khan *et al.* 2022) and assigned voucher numbers. These were kept in the herbarium of the Botany Department of the University of Peshawar for future reference. Information on medicinal plants was collected through questionnaires and interviews with local respondents in the research area. They were asked to register the medicinal plants, known in the community (Figure 2A-B). The information obtained was further processed and elaborated as stated (Badshah *et al.* 1996, Hussain *et al.* 2015). The medicinal information was compiled using different protocols such as field interpretation, semi-structured and open-ended interviews (Martin 1995; Bibi *et al.* 2014), while appropriate questionnaires were also completed by the local inhabitants. Interviews were conducted with 160 indigenous respondents was conducted randomly in the study area, of which 90 were male and 60 were female and 10 were indigenous herbalists (Table 1). These inhabitants belong to different occupations i.e farmers, herbalists, shopkeepers, business man. The "Khow" people who inhabit the Koh Valley are of "Aryan" descent. The majority of them initially came from China, Afghanistan, Tajikistan, and other regions of Central Asia at various points in time. The questionnaires contained information on the demographics of the locals (gender, age, education and

experience) as well as the vernacular names, use of the parts, preparation methods, type of use and ailments treated with these medicinal plants. The names of the medicinal plants were confirmed by plant experts from the department; in addition, plant networks (software) and (<http://www.kew.org/mpns>) were used for taxonomic and botanical authentication.

Figure 2. (A) Collection of *Capparis spinosa* at Koh Valley, (B) Discussion with local people about medicinal plants

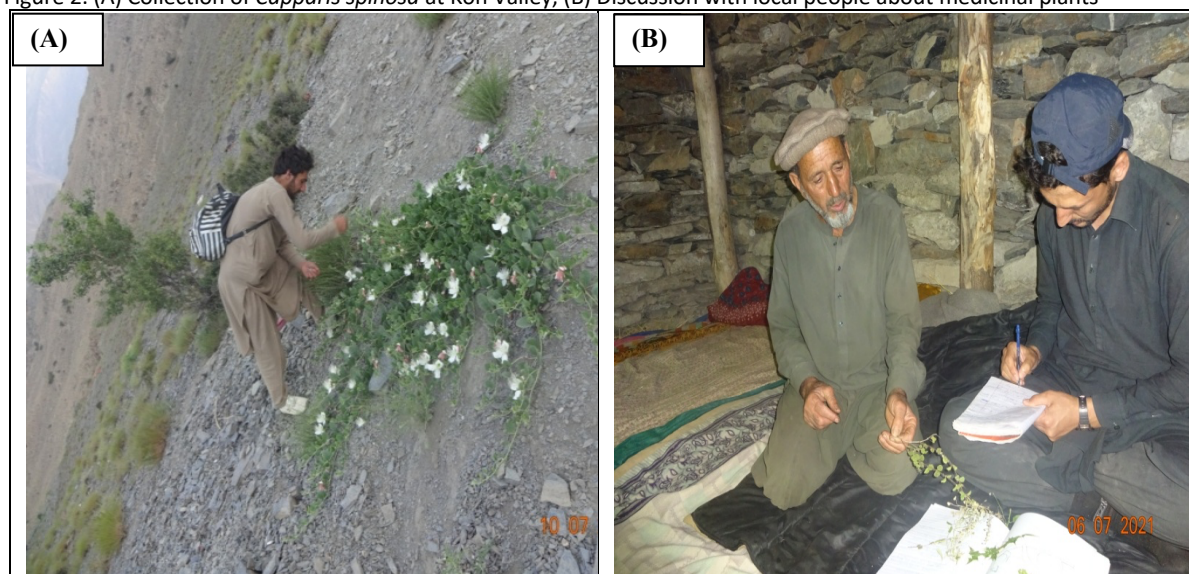


Table 1. Demographic table for the participants from the Koh Valley in Chitral

Variables	Categories	Number Of Persons	Percentages
Informant categories	Local people	147	91.875
	Health practitioners	13	8.125
Gender	Male	90	56.25
	Female	70	43.75
Age	Less than 30	23	14.375
	31-40	37	23.125
	41-50	40	25
	51-60	40	25
	61-70	20	12.5
Education backgrounds	Illiterate	52	32.5
	8 year education	16	10
	10 year education	42	26.25
	12 year education	18	11.25
	Graduate	24	15
	Higher studies	8	5
Experience of health practitioners'	Less than 5 years	37	23.12
	Less than 10 years	59	36.87
	Less than 20 years	21	13.12
	More than 20 years	43	26.87

Quantitative investigation of ethnomedicinal data

The data collected in Koh Valley was analyzed using various quantitative indices such as CF, RCF, UR and FIV.

Relative Frequency Citation (RFC)

The RFC data were analyzed using the RFC index, which describes the local preferences of medicinal plants. The frequency of mentions (FC) is used to evaluate the most commonly used plant species (Malik et al. 2018), and the RFC is calculated to determine the level of traditional knowledge about the use of medicinal plants in the study areas. The analysis was

performed using the formula of Tardio & Pardo-de-Santayana (2008) & Vitalini et al. 2013, A high RFC value indicates residents' preferences for plant species. It can be 1 for a particular plant if the informant mentioned the plant species in question as useful and it can be 0 if no one mentioned the use of the plant species (Medeiros et al. 2011).

$$RFC = \frac{FC}{N} \quad (0 < RFC < 1)$$

where FC is the number of respondents, who mentioned the use of plant species and N is the total number of informants who participated in the study.

Family Importance value (FIV)

It is used to describe the relative importance of families and was calculated on basis of the percentage of informants who mentioned the family. The FIV was assessed according to the standard protocol described by Rashid et al. 2015.

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

where FC represents the informants who mention the family and while N for the total informants involved in the study.

Result and Discussion

Demographic profile of the informants

In the Koh Valley Chitral research area, 160 informants were interviewed of whom 13 were herbalists and the rest were local inhabitants. Majority of them are from Chitral, a few are nomads, locally called Gujjar. The majority of the respondents were male, 90 (56.25%), while 60 (37.75%) were female. The informants were categorised into five main categories based on their age. Majority of the respondents were among 41 to 50 years old, 25% (40) and 51 to 60 years old 25% (40). A large proportion of the respondents were educated (67.5%), while less number of informants (32.5%) were illiterate as indicated in the demographic table (Table 1). The study by Rehman et al. (2017) also concluded that majority of the informants were between 51-60 years (27.55%) and 41-50 years (22.9%). The majority of the information on the medical applications of plants came from informants aged between 45 and 70 years, indicating that the elderly population in rural areas is gradually losing its wealth of knowledge on medicinal plants. There is currently less transfer of information about folk medicine from one generation to the next; similar findings were published by Jan et al. (2017). In addition, the highly educated inhabitants of the study area were found to know less about medicinal plants and their uses than the illiterate; this difference in knowledge could be due to the former group's reliance on the modern health care system. Kayani et al. (2015) came to the same conclusions. The role of the illiterate respondents was also significant as they pass on their knowledge of medicinal flora to the next generation and are in direct contact with valuable plants. Indigenous knowledge about the use of medicinal plants was found to be stronger among illiterate people (Rehman et al. 2017). The role of traditional healers is also exceptional as they have extensive knowledge about crude drugs and their role. Among the 13 herbalists (38.46%), most were indigenous nomads and had few knowledge about the use of medicinal plants.

Quantitative analysis of ethnomedicinal data

Relative Frequency of Citation (RFC)

The most common medicinal plants used to treat different diseases were identified by calculating the relative frequency based on information from local informants (Ahmad et al. 2017). The RFC values ranged from 0.05 to 0.29. The medicinal plants with the highest RFC values were *Berberis lycium* Royle. and *Cannabis sativa* L. (0.29). The most popular medicinal plant mentioned by locals is *Berberis lycium*, as evidenced by ethnobotanical research that examine local groups' usage habits. These studies frequently use quantitative measures to assess the significance and prominence of particular plants in traditional medical practices, such as Use Report (UR) and Frequency of Citation (FC). This could be due to their medicinal properties or their use as fuel and food. Other important plants in the area were *Ephedra gerardiana* Wall. ex Stapf., *Capparis spinosa* L. and *Allium cepa* L. due to their availability and cultivation with tremendous medicinal properties. Ahmad et al. (2017), and Ijaz et al. (2016), also reported the highest RFC values for *Berberis lycium* (0.75). Similarly, the findings of Aziz et al. (2017) achieved the highest RFC values for *Cannabis sativa* in Bajaur Agency, Federally Administrated Tribal Areas, Pakistan, and are similar to our results. The plants with the lowest importance were *Pinus roxburghii* Sarg., *Euphorbia helioscopia* L., *Goodyera tessellata* Lodd. and *Tribulus terrestris* L. Our result is in correlation with ethnomedicinal research in Pakistan (Barkatullah et al. 2014, Ullah et al. 2014), and Iran (Dolatkhahi et al. 2014). These results can be explained by the fact that many respondents mentioned the plant species, and the number of respondents describing the use of this medicinal species directly correlated with the RFC (Malik et al. 2019). The phytochemically and pharmaceutically significant

constituents found in the plants with high RFC should be further investigated in order to determine their active compounds and support the development of novel drugs. These results can be considered the most important for reference and evaluation of research in hypothesised related areas for the creation of new drugs and the sustainable use of plants for medical purposes (Ahmad et al. 2016). The most frequently cited species were those that are most useful and most commonly used by the people for medicinal purposes. The plants with high value of RFC should be included in phytochemical, biological and pharmacological studies (Mukherjee et al. 2012).

Family Importance Value (FIV)

When more species of a plant family are cited more frequently, this plant family gains in importance becomes more significant. The Family Importance Value (FIV) was used to determine the relative importance of families (Sulaiman et al. 2020). The plant families with the highest FIV were Asteraceae (183.13), followed by Rosaceae (180.6), Apiaceae (125.6), and Lamiaceae (96.9), while the families with the lowest FIV were Euphorbiaceae and Saxifragaceae. These dominant families were adapted to the environmental conditions and were more likely to survive than other families. In the study by Rehman et al. (2023), the family of Asteraceae was also reported to have the highest FIV values, which are consistent with our results.

Medicinal plant diversity, frequently cited plant and habits

In this ethnomedicinal study, a total of 128 plants belonging to 104 genera and 51 families were examined (Figure 3, Table 2). The detailed documentation of the medicinal plant species, including their vernacular names, family names, habit, partial use, folk recipes, mode of use and ailments treated, as well as the quantitative analysis is given in Tables 3 & 4 and Figures 3 & 4. The leading family in terms of number of plants was Asteraceae with 14 plants, followed by Rosaceae with 11, Apiaceae with 7, Solanaceae, Moraceae, Lamiaceae and Polygonaceae with 5 each, Brassicaceae, Chenopodiaceae and Cucurbitaceae with 4 each, Elaegnaceae with 3 species (in addition to the other remaining families with two and one species each. Asteraceae and Rosaceae dominated as many of the plants in these families were cultivated as food by the local people and these plants were adapted to the respective environments and used by the people against a number of diseases (Fazal et al. 2020, Khan et al. 2017, Zaman & Badshah 2019). This research shows that herbs were the leading life form with 82 (64%) species, followed by trees with 28 (22%), shrubs with 12 (9%), climbers with 4 (3%) and vegetables with 2 (1.5 %) (Figure 3). The reason for the high proportion of herbs could be due to their easy availability, ease of collection and their efficacy and effectiveness in treating various diseases due to the therapeutic agents present (Adnan et al. 2012, Ayyanar & Ignacimuthu 2005, Sanz-Bisetet et al. 2009, Shuaib et al. 2014, Uniyal et al. 2006). Other reasons could be that drugs can be easily produced from plants and that they play an active role in metabolic activities and digestion (Arshad et al. 2011, George & Nimmi 2011, Lulekal et al. 2013). The most commonly mentioned plants were used by the majority of the local people, especially in old age, as they are widely available, cheap and have no side effects compared to the synthetic drugs produced by the industry.

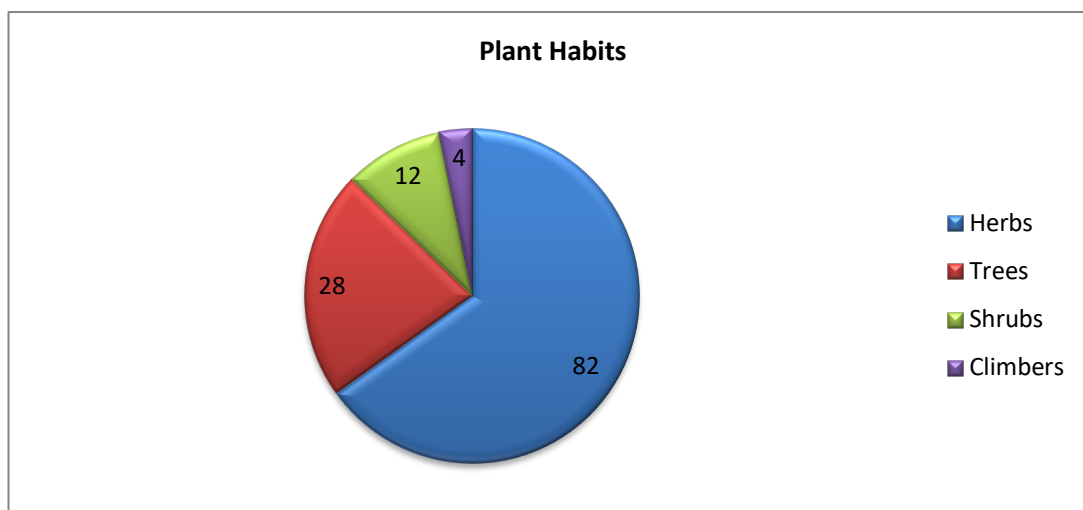


Figure 3. Summary of the plant habit classes and their species composition

Table 2. Checklist showing scientific The most commonly used vascular medicinal plants of the Koh Valley district in lower Chitral

Family	Botanical Names	Vernacular Names	Voucher numbers	H	P.U	Area	FC	RFC	UR	FIV	Herbal drugs preparation and Medicinal uses
Adiantaceae	<i>Adiantum capillus-veneris</i> L.	Sumbal	Fazal Bot 1	He	Le	Mo	12	0.08	2	16.3	The leaves after drying are grinded and the powder was chalked out through the silk cloth. After that 2-4g powder will be taken in a glass of water once a day before breakfast for better function of circulatory system. The dried shoot of this plant after grinding and mixing with mustard oil will be applied on baled head at night for lost hair and growth.
	<i>Adiantum venustum</i> D. Don.	Sumbali	Fazal Bot 2	He	Le	Ko	14	0.09	3		Liquid extracts from the fronds are prepared and consumed for excretory system and respiratory diseases. The fronds also used for insects bites.
Equisetaceae	<i>Equisetum ramosissimum</i> Desf.	N.I	Fazal Bot 3	He	Sh	Is	09	0.06	4	5.6	The juice extracts from shoots are used as tonic, anti-lice, anti-acidic, excretory system ailments.
Ephedraceae	<i>Ephedra gerardiana</i> Wall. ex. Stapf.	Somani	Fazal Bot 4	Shr	Wh Pl	Go	45	0.28	4	28.1	Whole plant uprooted and after washing and drying, are powdered and used for Respiratory system ailments. Extracts are also obtained from stem and is applied in skins and gastro-intestinal problems.
Cupressaceae	<i>Juniperus communis</i> L.	Saroz	Fazal Bot 5	Shr	Le	Pr	15	0.09	2	9.4	Dry leaves and berries are used against evil eyes and devils. Dry seeds oils have calming effects on nervous system and used for problems during sleeping.
Pinaceae	<i>Pinus roxburghii</i> Sarg.	Rogh	Fazal Bot 6	Tre	Re	Mo	08	0.05	4	11.3	Stem of fresh wood are burned in fire and oil is obtained and one drops of oil is mixed with a glass of milk and used against skin diseases, liver problems and carcinogenic. While, resin is used for skin diseases.
	<i>Pinus wallichiana</i> A.B. Jackson.	Jangali Rogh	Fazal Bot 7	Tre	Re	Go	10	0.06	3		From woods after burning oil is obtained and very useful for various ailments such as skin diseases, respiratory problems and liver health.
Alliaceae	<i>Allium cepa</i> L.	Thashtu	Fazal Bot 8	He	Bul	Pr	40	0.25	5	51.3	The bulb is wormed and oil like secretion is obtained, which is used for respiratory health in children and worm bulb is best against wounds. Green leaves are useful to decrease blood pressure and also helpful in digestion and against germs with anti-biotic properties.
	<i>Allium sativum</i> L.	Wrasnu	Fazal Bot 9	He	Bul	Mo	42	0.26	5		Bulbs are grinded with the help of pestle and motor and mixed with mustard oil, salt, juice of lemon and pasts are used in toothache, skin diseases, Gastro-intestinal tract problems, in circulatory system and respiratory problems.
Amaryllidaceae	<i>Narcissus tazetta</i> L.	Margasgmb uri	Fazal Bot 10	He	Fl	Mo	16	0.1	1	10	Flower is very helpful for bowl movements and also attracts honey bees for honey purposes.

Araceae	<i>Acorus calamus</i> L.	Shaye	Fazal Bot 11	He	Rhi	Ko	14	0.09	10	8.8	The dry rhizome grind to powder and used as sedative, in fever, Gastrointestinal health, insecticidal and tonic, also used in colic, cough, inflammation, brain health and in snake bites.
Poaceae	<i>Triticum aestivum</i> L.	Gom	Fazal Bot 12	He	See	Ka	38	0.24	3	65	Unripe seeds are collected and boiled locally called as 'Sormullough' and used as tonic, aphrodisiac and good for gastro-intestinal tract system.
	<i>Hordeum vulgare</i> L.	Sirey	Fazal Bot 13	He	See	Pr	16	0.1	4		The grains powders after making breads are used for excretory system issues, in fever, in gastro-intestinal problems and respiratory diseases.
	<i>Avena sativa</i> L.	Gracgh	Fazal Bot 14	He	See	Pr	19	0.11	2		The grains are useful for excretory system problem and nice for fever.
	<i>Zea mays</i> L.	Juwari	Fazal Bot 15	He	See infl	Mo	31	0.19	2		The seeds are used as source of starch and bread is good for gastro-intestinal problems. Fruit hairs like structure are used in making tea for breakdown of kidney stones.
Amaranthaceae	<i>Amaranthus viridis</i> L.	Shakh joshu	Fazal Bot 16	He	Le	Mo	23	0.14	7	14.4	Leaves of the plants are medicinally used in snakebites, scorpion sting and insect bites. Leaves also consumed for skin health and against intestinal worms. Decoction is used in inflammation and dysentery.
Anacardaceae	<i>Celtis australis</i> L.	Binju	Fazal Bot 17	Tr	Se Fr wo	Mo	17	0.11	5	32.5	Fruit is edible and used as tonic, abdominal pain and jaundice. Seed is good for skin health. Wood is considered good for evil eyes.
	<i>Pistacia khinjuk</i> Stocks.	Sawir	Fazal Bot 18	Tr	Fr	Ku	16	0.1	1		Powder in the flower is collected which is used in the preparation of drugs, especially containing anti-cancerous substances.
	<i>Pistacia integerrima</i> J.L. Steward ex Brandis.	Thok	Fazal Bot 19	Tr	Se Re	Pr	19	0.11	3		Gums in the bark after drying are grinded and the paste is then fried with ghee which is useful for diarrhea, constipation and dysentery. Seeds are eaten by wild birds for good health.
Apiaceae	<i>Bunium persicum</i> (Boiss). Fedstch	Hojosh	Fazal Bot 20	He	Se	Ku	40	0.25	1	125.6	Decoction from the boil seed are used against gastro-intestinal problems.
	<i>Carum carvi</i> L.	Zira	Fazal Bot 21	He	Fr	Ra	26	0.16	4		Dry fruit used as respiratory and gastro-intestinal tract, antibacterial and good for bone health.
	<i>Coriandrum sativum</i> L.	Danu	Fazal Bot 22	He	Le Fr	Is	32	0.20	3		Leaf is a source of salad while fruits is used in spices. A decoction of fruits is given in colic. Locally used as excretory system issues and gastro-intestinal issues.
	<i>Daucus carota</i> L.	Khasgum	Fazal Bot 23	He	Ro	Ko	30	0.19	2		Extractions of roots are given to patients three times a day for gastro-intestinal diseases and to improve eye problems.
	<i>Ferula narthex</i> Boiss.	Rav	Fazal Bot 24	He	Wh Pl	Ph	37	0.23	3		Locally this plant is used for respiratory health, toothache and gastro-intestinal problems.

	<i>Foeniculum vulgare</i> Mill.	Bodyong	Fazal Bot 25	He	Le Fr Se	Ka	35	0.22	6		Juice of the fruit is used as to improve eye sight and oil as vermicides. Fresh Leaves and oil are used as excretory ailments and improve gastro-intestinal issues while seeds are very helpful for bowl movements and aphrodisiac in nature.
	<i>Carum copticum</i> L.	Shnjmok	Fazal Bot 26	He	Se Le	Ku	20	0.13	2		Leaves are used as Salad and considered best for backache. Seeds have also medicinal value and good for gastro-intestinal tract.
Apocynaceae	<i>Catharanthus roseus</i> L.	Gamburi	Fazal Bot 27	He	Le	Ra	16	0.1	5	21.9	Locally the leaves are considered effective in blood cancer also the plant is used in brain health, liver health, stomachic, gastro-intestinal ailments.
	<i>Nerium indicum</i> Mill.	Tali gamburi	Fazal Bot 28	Tr	Ro Le	Mo	19	0.11	7		The dried root powder is used as vermicides, excretory system health and anti-inflammatory. It is also rubbed in the head during headache. Paste from the root and leaves are also useful against ring worms and other skin diseases. Decoctions from the leaves have soothing effects externally and decrease inflammation.
Asteraceae	<i>Anthemis cotula</i> L.	Shirvist	Fazal Bot 29	He	Fl	Mo	22	0.14	2	183.13	Flowers after boiling in water and decoction from them are used for gastro-intestinal problems. Most effective for abdominal worms of children.
	<i>Artemisia scoparia</i> Waldst & Kit.	Phaspuk	Fazal Bot 30	He	Sh Se	Mo	26	0.16	2		Plants shoot and seeds after collection are boiled and decoction is used as respiratory stimulant and vermicides.
	<i>Artemisia parviflora</i> Roxb. ex. D. Don.	Kharkhalig	Fazal Bot 31	He	Fl	Pr	24	0.15	3		Seed are collected, cleaned, dried and stored then crushed and mixed with soup and used for nappy rashes. A glass of 2 gram seed extract is also drunk once a day to cure a diabetes and as an vermicides.
	<i>Artemisia maritima</i> L.	Drone	Fazal Bot 32	He	Le	Ka	18	0.11	2		Traditionally Leaves extract and essential oil is used against various intestinal worms and also helpful for curing skin problems.
	<i>Cichorium intybus</i> L.	Khasti	Fazal Bot 33	He	Ro	Pr	28	0.18	4		The plant is boiled and decoction is consumed against fever, gastro-intestinal problems, vomiting and jaundice.
	<i>Calendula officinalis</i> L.	Mari-Gold	Fazal Bot 34	He	Fl	Mo	24	0.15	3		Juice of crushed flowers used for toothache. Dilute tincture formed in water used to boost liver issues and in jaundice.
	<i>Carthamus tinctorius</i> L.	Poam	Fazal Bot 35	He	Fl	Mo	30	0.19	3		Water extract of flowers are aromatic and useful for cough and common cold and various gastro-intestinal problems.
	<i>Helianthus annuus</i> L.	Yorot-mokhno korak	Fazal Bot 36	Shr	Se Fl	Ba	23	0.14	2		Oil extracted from seeds is used for jaundice and gastro-intestinal ailments and also rich source of vitamins. Flowers attract honeybees as honey is very good for health.
	<i>Lactuca sativa</i> L.	Kilim	Fazal Bot 37	He	Le	Ba	28	0.18	1		Fresh leaves are used as Salad to enhance gastro-intestinal health.

	<i>Matricaria chamomilla</i> L.	Shrisht	Fazal Bot 38	He	Fl He	Mo	25	0.16	1		Flowers are boiled in water and used for different gastro-intestinal problems.
	<i>Sonchus asper</i> (L.) Hill.	Shakh joshu	Fazal Bot 39	He	La Fl Le	Ba	12	0.08	3		The plants leaves and flower are crushed to form a paste and applied as a poultice on wounds and boils. Latex is also used to treat injuries.
	<i>Taraxacum officinale</i> Webb.	Troqphowo	Fazal Bot 40	He	Le Rh Ro	Mo	23	0.14	4		The young Leaves used as vegetable helpful in liver and excretory system disorders. The root used as mild bowel removal, excretory system health and bitter tonic. The rhizomes in roasted form used in coffee preparation.
	<i>Cirsium heterophyllum</i> (L.) Hill.	Chamchir	Fazal Bot 41	He	Ro	Mo	21	0.13	3		Root is edible and used for jaundice, liver issues and fever problems.
	<i>Xanthium strumarium</i> L.	Khoor zogkho	Fazal Bot 42	He	Ro Fr Le	Pr	15	0.09	6		The dry root crushed into powder and utilized as tonic and carcinogenic in nature. Fruit powder is used as fever problems and excretory system health, well in treatment of smallpox. Leaf decoction is recommended in long standing malarial fever.
Berberidaceae	<i>Berberis lycium</i> Royle.	Choange	Fazal Bot 43	Shr	Wh. Pl	Pr	46	0.29	8	28.8	Traditionally, decoction in the roots after boiling is obtained which is useful in the proper functioning of gastro-intestinal tracts and for eye diseases. Ripe berries also used medicinally. Bark powdered is used as astringent also in the healing of internal wounds, cracked bones and for the burning sensation of urine. It is considered as good tonic during pregnancy problems. The drug is also taken with Dasi ghee for hidden wounds.
Brassicaceae	<i>Brassica napus</i> L.	Tepor	Fazal Bot 44	Veg	Le Ro	Ka	35	0.22	1	66.9	Leaves and roots are source of vegetable and useful for gastro-intestinal tract problems.
	<i>Nasturtium officinale</i> R. Br.	Toqho-krdachi	Fazal Bot 45	He	Le	Ba	33	0.21	4		Fresh leaves used as salad and vegetable, medicinally very useful for excretory system, gastro-intestinal and respiratory health. It is also considered beneficial for circulatory system.
	<i>Capsella bursa-pastoris</i> L.	Jalajali	Fazal Bot 46	Her	Se	Mo	22	0.14	2		Collected seeds are locally used as gastro-intestinal problems as well as in dropsy.
	<i>Sisymbrium irio</i> L.	Khalikhali	Fazal Bot 47	Her	Se	Mo	17	0.11	3		Decoction from seed is used to treat flatulence, typhoid issues and gastro-intestinal problems.
Canabinaceae	<i>Cannabis sativa</i> L.	Boung	Fazal Bot 48	He	Le Fl	Ko	46	0.29	4		Juice extracted from leaves added with milk, sugar, crushed almond, opium seeds and walnut and made solution utilized against fever, narcotics and anti-spasmodic. Chars a narcotic drag is also prepared from leaves.
Capparidaceae	<i>Capparis spinosa</i> L.	Kaveer	Fazal Bot 49	He	Fr	Pr	45	0.28	5	28.1	Kaveerogh locally is very famous dish made by dry fruit with meat and very powerful for liver health and aphrodisiac. Flowers with water are placed in sun for few days and decoction is used for gastro-intestinal ailments. Fruits (Chantiq) are used for skin ache and face beautification.

Caryophyllaceae	<i>Silene conoidea</i> L.	Apopar	Fazal Bot 50	He	Wh Pl	Mo	32	0.2	2	20	From young plants Sag and medicinally used for bowl movements and vermicides.
Chenopodaceae	<i>Chenopodium album</i> L.	Pililio- mragh	Fazal Bot 51	He	Wh. Pl	Pr	28	0.18	7	70.6	Medicinally the whole plant is used. From fresh leaves sage is prepared and good for bowl movements, vermicides, excretory system issues and circulatory issues. The seed and root used in jaundice and urinary tract diseases. Root and fruit is antidote to snake poison.
	<i>Chenopodium botrys</i> L.	Kunakh	Fazal Bot 52	He	Sh	Mo	37	0.23	6		The plant as a vegetable is vermicides and also used in cough and for liver health and bowel movements. Leaves decoction is used for healing wounds and pus discharge.
	<i>Spinacia oleracea</i> L.	Palak	Fazal Bot 53	He	Le	Ku	35	0.22	2		Leaves are boiled as vegetable and used as bowel movement and improve gastro-intestinal problems.
	<i>Beta vulgaris</i> L.	Lablabu	Fazal Bot 54	He	Fr Le	Mo	24	0.15	5		Fruit are boiled and with walnut used as tonic, circulatory stimulant, blood purifiers and aphrodisiac. Leaves are also made Sag as a vegetable useful for bowel movements.
Convulvulaceae	<i>Convulvulus arvensis</i> L.	Mesh	Fazal Bot 55	He	Sh	Mo	34	0.21	3	21.2	Juice extract of the plant is good for skin diseases and dandruff control. Root decoction is a good source for bowel treatments.
Cucurbitaceae	<i>Cucurbita maxima</i> Duch. ex Lamb.	Kadoo	Fazal Bot 56	Cli	Le Fl Se Fr	Ba	27	0.17	3	78.8	Sag from the young leaves, shoots and flowers are useful for gastro-intestinal disorders. The seed are vermicides, while from fruit a pudding is prepared called as 'Kadoo-Halwa' good for gastro-intestinal problems.
	<i>Cucurbita pepo</i> L.	Alok	Fazal Bot 57	Cli	Fr	Mo	34	0.21	4		Fresh fruit is used with Salad very good for skin problems, excretory system, gastro-intestinal health and dehydration.
	<i>Luffa cylindrica</i> (L.) Roem.	Torai	Fazal Bot 58	Cli	Fr	Pr	32	0.2	2		Local cultivate the plant and used its fruit as vegetable which is medicinally beneficial for fever, good for gastro-intestinal problems.
	<i>Momordica charantia</i> L.	Karalla	Fazal Bot 59	Her	Fr	Ko	33	0.21	4		Fruit is bitter and used as vegetable. Fruit juice after dilution with water with single glass in early morning is good for diabetes, kidney stones, in malaria and fever.
Cuscutaceae	<i>Cuscuta reflexa</i> Roxb.	Umbool	Fazal Bot 60	He	Sh	Ra	10	0.06	6		Fresh shoots are collected, crushed and juice is extracted from it and used as blood purifier, vermicides and in excretory system issues as well as in curing jaundice, diabetes and vomiting.
Ebenaceae	<i>Diospyros lotus</i> L.	Jangali amlook	Fazal Bot 61	Tre	Fr Le	Mo	28	0.18	6	33.8	Edible fruit is helpful against blood diseases and bowel discharge. Unripe fruit juice is useful in chronic diarrhea and dysentery. The bark paste application on wounds is good having carcinogenic properties.
	<i>Diospyros kaki</i> L.	Amlook	Fazal Bot 62	Tre	Fr	Mo	26	0.16	4		The fruit is edible and stimulate gastric activities, to treat piles, and best in bone health. Unripe fruit pulp is used as basis for face pack to enhance skin health.

Elaeagnaceae	<i>Elaeagnus angustifolia</i> L.	Shinjur	Fazal Bot 63	Tre	Fr	Is	40	0.25	3	55	Leaves juice and fruits juice are extracted which is consumed for gastro-intestinal problems and also for fever and sore throat.
	<i>Elaeagnus umbellata</i> Thunb.	Bebagh	Fazal Bot 64	Tre	Fr	Mo	32	0.20	2		Fruits are edible and good for circulatory and respiratory system.
	<i>Hippophae rhamnoides</i> Rousi.	Mirghinz	Fazal Bot 65	Tre	Fr	Ra	16	0.1	2		Berries are used for gastro-intestinal pain (Ishkama-Chomik) and irritated eyes.
Euphorbiaceae	<i>Euphorbia helioscopia</i> L.	Bichigh joshu	Fazal Bot 66	He	Ro Sh Se	Ka	8	0.05	3	5	From dry root decoction is obtained which very helpful vermicides and shoot used in constipation and seed in cholera.
Fumariaceae	<i>Fumaria indica</i> (Haussk) Pugsly.	Shahtara	Fazal Bot 67	He	Sh	Ka	42	0.26	5		Leaves and shoot extracts is a source of blood cleaner, in fever, for curing malaria, in whooping coughs and in sore throats.
Hypericeaceae	<i>Hypericum perforatum</i> L.	Zerbali	Fazal Bot 68	He	Fl	Ko	14	0.09	2	8.8	Dried petal are powdered and used as blood purifiers and gastro-intestinal problems.
Juglandaceae	<i>Juglans regia</i> L.	Birmough	Fazal Bot 69	Tre	NuB a	Go	40	0.25	7	25	The leaves and bark are used for cleaning of teeth and sore throat. Decoction of leaves is used as vermicides. The fruit and its oil are used as tonic, gastro-intestinal problems against fever and enhance brain health.
Lamiaceae	<i>Lamium amplexicaule</i> L.	N.I	Fazal Bot 70	He	Le	Mo	20	0.13	3	96.9	Plant is collected and sag is prepared, also brewed and make tea which is beneficial for fever, gastro-intestinal problems and excretory system related ailments.
	<i>Mentha longifolia</i> (L.) Huds.	Jangali Bane	Fazal Bot 71	He	Le	Mo	42	0.26	5		Decoction of leaves is given to children as gastro-intestinal troubles. Leaves are useful during rheumatic pain while decoction of shoot is used in fever. The pregnant female made green tea from dried leaves and used for the cure of vomiting. Fresh leaves are used as anti-septic.
	<i>Nepeta cataria</i> L.	Mutrigh	Fazal Bot 72	He	LeFl	Pr	30	0.19	4		Fruits and seeds after drying is grinded and with water used in Fever, internal and external wounds, lumbago and toothache.
	<i>Ocimum basilicum</i> L.	Niazbo	Fazal Bot 73	He	Le Se	Ko	28	0.18	6		Leaves juices are used as gastro-intestinal issues, stimulant, vermicides and insect repellent. Seeds used as excretory system problems and against piles.
	<i>Mentha arvensis</i> L.	Pudina	Fazal Bot 74	He	Sh	Mo	35	0.22	5		The green and dried leaves used as anti-spasmodic, against fever, excretory system health and gastro-intestinal problems. Leaves decoction with lemon grass is prepared and used as febrifuge in fever.
Malvaceae	<i>Althaea rosea</i> L.	Lane	Fazal Bot 75	Sh	Fl	Mo	18	0.11	2	23.8	The petals of flowers are collected, dried and grinded then the powder mixed with guar or tea, which is applied to the boils to draw out the pus and Tea is very useful against throat tonsils.

	<i>Althaea officinalis</i> L.	Ishparolane	Fazal Bot 76	Sh	Fl Le Ro	Mo	20	0.13	5		Leaves and flower are applied to burns as a poultice. Dried Leaves are taken in rectum bleeding. Root after soaking in water for 24 hours and extracts are used for jaundice, liver health, gastro-intestinal and excretory system problems.
Moraceae	<i>Ficus carica</i> Forsk.	Lot Koyet	Fazal Bot 77	Tre	Fr, Lat	Pr	33	0.21	5	84.4	Milky exudation from fruit and leaves are used to treat pus, insect bites and stings also poured in wound to remove spines. Dry and fresh fruit are used for constipation and bowel movements.
	<i>Ficus palmata</i> Forrsk.	Jangali koyet	Fazal Bot 78	Tre	Fr La	Pr	31	0.19	6		The edible fruit is powerful bowel removers, tonic and demulcent. Milky extract is used to relieve wounds and insect bites.
	<i>Morus alba</i> L.	Mragh	Fazal Bot 79	Tre	Fr Le Ba	Mo	30	0.19	4		Fresh and dry fruits are good for bowel movements and urinary system. The leaves and bark exudation is vermicides and beneficial for fever.
	<i>Morus nigra</i> L.	Shayiky	Fazal Bot 80	Tre	Fr	Pr	21	0.13	5		The fruits are delicious and used as bowel treatments and fever issues and also used for cough and sore throat and blood purifiers.
	<i>Morus rubra</i> L.	Ghatikn	Fazal Bot 81	Tre	Fr	Mo	20	0.13	3		Both dry and fresh fruit is used as tonic, blood purifiers and bowel treatments.
Orchidaceae	<i>Goodyera tessellata</i> Lodd.	Baesabur	Fazal Bot 82	He	Ro	Pr	08	0.05	1	5	Dry root after converting into powder form are used for gastro-intestinal system issues.
Oxalidaceae	<i>Oxalis corniculata</i> L.	Trewakhay	Fazal Bot 83	He	Wl Pl	Ka	12	0.08	4	7.5	Fresh plant juice extraction is beneficial in gastro-intestinal problems. Leaves are also used to stop bleeding from wounds, in fever and having antispasmodic properties.
Papavaraceae	<i>Papaver somniferum</i> L.	Afyon	Fazal Bot 84	He	Lat Se Fr	Mo	44	0.28	16	27.5	Opium is obtained as latex from fruits and used for respiratory problems, sedative, relieve toothache, against cough, vomiting, as a narcotics, stimulant, to increase physical vigor as a pain reliever and also in fever, dysentery and diarrhea. Seeds with nutritive value are used as demulcent. Dry fruit are also made in tea and used as a remedy for fever, coughs, common cold and throat problems.
Papilionaceae	<i>Medicago denticulata</i> L.	Mushig	Fazal Bot 85	He	Sh	Pr	28	0.18	1	93.1	From fresh leaves Sag is prepared and locally used as bowel treatments.
	<i>Medicago sativa</i> L.	Violet	Fazal Bot 86	He	Le	Mo	17	0.11	1		The plant is used as vegetable in young stage and good for gastrointestinal tract ailments.
	<i>Astragalus psilocentros</i> Fisch.	Garmenzo	Fazal Bot 87	He	Ro	Ko	21	0.13	1		The root decoction is used to treat toothache and in making tooth brushes (Miswak).
	<i>Glycyrrhiza glabra</i> Waldst & Kit.	Mooyo	Fazal Bot 88	He	Ro	Mo	30	0.19	2		Roots are boiled in water and extracts are applied to children for vermicides purposes and also used to cure cough.

	<i>Trifolium resupinatum</i> L.	Shaftal	Fazal Bot 89	He	Sh	Mo	25	0.16	2		Fresh leaves are used as vegetable and used for bowel movement and gastro-intestinal problems.
	<i>Vigna radiata</i> (L.) R. Wilczek.	Khanis	Fazal Bot 90	He	Se	Pr	28	0.18	6		Dry seeds are boiled and cooked with rice and used as tonic and enhance respiratory system. Seeds extract after boiling are used as aphrodisiac also taken for respiratory health and throat problems and gastro-intestinal pain.
Plantaginaceae	<i>Plantago lanceolata</i> L.	Boikoligini	Fazal Bot 91	He	Le Se	Ko	14	0.09	5	20.6	Extractions from Leaves are useful against sore throat and wounds. Dry seeds are used in bowel treatments and also commonly used during mouth problems and in dysentery.
	<i>Plantago major</i> Aitch.	Ispaghol	Fazal Bot 92	He	Se	Mo	19	0.11	2		Dry seeds are commonly used for dysentery and diarrhea.
Polygonaceae	<i>Rumex hastatus</i> D. Don	Shutshakhu	Fazal Bot 93	He	Sh	Mo	22	0.14	3	77.5	The fresh and young shoots are used as bowel treatments and anti-septic, in addition flavoring agent while dry shoots after grinding used in snuff (Naswar) preparation as narcotics.
	<i>Rumex dentatus</i> L.	Sirkonzo	Fazal Bot 94	He	Sh	Ka	26	0.16	3		Shoot of the plant is used as excretory ailments and demulcent. Leaves decoction have soothing effects on skin due the irritation caused by <i>Urtica dioica</i> L. and other plants.
	<i>Polygonum aviculare</i> L.	Nazuk-joshu	Fazal Bot 95	He	Le	Ko	10	0.06	1		Leaves after cooking are eaten as vegetables and medicinally affective for gastro-intestinal health.
	<i>Rheum webbianum</i> Royle.	Ishpar	Fazal Bot 96	He	Sh	Ka	36	0.23	2		Fresh juice is used as bowel treatments and for gastro-intestinal problems in dyspepsia. Fresh shoots are eaten in fever relief.
	<i>Rheum emodi</i> Wall. ex.Meisn.	Nari ishpar	Fazal Bot 97	He	Wh Pl	Ko	30	0.19	4		Whole plant used as bowel treatments, excretory ailments, respiratory issues and tonic.
Portulacaceae	<i>Portulaca oleracea</i> L.	Shakh	Fazal Bot 98	He	Le St	Mo	36	0.23	7	31.3	Fresh juice from entire plant except root is used as anti-bacterial, anti-inflammatory and vermicides. Used as fever issues, for excretory system, liver, and urinary bladder problems.
Primulaceae	<i>Primula denticulate</i> Sm.	Punar	Fazal Bot 99	He	Fl	Ko	14	0.09	1	8.75	Powdery exudates in flowering time are very useful for eye problems.
Punicaceae	<i>Punica granatum</i> L.	Dalum	Fazal Bot 100	Sh	Fr	Mo	42	0.26	10	26.3	Rind of fruit is powdered and with water used for diarrhea, diabetic and dysentery. Fruit juice is used for leprosy, dyspepsia, fever and blood purification. The bark used in mouth issues, vermicides and respiratory issues.
Ranunculaceae	<i>Aconitum heterophyllum</i> Wall.	Zaharmora	Fazal Bot 101	He	Rh	Go	14	0.09	7	35	Rhizome is dried, grinded and powder is used as pain killer, anti-inflammatory, anti-periodic, aphrodisiac, astringent, against fever and tonic.
	<i>Nigella sativa</i> L.	Kalongii	Fazal Bot 102	He	Se	Ka	42	0.26	9		Seeds are used in various dishes as liver tonics, excretory ailments, digestive, anti-diarrheal, stimulant, pain killer, anti-bacterial and in various skin problems.
Rosaceae	<i>Cotoneaster microphyllus</i> Wall. ex. Lind	Miken	Fazal Bot 103	Sh	Fr	Mo	26	0.16	3	180.6	Fresh fruits are edible and used as respiratory issues, fever issues and gastro-intestinal tract issues.

	<i>Prunus amygdalus</i> Batsch.	Badam	Fazal Bot 104	Tre	Se	Ko	24	0.15	4		Seed in both fresh and dry form are used to enhance memory, as a tonic, aphrodisiac and demulcent.
	<i>Prunus domestica</i> L.	Alocha	Fazal Bot 105	Tre	Fr	Pr	30	0.19	2		Fresh fruits are edible and therapeutically used as bowel treatments and fever issues.
	<i>Pyrus communis</i> L.	Tong	Fazal Bot 106	Tre	Fr	Mo	33	0.21	3		Fruits are eaten are delicious and medicinally used as febrifuge in fever, sedative and astringent.
	<i>Prunus armeniaca</i> Marsh.	Zhuli	Fazal Bot 107	Tre	Fr Se	Pr	32	0.2	4		Both fruit and seed are eaten in fresh and dry form as a bowel treatments and fever issues. Seed also improve brain health and skin issues.
	<i>Prunus avium</i> L.	Cherry	Fazal Bot 108	Tre	Fr	Ko	28	0.18	4		Fresh fruit is used as blood purifiers, circulatory system health, as a tonic and stimulant.
	<i>Crataegus songarica</i> C. Koch	Gooni	Fazal Bot 109	Tre	Fr	Mo	26	0.16	2		Fresh fruits extracts are used against circulatory issues and healthy heart.
	<i>Eriobotrya japonica</i> (Thunb.) Lindley	Lookat	Fazal Bot 110	Tre	Fr	Pr	30	0.19	1		The fruits are edible and good for gastro-intestinal tract. Flowers attract honeybees.
	<i>Prunus persica</i> L.	Gergalog	Fazal Bot 111	Tre	Fr	Mo	26	0.16	4		Fresh fruits are delicious and medicinally used as gastro-intestinal problems, demulcent, anti-scorbutic and vermicides.
	<i>Rosa brunonii</i> Lindli. Ros.	Thoni	Fazal Bot 112	Sh	Fr	Mo	14	0.09	1		Fruits after drying are grinded and a decoction is prepared to treat various respiratory problems.
	<i>Fragaria vesca</i> L.	Achu	Fazal Bot 113	Sh	Fr	Mo	25	0.16	3		Fruit (berries) are edible and used for blood purification and fever issues and improve circulatory system.
Rutaceae	<i>Citrus sinensis</i> (L.) Osbeck.	Malta	Fazal Bot 114	Tr	Fr	Ko	32	0.20	1	38.6	Fruit juice is rich source of Vitamin C. fruits warmed in ashes and used for cold, while fruit pericarp consumed durin vomiting.
	<i>Citrus medica</i> L.	Kenu	Fazal Bot 115	Tr	Fr	Ko	30	0.19	2		Fruit juice is used to stimulate gastro-intestinal problems and liver health.
Saxifragaceae	<i>Bergenia stracheyi</i> Hook.f. & Throns.	Besabur	Fazal Bot 116	Sh	La	Ku	10	0.06	4	11.9	Latex is directly applied to cure face pimples and skin problems.
	<i>Saxifraga sibirica</i> L.	Dromosuro	Fazal Bot 117	Tr	Fl Le	Ba	09	0.6			Flower and leaves are utilized as a tonic while it's decoction is used to treat backache.
Scrophulariaceae	<i>Verbascum thapsus</i> L.	Gordoh Kharo	Fazal Bot 118	He	Fl Le Se	Ka	15	0.09	5	9.4	Flower and Leaves after drying are powdered and with milk or water are taken for diarrhea and dysentery. Flower, leaves and seeds are also beneficial as a demulcent, in skin health and vermicide.
Solanacea	<i>Datura stramonium</i> L.	Phorol	Fazal Bot 119	He	Le Se	Mo	06	0.04	10	54.4	Fresh leaves are used with oil or ghee to cover inflammations and hemorrhoids. Dry leaves are utilized as a narcotics and antispasmodics purposes. Seeds are also smoked for its narcotic purposes in addition to use as astringent, in bowel complaint, fever and skin diseases.
	<i>Hyoscyamus niger</i> L.	Banga-dewani	Fazal Bot 120	He	Fl Se	Mo	14	0.09	2		Flowers and seed of Henbane are very good for brain health and bone health.

	<i>Capsicum annum</i> L.	Mahj	Fazal Bot 121	Ve	Fr	Mo	30	0.19	6		The active ingredient Capsaicins in fruits stimulate circulation, related pain and in have soothing effect on brain. Fresh chillies are used as flavoring agent and condiments which are helpful in stimulating immune system against common cold and diarrhea.
	<i>Solanum nigrum</i> L.	Pirmilik	Fazal Bot 122	He	Fr Le	Mo	16	0.10	7		From fruits paste are obtained which is useful for pimples and skin beauty. Fresh herb juice is used for fever and sore eyes, diarrhea, eye-troubles and fruits after ripening are useful for piles.
	<i>Solanum melongena</i> L.	Patigan	Fazal Bot 123	He	Fr	Mo	21	0.13	1		Fruit after collections are used as vegetable and very beneficial for respiratory disorders.
Thymaliaceae	<i>Daphne mucronata</i> Royle.	Lovomikin	Fazal Bot 124	Sh	Fr	Pr	12	0.08	1	7.5	Fruits after drying, grinded and paste is used for treatment of skin pimples and to enhance its beauty.
Violaceae	<i>Viola odorata</i> L.	Mulkhon	Fazal Bot 125	He	Wh Pl	Mo	16	0.10	3	10	Flowers and leaves are air dried, crushed powder with water, milk or tea consumed against fever, gastro-intestinal problems and scent of fresh plant is recommended for brain health.
Vitaceae	<i>Vitis vinifera</i> L.	Drogh	Fazal Bot 126	Cl	Fr Ju	Mo	38	0.24	6	23.8	Fresh fruits are consumed as circulatory tonic, blood purifiers and against urinary disorders. Vine Juice of fruits is useful for Liver health, excretory system issues and gastro-intestinal problems.
Zygophyllaceae	<i>Peganum harmala</i> L.	Ispandur	Fazal Bot 127	He	Se	Go	18	0.11	2	16.3	Dried seeds are placed in fire and fumes are best for evils eyes and also have antibiotic properties.
	<i>Tribulus terrestris</i> L.	Khor- zoghu	Fazal Bot 128	He	Ro Fr Se	Mo	08	0.05	4		The root and fruit in crude form are very useful for urinary system disorders and aphrodisiac. Fruit and seeds are also used for curing diabetes and vermicides.

Keys to Abbreviations:

H-Habit, P.U-Part Used, CF-Frequency of citation, RFC- Relative frequency of citation, UR- Use report, FIV- Family importance value, N.I-Not identified

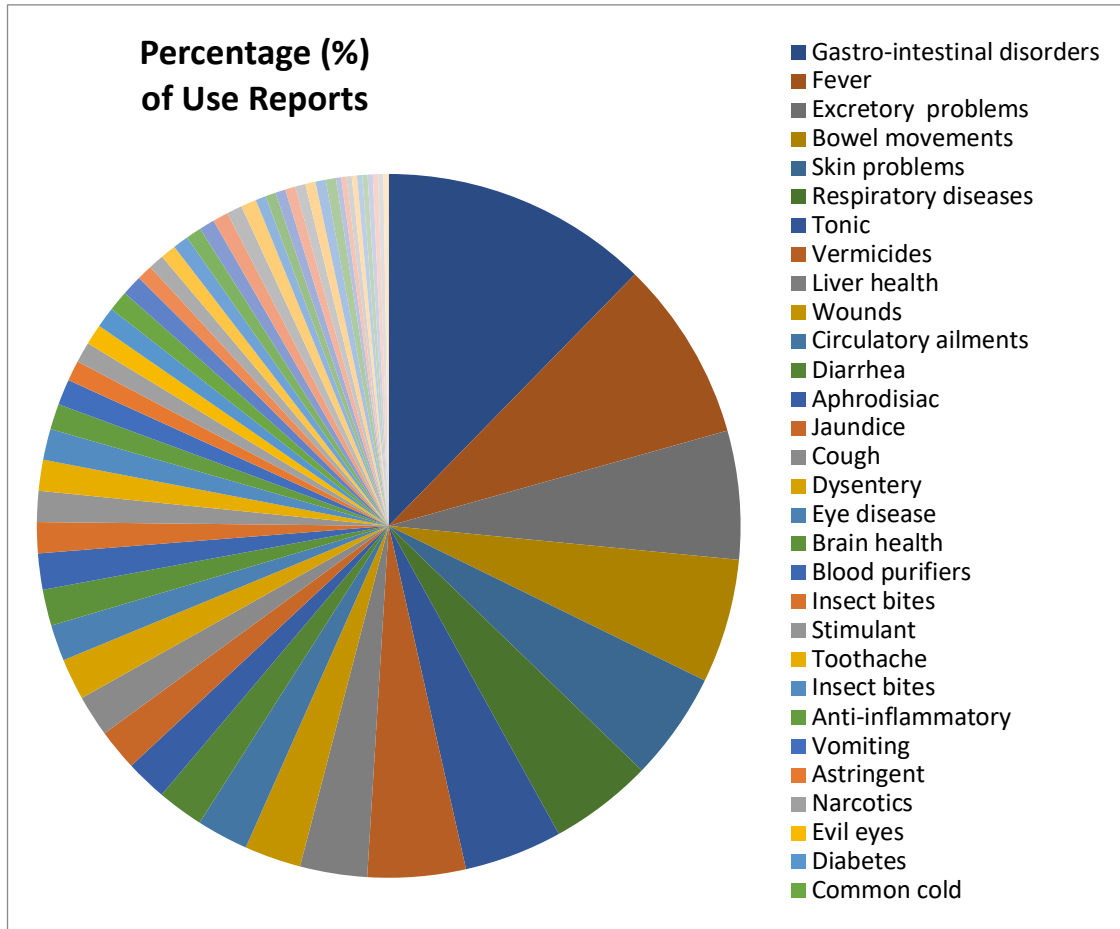


Figure 4. Percentage (%) of administration use of the plants

Plant parts used their mode of utilization

The inhabitants were found to consume various parts of medicinal plants in crude herbal medicinal preparations, so the use of many parts and their utilisation was investigated. Fruits were most commonly consumed by the residents 42 (32%), followed by leaves (33, 25%), seeds (26, 20%), flowers (16, 12%), roots (13, 10%) (Table 2, Figure 5). In addition, bulb, latex, resin, bark, wood, and rhizome are consumed in small numbers for various ailments (Ullah & Rehman 2016). Other studies in various areas and ethnic groups are also in agreement with our findings when it comes to plant parts used for crude medicinal preparations (Ahmad *et al.* 2006, Ali & Qaise 2009, Fazal *et al.* 2020, Khan *et al.* 2011, Hussain & Ishtiaq 2009, Badshah & Hussain 2011).

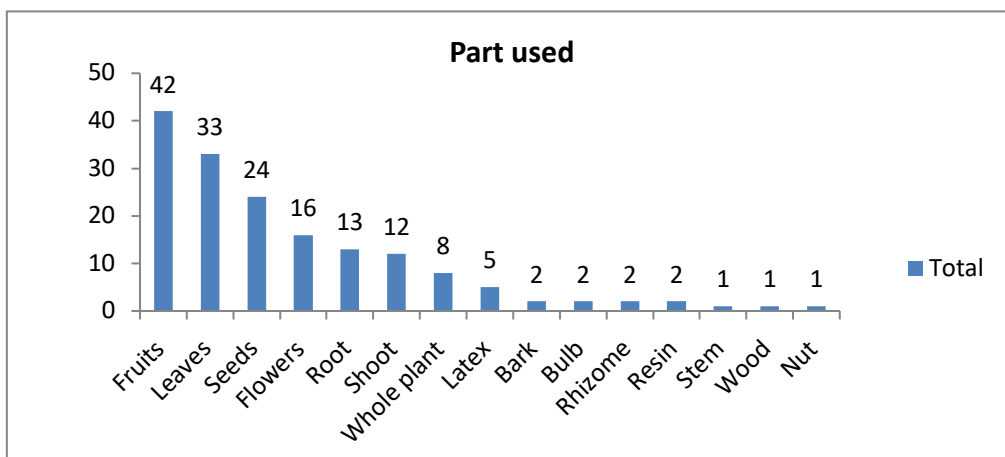


Figure 5. Plant part usage

Table 3. Disease categories and number of use report

Categories of diseases	Number of use report	% of use reports
Gastro-intestinal disorders	52	12.32
Fever	35	8.30
Excretory problems	25	5.90
Bowel movements	24	5.70
Skin problems	21	4.98
Respiratory diseases	20	4.74
Tonic	19	4.50
Vermicides	19	4.50
Liver health	13	3.08
Wounds	11	2.60
Circulatory ailments	10	2.37
Diarrhea	09	2.13
Aphrodisiac	08	1.90
Jaundice	08	1.90
Cough	08	1.90
Dysentery	08	1.90
Eye disease	07	1.66
Brain health	07	1.66
Blood purifiers	07	1.66
Stimulant	1.42	06
Toothache	1.42	06
Insect bites	1.42	06
Anti-inflammatory	1.18	05
Vomiting	1.18	05
Astringent	0.94	04
Narcotics	0.94	04
Evil eyes	0.94	04
Diabetes	0.94	04
Common cold	0.94	04
Bone health	0.94	04
Sedative	0.71	03
Piles	0.71	03
Constipation	0.71	03
Demulcent	0.71	03
Snake bites	0.71	03
Carcinogenic	0.71	03
Throat issues	0.71	03
Anti-septic	0.71	03
Face beautification	0.71	03
Backache	0.47	02
Anti-spasmodic	0.47	02
Colic	0.47	02
Mouth disease	0.47	02
Boils	0.47	02
Pus	0.47	02
Anti-bacterial	0.47	02
Backache	0.47	02
Hair problems	0.24	01
Anti-lice	0.24	01
Anti-scorbutic	0.24	01
Anti-acidic	0.24	01
Cholera	0.24	01
Anti-periodic	0.24	01
Leprosy	0.24	01
Anti-scorbutic	0.24	01
Small-pox	0.24	01
Hemorrhoids	0.24	01

Table 4. Summary of the plant families, and their species contribution in the area

Families	Contribution (%)
Asteraceae	14
Rosaceae	11
Apiaceae	07
Papilionaceae	06
Solanaceae	05
Lamiaceae	05
Polygonaceae	05
Moraceae	05
Brassicaceae	04
Chenopodiaceae	04
Cucurbitaceae	04
Poaceae	04
Elaeagnaceae	03
Anacardiaceae	03
Adiantaceae	02
Pinaceae	02
Alliaceae	02
Apocynaceae	02
Ebenaceae	02
Malvaceae	02
Plantaginaceae	02
Ranunculaceae	02
Rutaceae	02
Saxifragaceae	02
Zygophyllaceae	02
Remaining all families	01

Conclusion

The results of our findings indicated that Koh Valley is rich in medicinal plants and local communities still use different parts of plants to treat various diseases. A total of 128 plant species commonly consumed by the inhabitants of the research area were studied. The dominant family was the Asteraceae followed by the Apiaceae. Many more new plants were discovered during this research work, which will be very helpful in documenting medicinal plants for the next generation and people will be able to understand the proper use and preparation of recipes from plant materials. Herbal medicines are accessible, have no side effects and are a cheap source of medicines compared to modern allopathic medicine. It is evident from this study that the valley has less access to modern facilities and people are financially poor and mostly use these crude drugs and have adequate knowledge about the use of plants.

Future perspectives

Future perspectives for research into traditional medicinal plants in the Koh Valley of the Hindukush Range, Pakistan, could encompass several dimensions. Further research in the field of ethnobotany could explore the traditional knowledge systems of the local people regarding medicinal plants. This may mean recording more plants, finding out how they are used and conserving traditional knowledge. The identification of new chemical substances from traditional medicinal plants through bioprospecting expeditions can lead to the discovery of new therapeutic agents or medications. Pharmacological studies can confirm the efficacy and safety of these substances, which can lead to the development of new medicines. In order to maintain the sustainable use of medicinal plants, protective measures are essential due to their ecological importance. To preserve plant biodiversity, efforts can be made to preserve habitats, cultivate land, and create protected areas. Remote areas can gain better access to healthcare by working with local healers and practitioners to integrate traditional medicine into mainstream healthcare systems. This could include establishing guidelines for the safe and efficient use of conventional treatments and encouraging communication between conventional healers and

modern medical professionals. Socio-economic development can be promoted by supporting the local population in value-added processing and sustainable harvesting methods for medicinal plants. Community enterprises, training programmes, and market connections are some examples of initiatives that can improve prospects for income while encouraging environmental conservation. Future studies should evaluate the effects of climatic changes on the distribution and accessibility of medicinal plants, as alpine habitats are particularly vulnerable to climate change. This could help to develop adaptation options to reduce the impact of climate change on plant biodiversity and conventional medical practises. For the conservation and sustainable use of traditional medicinal plants, it is essential that local communities, decision-makers and the public understand the cultural, ecological, and economic significance of these plants. Workshops, awareness campaigns, and the production of educational material for different target groups are some examples of educational initiatives. Researchers, policy-makers and practitioners can support the protection of biodiversity, public health, and socio-economic well-being in the Koh Valley and beyond, as well as the preservation of traditional knowledge, by pursuing these futures.

Declarations

List of abbreviations: He, Herb ; Sh, Shrubs; Tr, Tree; Cl, Climbers; Ve, Vegetable; Fr, Fruit; Se, Seed; Ro, Root; Ju, Juice; Wh.Pl, Whole plants; Le, Leaf; St, Stem; inf, inflorescence; Mo, Moroi; Ko, Koghuzi; Is, Istangol; Pr, Prayet; Go, Golan; Br, Barenis; Ka, Kari; Ku, Kaju; Ra, Ragh; FIV, Family Importance value; RFC, Relative Frequency of Citation; UR, Used report; FC, Frequency of Citation.

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Supporting information: Tables and graphs in this research will clearly explain the research idea and the people will understand the proper utilization.

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