

Original Article

An ethno-botanical study of indigenous medicinal plants and their usage in rural valleys of Swabi and Hazara region of Pakistan

Um estudo etnobotânico de plantas medicinais indígenas e seu uso nos vales rurais da região de Swabi e Hazara, no Paquistão

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Abstract

An ethnobotanical study was conducted to document indigenous medicinal plants and their usage from knowledgeable and elderly persons in Razzar and Gadoon valley of Swabi and Allai and Tanawal valley of Hazara region of Pakistan during 2016–2019. Several systematic field visits and questionnaire surveys were carried out in selected sites of the study area to gather relevant information from the local community. Rapid assessment method was adopted for data collection by interviewing the local people having enough knowledge of medicinal plants use for treatment of different ailments. UV (UV) formula was applied to calculate the relative importance of medicinal plant species in each site of the study area. In the present study, 221 medicinal plants belonging to 105 families have been reported through 580 respondents (385 males, 138 females and 57 local health healer) from the Swabi and Hazara region. The main sources of herbal medicines were leaves (21%) followed by fruits (21%), seeds (17%), whole plants (14%), roots (9%), bark (9%), flowers (7%) and gum (2%). *Mentha spicata* L. and *Berberis lycium* Royle were reported with highest UV (UV) i.e. 0.92 and 0.68 in Razzar tehsil and Gadoon valley of Swabi, whereas *Mentha longifolia* L. and *Geranium wallichianum* D. were reported with highest UV i.e. (0.65) and (0.88) in Allai and Tanawal valley of Hazara region, respectively. It was concluded that Swabi and Hazara region is rich in medicinal plants species and associated traditional knowledge. Moreover, ethno-medicines have played significant role in the indigenous healthcare system of the study area. However, uprooting the entire plant for ethno-medicine is a big threat to conservation of medicinal plants diversity in the study area.

Keywords: medicinal plants, indigenous knowledge, ethnobotany, Swabi, Pakistan.

Resumo

Um estudo etnobotânico foi realizado para documentar as plantas medicinais indígenas e seu uso por pessoas experientes e idosas em Razzar e Gadoon, no vale de Swabi e no vale Allai e Tanawal da região de Hazara, no Paquistão, durante 2016 a 2019. Várias visitas sistemáticas de campo e pesquisas por questionário foram realizadas em locais selecionados da área de estudo para coletar informações relevantes da comunidade local. O método de avaliação rápida foi adotado para a coleta de dados por meio de entrevistas com a população local, com conhecimento suficiente do uso de plantas medicinais para o tratamento de diferentes enfermidades. A fórmula UV (UV) foi aplicada para calcular a importância relativa das espécies de plantas medicinais em cada local da área de estudo. No presente estudo, 221 plantas medicinais pertencentes a 105 famílias foram relatadas por 580 entrevistados (385 homens, 138 mulheres e 57 curandeiros locais) da região de Swabi e Hazara. As principais fontes de medicamentos fitoterápicos foram folhas (21%), seguidas de frutas (21%), sementes (17%), plantas inteiras (14%), raízes (9%), cascas (9%), flores (7%) e goma (2%). *Mentha spicata* L. e *Berberis lycium* Royle foram relatados com maior UV (UV), ou seja, 0,92 e 0,68 em Razzar tehsil e vale Gadoon de Swabi, enquanto *Mentha longifolia* L. e *Geranium wallichianum* D. foram relatados com maior UV, isto é, 0,65 e 0,88 no vale Allai e Tanawal da região de Hazara, respectivamente. Concluiu-se que a região de Swabi e Hazara é rica em espécies de plantas medicinais e conhecimentos tradicionais associados. Além disso, etnomedicamentos têm desempenhado um papel significativo no sistema de saúde indígena da área de estudo. No entanto, arrancar a planta inteira para etnomedicina é uma grande ameaça à conservação da diversidade de plantas medicinais na área de estudo.

Palavras-chave: plantas medicinais, conhecimento indígena, etnobotânica, Swabi, Paquistão.

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1. Introduction

Ethnobotany is the systematic study of the relations among people and plants (Sheng-Ji, 2001; Dubey and Sao, 2018). For the first time in 1896, a US botanist John Harshberger coined the word 'ethnobotany', although the history of ethnobotany began long before that (Cox, 2000; Awan et al., 2013). Ethnobotany plays a crucial role in studying the effective link among biodiversity, social, and traditional systems (Panhwar and Abro, 2007; Mahmood et al., 2011a). A plant that possesses some remedial properties for healthy pharmacological effects on the human or animal body is commonly called "medicinal plant" (Ahmad et al., 2009a, b; Ahmad et al., 2010; Ullah et al., 2013). According to report of the World Health Organization (WHO) 80% of the people in developing countries depend on indigenous medicinal plants for their basic healthcare because of insufficiency or absence of modern healthcare services (Calixto, 2005; World Health Organization, 2002). The total flowering plants in the world are 422,000 (Govaerts, 2001), out of which, about 50000 flowering plants have been used for medicinal purposes globally (Hostettmann et al., 2000; Schippmann et al., 2002). More than 25% medicines and drugs are prepared from medicinal plants globally (Malik et al., 2010). According to WHO about 252 drugs are crucial for essential healthcare and out of these 11% are obtained from medicinal plants (Rates, 2001).

People use medicinal plants for ailment treatment according to their cultural traditions and indigenous knowledge (Vandebroek and Thomas, 2003). Medicinal plants are natural asset of great significance and play a crucial role in the primary healthcare system of remote, developing and under-developed regions of the world (Shinwari and Gilani, 2003; Bhardwaj and Gakhara, 2005). For instance, medicinal plants in the Himalayas and adjoining regions (Khan et al., 2011) are the major source of ethno-medicines based on indigenous knowledge of the elderly persons (Singh and Lal, 2008). Thus, the indigenous knowledge about medicinal plants has been transmitted from generation to generation through oral conversation (Shinwari, 2010). This oral conversation although promotes transmission of indigenous knowledge about medicinal plants but also alters with the passage of time while passing from one person to another (Balick and Cox, 1996). Through ethnobotanical surveys, indigenous knowledge of medicinal plants from local elderly persons and professionals is compiled and documented in a manner to describe plants, which can be a source of medicines to cure diseases (Sarwat and Ahmad, 2012).

Pakistan has a variety of plants that are being utilized by local people as medicine to cure different ailments (Bukhari, 1994; Zandial, 1994; Pie and Manandhara, 1987; Ibrar et al., 2007; Bibi et al., 2008; Mahmood et al., 2013). According to Raj and Toppo (2014) plant diversity estimation and documentation is the first step before the second step of conservation of these natural resources. Thus, documentation is fundamental aspect for sustainability, consumption and management of medicinal flora. Many research studies have been conducted on the documentation of indigenous knowledge of native

medicinal plants for healthcare purposes by the local communities of Pakistan (Shehzad and Qureshi, 2001; Saghir et al., 2001; Dar, 2003; Qureshi et al., 2007; Ajaib et al., 2010). However, there is dearth of information on ethno-medicinal uses of plants from Swabi and Hazara regions of Pakistan. Therefore, this study was conducted to explore and document indigenous knowledge of medicinal flora of selected sites of Swabi and Hazara region of Pakistan and to propose or recommend a better management and conservation plan for medicinal plant diversity in these regions.

2. Materials and methods

2.1. Study Area

The study area consists of district Swabi (Razzar and Gadoon valley) and district Hazara (Allai and Tanawal valley) regions of the Khyber Pakhtunkhwa province of Pakistan. The coordinate of Swabi is 34.1241° N, 72.4613° E. The total area of District Swabi is 1,543 km² (595.8 sq. mi) and it lies between the River Indus and River Kabul. The climate is sub-tropical and semi-arid and summer season is extremely hot. From May to June, temperature reaches up to 41.50 °C (Naveed et al., 2019). Winter is cold and mean monthly temperature is 4 to 10°C. The annual rainfall varies from 60 cm to 145 cm. The present study was conducted in two selected sites of district Swabi i.e. Gadoon valley, which is the only mountainous valley of district Swabi popular for Mahaban forest and Razzar which is a tehsil of district Swabi having most of the area with plain relief. Similarly, the total area of Hazara division is 18,013 km². It lies between 33° 44' and 35° 10' N. and 72° 33' and 74° 6' E. Because of high altitude, temperature in Hazara are cooler than in the plains; though Abbottabad at 1,200 metres still has highest temperature around 32°C with high humidity in June and July. In winter, temperatures are cold with lowest in January around 0 °C (Ullah et al., 2019) and in minus in the higher mountainous areas of Hazara region of Pakistan. The present study was conducted in two selected sites of Hazara division, i.e. Allai valley of district Batagram and Tanawal valley of district Haripur as can be seen in Figure 1.

2.2. Data Collection

The data about medicinal plants were collected from selected sites of Swabi (Razzar and Gadoon valley) and Hazara (Allai and Tanawal valley) regions of Pakistan. In Tehsil Razzar of Swabi region, this research study was conducted during the year 2016-2017 and data were collected from 22 sub-sites including Karnal Sher Kalli, Sheikh Jana, Asota, Shewa, Parmoli, Ghulama, Naranji, Mehershahi, Pamano Cheni, Gedare, Khalil, Sher Dara, Shera ghund, Kalu Khan, Adina, Tarakai, Rashakai, Dagai, Managi, Chaknoda, Mansabdar, and Akbar Abad. A total of 55 medicinal plants belonging to 34 families were noted for their native medicinal use. The noted plants were comprised of herbs, shrubs and trees as shown in Table 1. Several systematic field visits were made to different locations of the study area to acquire

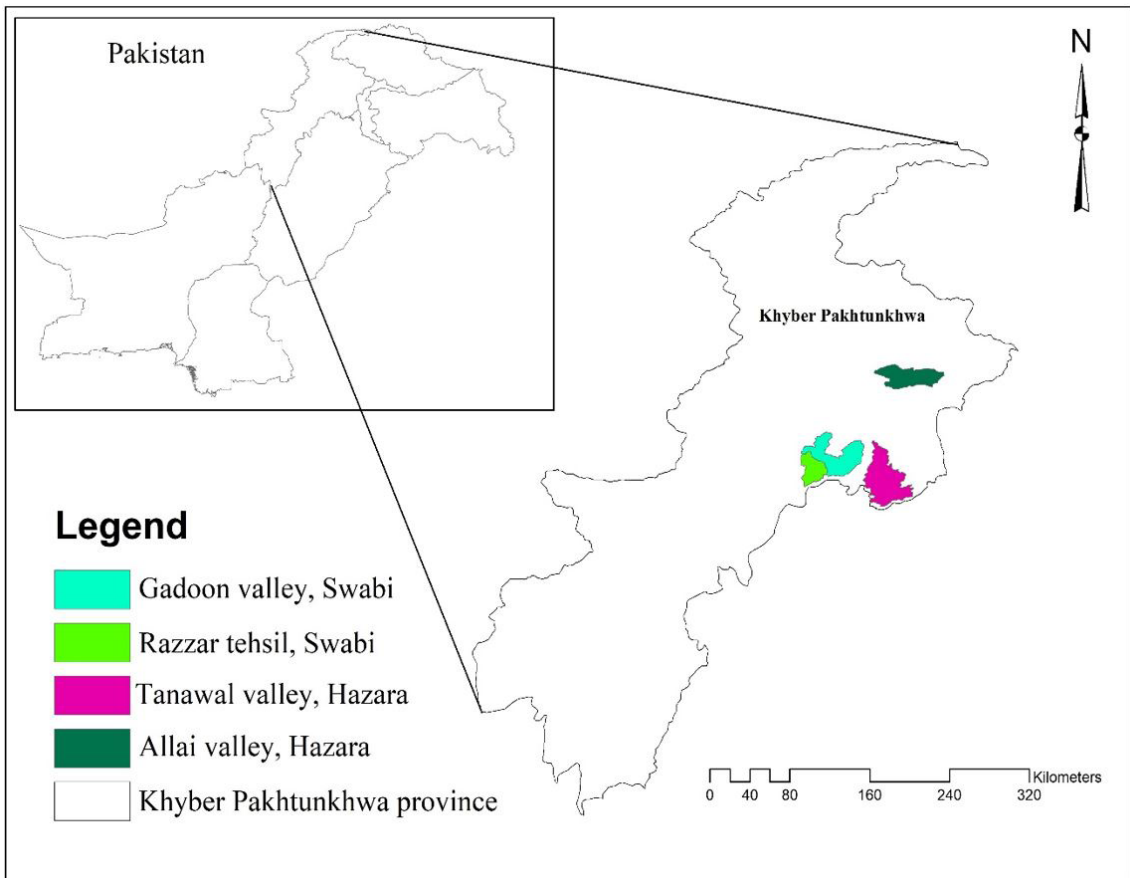


Figure 1. Location map of the study area.

information regarding parts of medicinal plants such as seeds, fruits, leaves, stem, and even whole plants used as medicine. Rapid assessment method was followed for data collection by interviewing people having enough knowledge of medicinal usages of flora in the study area. A total of 200 respondents were interviewed in the Razzar tehsil as can be seen in Figure 2. Through questionnaire surveys local name, plant parts used, remedial uses and method of preparation were documented from the elderly knowledgeable people of the study area. Similarly, in Gadoon valley of district Swabi the study was conducted in the year 2017-2018 and data were collected from 15 villages including Gandap, Chanai, Bada, Besak, Malak Abad, Kabgani, Takill, Dewal, Sandawa, Dagai, Gabasnai, Amrai, Ganichatra, Uvla, and Bir Gali. A total of 57 medicinal plants belonging to 39 families were documented for their local medicinal use. A lot of regular field visits were made to the selected sub-sites to get information regarding the use of seeds, fruits, leaves, stem, and whole plants as medicine for ailment treatment in the study area. Around 150 respondents were interviewed in Gadoon valley of district Swabi (Figure 2). During questionnaire surveys local name, plant parts used, remedial uses and mode of preparation were documented from the local community of the study

area. It is concluded from our questionnaire surveys that indigenous knowledge about medicinal plants and their usage was less with young generation (age limit was <30) as compare to old people (age limit was >40 year) because the young generation was interested in the use of pharmaceutical medicines.

Ethnobotanical surveys were also conducted in the Allai valley of district Batagram, Hazara division, Pakistan during 2018-2019. Information regarding medicinal plants was collected through field visits, personal observations and questionnaire surveys. Data was collected through random sampling in each Union Council (UC) of Allai valley. The study area was divided into different sub-sites to facilitate the data collection process. The data was collected from different sub-sites including Banna, Bateela, Koshgam, Gantar, Rashang, Biari, Karg, Rabat, Pashto, Skargah, Asharbang, Lond Khwar, Kund, Bojri and Gangwal. A total of 110 informants were interviewed during data collection (Figure 2). Likewise, the data was collected from Tanawal valley of Hazara division during 2018-2019 through questionnaire surveys to obtain information about ethno-medicines used in local healthcare system in the study area. Questions about the value or importance of medicinal plants, variety based on plants used for ethno-medicines, quantity of utilization of plants, availability, economic/

Table 1. Ethno-botanical information's of medicinal plants from selected regions of Swabi and Hazara, Khyber Pakhtunkhwa, Pakistan during 2016–2019.

S. No	Botanical name	Vernacular Name	Family name	Plant Part used	Ethno-medicinal uses				UV (UV)		
					Swabi region			Hazara region			
					Razzar tehsil	Gadoon Valley	Allai Valley	Tanawal Valley			
1	<i>Dochesnea indica</i>	Jangali Toot	Rosacea	Fruit	It is used as nerves tonic and astringent in diarrhoea	0.03	NA	NA	NA		
2	<i>Melia azedarach</i>	Bakiara	Meliaceae	Leaves, fruit, bark	Leaves, roots and bark is used in scrofula and pimples, seeds are used in rehumatisms	0.18	0.13	NA	NA		
3	<i>Zizyphus mauritiana</i>	Bera	Rhamnaceae	Whole plant	Fruit is mucilaginous and pectoral, used for blood purification and digestion, powder root applied to wounds and ulcer.	0.23	0.04	NA	NA		
4	<i>Ficus carica</i>	Enzar	Moraceae	Fruit	Fruit is used for dysentery, constipation and for diabetes. Used in diseases of lungs and bladder	0.36	0.06	0.05	NA		
5	<i>Acacia modesta</i>	Palosa	Mimosaceae	Dried gummy exudates	It is used for pain in body, especially for pain of limb. Dried gum mix with sugar use as tonic for pregnant and lactating women. Gastric pain, protection of teeth	0.12	0.06	0.01	0.71		
6	<i>Cannabis sativa</i>	Bang	Cannabaceae	Leaves	Narcotic drug used for malaria, blood poisoning, anthrax and dysentery, pain killer, antidiarruff, Cancer, HIV/AIDS, Darmatic weight loss & Muscle atrophy	0.29	0.09	0.05	0.28		
7	<i>Rumex dentatus</i>	Shalkhe	Polygonaceae	Leaves, roots	Leaves mixed flour used for constipation in livestock.	0.05	NA	0.02	NA		
8	<i>Morus alba</i>	Spin toot	Moraceae	Fruits, leaves	It is used for treatment of flu and fever treat prematurely grey hair, to "tonify" the blood, and treat constipation and diabetes cough, wheezing, enema, and to promote urination. It is also used to treat fever, headache, and red dry and sore eyes.	0.4	0.03	NA	0.18		
9	<i>Morus nigra</i>	Tor toot	Moraceae	Fruits, leaves	It is used for the treatment of coughing, Sore Throat, Tonsillitis, Stomach worms	0.34	0.05	NA	0.17		
10	<i>Malva neglecta</i>	Panerak	Malvaceae	Seeds, leaves	It is used for sexual debility, Digestive and urinary diseases.	0.43	0.18	0.05	NA		
11	<i>Punica granatum</i>	Narsave	Punicaceae	Fruits	It is used for treatment of hepatitis C, and cancer. The rind of fruit mixed with water for diabetes	0.49	NA	0.01	NA		
12	<i>Solanum nigrum</i>	Kachmacho	Solanaceae	Leaves	Leaves is used for liver disease/jaundice.	0.72	0.13	0.06	NA		

*NA stands for not available or not reported.

Table 1. Continued...

S. No	Botanical name	Vernacular Name	Family name	Plant Part used	Ethno-medicinal uses	UV (UV)			
						Swabi region		Hazara region	
						Razzar tehsil	Gadoon Valley	Allai Valley	Tanawal Valley
13	<i>Dalbergia sissoo</i>	Shawa	Papilionaceae	Leaves	It is used for coldness of body.	0.07	NA	NA	NA
14	<i>Portulaca oleracea</i>	Warkhare	Portulacaceae	Whole plant	It is used to treat a variety of afflictions including arthritis, headaches, burns, and coughs.	0.38	0.13	NA	NA
15	<i>Berberis lycium</i>	Ziarlarge, kowrey	Berberidaceae	Bark, seeds, roots	Seeds is used for treatment of pain in body and roots is used for coldness of body. Powder root bark is used in broken bones and wounds	0.81	0.68	0.2	0.50
16	<i>Paeonia emodi</i>	Maamekh	Paeoniaceae	Roots, Gum and flower	used for diarrhoea, cough remedy, hysteria, convulsions, colic, uterine diseases and obstructions of the bile duct, blood purifier, cathartic and emetic	0.85	0.5	0.06	0.80
17	<i>Coriandrum sativum</i>	Dhania	Apiaceae	Seeds, leaves	It is used as coldness of body.	0.69	NA	NA	NA
18	<i>Isodon rugosus</i>	Sperkai	Labiatae	Seeds	Seeds is used for constipation and for fever disease. dried leaves used in tooth pain	0.9	NA	0.09	NA
19	<i>Foeniculum vulgare</i>	Kaaga	Apiaceae	Seeds	It is used for constipation and for eyesight disease.	0.87	NA	NA	NA
20	<i>Lepidium sativum</i>	Alam	Brassicaceae	Seeds	Seeds is used for treatment of pain in stomach.	0.18	0.14	NA	NA
21	<i>Platanus orientalis</i>	Chinar	Platanaceae	Bark	The bark is used for toothache and dysentery	0.07	0.1	NA	NA
22	<i>Citrus aurentium</i>	Naranj	Rutaceae	Seeds	It is used as carminative.	0.41	0.04	NA	NA
23	<i>Prunus armeniaca</i>	Khobani	Rosaceae	Fruit	Fruit is used for treatment of coughing.	0.27	0.08	NA	NA
24	<i>Achyranthus aspera</i>	Geeshay	Amaranthaceae	Seeds	It is used for treatment of malarial fever.	0.09	NA	NA	NA
25	<i>Asparagus officinalis</i>	Tindoray	Asparagaceae	Whole plant	It is used for the treatment of urinary and kidney problem.	0.29	NA	NA	NA
26	<i>Plantago Ispaghula</i>	Espaghol	Plantaginaceae	Seeds	It gives power to stomach.	0.83	NA	NA	NA

*NA stands for not available or not reported.

Table 1. Continued...

S. No	Botanical name	Vernacular Name	Family name	Plant Part used	Ethno-medicinal uses	UV (UV)		
						Swabi region	Allai Valley	Hazara region
						Razzar tehsil	Gadoon Valley	Tanawal Valley
27	<i>Solanum surratense</i>	Maraghoni	Solanaceae	Seeds, fruit, leaves	Seeds is used for diabetes disease, Fruit used in jaundice, Root for kidney stones, tuberculosis, liver diseases, leaf: haemostasis	0.12	NA	0.30
28	<i>Lathyrus aphaca</i>	Kurkaman	Papilionaceae	Roots	It is used as antibiotic and wound/cuts in body.	0.6	0.05	NA
29	<i>Sapindus marginatus</i>	Reeta	Sapindaceae	Seeds	It is used for strongness of hairs.	0.18	NA	NA
30	<i>Zizyphus oxyphylla</i>	Elane	Rhamnaceae	Roots	It is used as cooling of body, remedy for pain, diabetes, fever	0.14	NA	NA
31	<i>Dodonaea vescosa</i>	Ghorhaske	Sapindaceae	Seeds, leaves	Seeds is used as antibiotics, Seed mixed with honey to treat malaria and for Stomach acidity and skin allergy	0.09	0.13	0.60
32	<i>Acacia nilotica</i>	Kekar, babul	Mimosaceae	Seeds, flower, gum	It is pain killer and for sexual debility and to treat iron deficiency anaemia	0.1	NA	0.48
33	<i>Eucalyptus lanceolata</i>	Lachi	Myrtinaceae	Whole plant	Its oil is used for hair strengthens.	0.61	0.22	NA
34	<i>Ficus religiosa</i>	Pepal	Moraceae	Seeds	It is used for sexual debility.	0.05	NA	NA
35	<i>Citrus lemon</i>	Lembo	Rutaceae	Seeds, leaves	Leaves is used as carminative.	0.7	0.18	NA
36	<i>Adiantum capillus</i>	Sumbal	Polypodiaceae	Gum	It uses for sexual edibility.	0.2	0.02	0.28
37	<i>Daphne oloides</i>	Koti lal	Thymalaceae	Roots	It uses for cooling of body and pain killer.	0.16	NA	NA
38	<i>Pinus roxburghii</i>	Nakhtar	Pinaceae	Gum, oil	It is used as antibiotics for blood purification, bones and joints pain.	0.38	0.4	NA
39	<i>Olea europaea</i>	Zaitoon	Oleaceae	Seeds(oil)	It is used for treatment of diabetes and for stomach ulcer.	0.5	NA	NA
40	<i>Grewia optiva</i>	Pasta wone	Tiliaceae	Leaves	It is used for animal child when born for relaxation and for milk production in animals.	0.14	0.22	0.016
41	<i>Juglans regia</i>	Ghaz	Juglandaceae	Bark	In powder form it use for wounds on body.	0.36	NA	NA
42	<i>Cordia dichotoma</i>	Laashora	Cordiaceae	Fruit	It is used for treatment of flu coughing and a pain killer in limbs.	0.21	NA	NA

*NA stands for not available or not reported.

Table 1. Continued...

S. No	Botanical name	Vernacular Name	Family name	Plant Part used	Ethno-medicinal uses	UV (UV)			
						Swabi region	Hazara region	Allai Valley	Tanawal Valley
43	<i>Zizyphus sativa</i> G	Makhraray	Rhamnaceae	Seeds	It is used for treatment of coughing and diarrhea.	0.32	NA	NA	NA
44	<i>Mentha spicata</i>	Podina	Lamiaceae	Leaves	It is used for cooling of body and for constipation.	0.92	0.22	0.12	0.90
45	<i>Datura stramonium</i>	Datura	Solanaceae	Seeds	It is narcotic drugs and for treatment of coughing.	0.23	NA	NA	NA
46	<i>Syzygium cumini</i>	Jaman	Myrtaceae	Fruits	It is used for treatment of diabetes and for cooling of body.	0.47	NA	NA	NA
47	<i>Cassia fistula</i>	Amaltas	Caesalpinaceae	Fruit	It covers disorder in Billy. Gastric problem, seed are highly poison	0.1	0.09	NA	0.40
48	<i>Persicaria amplexicaule</i>	Anjabar	Polygonaceae	Roots	It is used for treatment of female sexual problem and for diarrhoea.	0.29	NA	NA	NA
49	<i>Brassica campestris</i>	Sharsham	Brassicaceae	Whole plant	It is used for treatment of cancer and tumor.	0.8	0.13	NA	NA
50	<i>Arachis hypogaea</i>	Pali	Papilionaceae	Fruits	It is best for hotness of body.	0.63	NA	NA	NA
51	<i>Papaver somniferum</i>	Qashqash	Papaveracea	Seeds	It is used as narcotic.	0.3	NA	NA	NA
52	<i>Diospyrus lotus</i>	Amlook	Ebenaceae	Fruit	It is used for treatment of constipation.	0.4	NA	NA	NA
53	<i>Broussonetia papyrifera</i>	Gul toot	Moraceae	Leaves, roots	Its leaves and roots are used as a tonic.	0.1	0.02	NA	NA
54	<i>Prunella vulgaris</i>	Ustrakhodus	Lamiaceae	Whole plant	Whole plant both in fresh and dry form is used to relieve respiratory difficulties, in treating joint pains and easing gastric spasm.	0.14	NA	NA	NA
55	<i>Aloe vera</i>	Zmari Panra	Liliaceae	Gel, juice	Used for wounding and cuts in the body, and also for Anti-inflammatory in the body.	NA	0.04	NA	NA
56	<i>Celtis caucasica</i>	Tagha	Cannabaceae	Leaves, fruit, bark	Fruits are edible which are refrigerant, and also applied in allergy.	NA	0.03	NA	NA

*NA stands for not available or not reported.

Table 1. Continued...

S. No	Botanical name	Vernacular Name	Family name	Plant Part used	Ethno-medicinal uses	UV (UV)			
						Swabi region	Hazara region	Allai Valley	Tanawal Valley
57	<i>Allium sativum</i>	Ooga	Alliaceae	fruit	Used at morning before breakfast, this reduces the high blood pressure.	NA	0.11	NA	NA
58	<i>Viola betonicifoliasm</i>	Banafsh	Violaceae	Whole plant	It is used as diaphoretic Anticancer and purgative. It is also used in nervous disorders.	NA	0.13	NA	NA
59	<i>Viola canscens</i>	Banafsha	Violaceae	Whole plant	Used as astringent, demulcent, purgative blood purifier and anticancer.	NA	0.18	0.05	NA
60	<i>Justicia adhatoda</i>	Baikar	Acanthaceae	Leaves, roots	Antispasmodic, expectorant, abortifacient, TSR, honey bee. use for cough	NA	0.12	0.04	0.65
61	<i>Mallorus philippensis</i>	Kambela, Kamela	Euphorbiaceae	leaves, flowers, fruits	used in Purgative, anthelmintic, narcotic, appetizer, gastritis & abdominal diseases	NA	0.23	0.01	0.05
62	<i>Zizyphus nummularia</i>	Karkunda	Rhamnaceae	Leaves, fruit	Laxative, fodder, fruit, Honey bee.	NA	0.27	NA	NA
63	<i>Valeriana jatamansii</i>	Mushkabala	Valerianaceae	Rhizome	Carminative and aromatic.	NA	0.07	NA	NA
64	<i>Carissa opaga</i>	Garanda	Apocynaceae	berries	Berries are carminative,	NA	0.09	NA	NA
65	<i>V. grandiflorum</i>	Guch	Caprifoliaceae	Fruit, wood	Fruits are used to ease gastric spasms and Uterine irritability.	NA	0.08	NA	NA
66	<i>Buxus wallichiana</i>	shamshad	Buxaceae	Whole plant	Diaphoretic,	NA	0.12	NA	NA
67	<i>Quercus incana</i>	bunj	Fagaceae	Fruit	A fruit is used as astringent, diuretic, diarrhea and asthma.	NA	0.08	NA	NA
68	<i>Amaranthus caudatus</i>	chalere	Amaranthaceae	Shoot and leaves	Used for Cough, asthma, diuretic, sores, piles, pulmonary diseases & treat joint pain.	NA	0.12	0.02	0.45
69	<i>Lepidium sativum</i>	Noor alam	Brassicaceae	Seeds	A seed is used for treatment of pain in stomach.	NA	0.14	NA	NA
70	<i>Pistacea integrima</i>	shnai	Anacardiaceae	leaves, fruit	used in Tonic and antiseptic, cough asthma and dysentery	NA	0.06	0.05	NA
71	<i>Ricinus communis</i>	Arand, Rand, castor bean	Euphorbiaceae	seed	Used as a Laxative, cough, fever, swelling, headache, chopsy & rheumatism	NA	0.04	NA	0.75

*NA stands for not available or not reported.

Table 1. Continued...

S. No	Botanical name	Vernacular Name	Family name	Plant Part used	Ethno-medicinal uses	UV (UV)			
						Swabi region	Hazara region	Allai Valley	Tanawal Valley
72	<i>Juglans regia</i>	Akkort	Juglandaceae	Fruits, bark	Nuts are believed to use as brain tonic, bark in toothache.	NA	0.13	NA	NA
73	<i>Zanthoxylum armatum</i>	Dambara	Rutaceae	Wood, fruit	used in Stomach disorder, Aromatic, fever, cholera, and toothache	NA	0.08	0.016	NA
74	<i>Bauhinia variegata</i>	Kulyar	Caesalpinaceae	Wood, bark, flower buds	Skin diseases and leprosy,	NA	0.09	NA	NA
75	<i>Rhododendron arborium</i>	Gul amer	Ericaceae	Wood, flower	Flower petals are tonic and ornamental	NA	0.13	NA	NA
76	<i>Rubus ulmifolius</i>	Conuch	Rosaceae	Leaves, fruit	Carminative, fodder, fruit,	NA	0.19	NA	NA
77	<i>Tinospora cordifolia</i>	Gillo	Menispermaceae	Stem	Fever, ornamental	NA	0.05	NA	NA
78	<i>Indigofera heterantha</i>	Kanthea, Ghawreja	Papilionaceae	Leaves, wood, branches	Fodder, TSR, Powder roots used to cure chest pain and headache	NA	0.18	0.07	NA
79	<i>Albizia lebeck</i>	Stekh	Mimosaceae	Bark, and leaves	Powdered bark is used in diarrhea and used for dysentery. Cough and tonic.	NA	0.09	NA	NA
80	<i>Cedrella serrata</i>	Meem	Meliaceae	Bark, leaves	Diabetes, TSR	NA	0.17	NA	NA
81	<i>Solanum nigrum</i>	Kachmachu	Solanaceae	Shoot, leaves	Dropsy and jaundice.	NA	0.13	NA	NA
82	<i>Betula utilis</i>	Boraj	Betulaceae	Bark	Birch bark soaked until moist in water, and then formed into a cast for a broken arm.	NA	0.1	NA	NA
83	<i>Tribulus terrestris</i>	Markundai	Zygophyllaceae	Fruits, roots	Urinary disorders	NA	0.02	NA	NA
84	<i>Oxyria digyna</i>	Turkay	Polygonaceae	Aerial parts	Young leaves and aerial parts are used as source of vitamin C.	NA	0.09	NA	NA
85	<i>Zizyphus vulgare</i>	Markhani	Rhamnaceae	Leaves, fruit	Used in diabetes	NA	NA	0.03	NA
86	<i>Narcissus tazetta</i>	Gul nargis	Amaryllidaceae	Roots	Used to relieve headache	NA	NA	0.04	NA

*NA stands for not available or not reported.

Table 1. Continued...

S. No	Botanical name	Vernacular Name	Family name	Plant Part used	Ethno-medicinal uses	UV (UV)			
						Swabi region	Hazara region	Hazara region	
						Razzar tehsil	Gadoon Valley	Allai Valley	Tanawal Valley
87	<i>Mentha longifolia</i>	Velany	Labiatae	Leaves	Used in digestion and diarrhea	NA	NA	0.65	NA
88	<i>Aesculus indica</i>	Joze	Hippocastinaceae	Seed	Powder seed are used for jaundice	NA	NA	0.02	NA
89	<i>Fumaria indica</i>	Papra	Fumariaceae	Whole plant	Used in diabetes	NA	NA	0.07	NA
90	<i>Solena amplexicaulis</i>	Kakora	Cucurbitaceae	Root, seed	Stimulant & purgative	NA	NA	0.05	NA
91	<i>Foeniculum vulgare</i>	Kaga welany	Apiaceae	Fruit	Used in stomach disorder and fever	NA	NA	0.09	NA
92	<i>Rheum australe</i>	Chotal	Polygonaceae	Roots	Used to remove kidney stone	NA	NA	NA	NA
93	<i>Skimmia laureola</i>	Nera	Rutaceae	Leaves	Burned leaves smoke used in nasal tract cleaning and in cold and cough	NA	NA	0.14	NA
94	<i>Ajuga bracteosa</i>	Boti	Labiatae	Leaves	Juice of the leaves is good in jaundice and used in sore throat	NA	NA	0.04	NA
95	<i>Myrtus communis</i>	Mano	Myrtaceae	Leaves	Used in abdominal pain diarrhea and urinary infection	NA	NA	0.03	NA
96	<i>Acorus calamus</i>	Skha waja	Acoraceae	Rhizome	Powder tuber is used in diarrhea and dysentery	NA	NA	0.01	NA
97	<i>Bergeria ciliata</i>	Gut panra	Saxifragaceae	Whole plant	The whole plant juice is used to cure urinary troubles	NA	NA	0.01	NA
98	<i>Rumex hastatus</i>	Tarokey	Polygonaceae	Whole plant	Used in jaundice and as antiseptic	NA	NA	0.06	NA
99	<i>Papaver somniferum</i>	Qashqash	Papaveracea	Fruit	Used in diarrhea and abdominal cramping	NA	NA	0.03	NA
100	<i>Crataegus songarica</i>	Batsinga	Rosaceae	Fruit	Used as cardiac tonic	NA	NA	0.04	NA

*NA stands for not available or not reported.

Table 1. Continued...

S. No	Botanical name	Vernacular Name	Family name	Plant Part used	Ethno-medicinal uses	UV (UV)			
						Swabi region		Hazara region	
					Razzar tehsil	Gadoon Valley	Allai Valley	Tanawal Valley	
101	<i>Polygonum amplexicaule</i>	Masloon	Polygonaceae	Rhizome	Used in diarrhea	NA	NA	0.07	NA
102	<i>Calendula aenis</i>	Zyar gulay	Asteraceae	Flower	Remedy for skin problems externally applied to bites and wounds	NA	NA	0.03	NA
103	<i>Angelica glauc</i>	Chora	Umbelliferae	Roots	Used in dyspepsia and constipation	NA	NA	0.01	NA
104	<i>Verbascum thapsus</i>	Khardag	Scrophulariaceae	Leaves and flower	Leaves and flower decoction used in cough, and skin diseases	NA	NA	0.02	NA
105	<i>Equisetum arvense</i>	Bandakey	Equisetaceae	Whole plant	Extract is used in jaundice	NA	NA	0.06	NA
106	<i>Nasturtium officinale</i>	Talmera	Brassicaceae	Whole plant	Used in chest complaints	NA	NA	0.33	NA
107	<i>Marrubium vulgare</i>	Skha boty	Labiatae	Leaves	Decoction is used against cough	NA	NA	0.06	NA
108	<i>Ficus racemosa</i>	Oormal	Moraceae	Leaves, fruit	Leaves decoction is used for wounds healing	NA	NA	0.02	NA
109	<i>Artemisia spp.</i>	Tarkha, Afsunteen	Asteraceae	Leaves, flower, Branches	Leaves juice is used as anthelmintic and Blood purifier	NA	NA	0.05	NA
110	<i>Morchella spp.</i>	Gochai	Helvelaceae	Whole plant	General body tonic	NA	NA	0.09	NA
111	<i>Geranium wallichianum</i>	Ratan joke	Geraniaceae	Whole plant	Used in joint pains, peptic ulcers, cure for toothache and eyes(externally)	NA	NA	0.05	0.88
112	<i>Inula royleana</i>	Kut	Asteraceae	Roots	Used for high blood pressure	NA	NA	0.01	NA
113	<i>Prunus persica</i>	Shaltalo	Rosaceae	Fruit	Dried fruit and ginger are mixed with honey eaten for body cooling and diabetes	NA	NA	0.02	NA
114	<i>Rosa spp.</i>	Gulaab	Rosaceae	Leaves and flower	Juice reduce swelling of capillaries under the skin used as ant Bacterial	NA	NA	0.01	NA
115	<i>Myrsine africana</i>	Marorang	Myrsinaceae	Leaves, fruit	Powder fruit used in treating tapeworm leaves decoction used in blood purification	NA	NA	0.07	NA

*NA stands for not available or not reported.

Table 1. Continued...

S. No	Botanical name	Vernacular Name	Family name	Plant Part used	Ethno-medicinal uses	UV (UV)			
						Swabi region	Gadoon Valley	Allai Valley	Hazara region
					Razzar tehsil	Gadoon Valley	Allai Valley	Tanawal Valley	
116	<i>Plantago major</i>	Jabai	Plantaginaceae	Roots	Used in diarrhea treatment	NA	NA	0.02	NA
117	<i>Euphorbia helioscopia</i>	Gandi boti	Euphorbiaceae	Whole plant	Antiperiodic, Cathartic & anthelminthic	NA	NA	NA	0.15
118	<i>Xanthium strumarium</i>	Chhota dhatura & cocklebur	Asteraceae	Root & fruit and seed	Stomach diseases, demulcent & Smallpox and dysentery	NA	NA	NA	0.03
119	<i>Launea procumbis</i>	Bhatter	Asteraceae	Whole plant	Tooth diseases diabetes, constipation, intestinal disorder, painful urination, gonorrhoea, relief in cold, cough, flu and Wound infection	NA	NA	NA	0.12
120	<i>Verbascum thapsus</i>	Ghad kana	Scrophulariaceae	Whole plant	Acts as steroid	NA	NA	NA	0.35
121	<i>Zizyphus nummularia</i>	Beri	Rhamnaceae	Leaves and fruit	Carminative & Sedative	NA	NA	NA	0.46
122	<i>Taraxacum officinale</i>	Hand	Asteraceae	Seed & Flower	Analgesic & Astringent	NA	NA	NA	0.08
123	<i>Cuscuta reflexa</i>	Amber bail, akash bail	Cuscutaceae	Stem	Paralysis & Hair treatment	NA	NA	NA	0.60
124	<i>Chenopodium album</i>	Bathu, goose foot	Chenopodiaceae	Whole plant	Jaundice	NA	NA	NA	0.32
125	<i>Glaucium spinosum</i>	Kala mewa, Sataya nasi	Papaveraceae	Whole plant	For treatment of hepatitis	NA	NA	NA	0.25
126	<i>Butea monosperma</i>	Palaas	Fabaceae	Timber, resin, fodder,	Its flower is used for treatment of liver disease	NA	NA	NA	0.40
127	<i>Adiantum venustum</i>	Persoshan	Pteridaceae	Whole plant	The fern is used for the treatment of cold, headache, hydrophobia, inflammation of the chest. It is also used as an antiviral or antibacterial drug.	NA	NA	NA	0.28
128	<i>Ephedra vulgaris</i>	Asmani	Ephedraceae	Fruit stem & root	Cure from Allergies, Asthma and other breathing disorders, Nasal congestion, Colds, Flu, Fever	NA	NA	NA	0.08

*NA stands for not available or not reported.

Table 1. Continued...

S. No	Botanical name	Vernacular Name	Family name	Plant Part used	Ethno-medicinal uses	UV (UV)			
						Swabi region	Hazara region	Allai Valley	Tanawal Valley
129	<i>Eclipta alba</i>	Safaid bangeri	Asteraceae	Whole plant	Leaf paste applied to treat allergy, athlete's foot and ringworm infestation.	NA	NA	NA	0.17
130	<i>Calotropis procera</i>	Aak	Asclepiadaceae	Whole plant	Treatment of asthma.	NA	NA	NA	0.33
131	<i>Aconitum chasmanthum</i>	Mohri	Ranunculaceae	Fruit & Leaves	Treatment of disc prolapse and backache	NA	NA	NA	0.54
132	<i>Berberis Artissata</i> (black)	Sumbul	Berberidaceae	Fruit & bark	To treat fractured bones, spine dislocation	NA	NA	NA	0.68
133	<i>Moringa oleifera</i>	Suhanjana	Moringaceae	Seed & bark Leaves and Root	Highly energetic	NA	NA	NA	0.72
134	<i>Ficlipta prostrata</i>	Bhangra	Asteraceae	Whole plant	Oil is used to colour hairs	NA	NA	NA	0.25
135	<i>Solanum surrattense</i>	Muhakri/ kandiari	Solanaceae	Root and leaves	Roots for kidney stones, tuberculosis, liver diseases, leaf for haemostasis.	NA	NA	NA	0.45
136	<i>Ficus Benghalensis</i>	Bar/Burgud	Moraceae	Fruit, water and stem	Gonorrhea	NA	NA	NA	0.50
137	<i>Lactica scariota</i>	Dodal	Asteraceae	Whole plant	Applied to burns, poultice for rheumatism and gout, internally for Gonorrhoea and urogenital irritation	NA	NA	NA	0.23
138	<i>Prinsepia utilis</i>	Phulwara	Rosaceae	Whole plant	It is applied externally as a treatment for rheumatism and muscular pain Stomach Pain.	NA	NA	NA	0.09
139	<i>Bombax ceiba</i>	Samalkoka	Mahiaceae	Flower, Seed	Dysentery, stimulant and blood purification	NA	NA	NA	0.20
140	<i>Olea ferruginea</i>	Desi zaitoon	Oleaceae	Leaves & bark	Used to treat common cold	NA	NA	NA	0.26

*NA stands for not available or not reported.

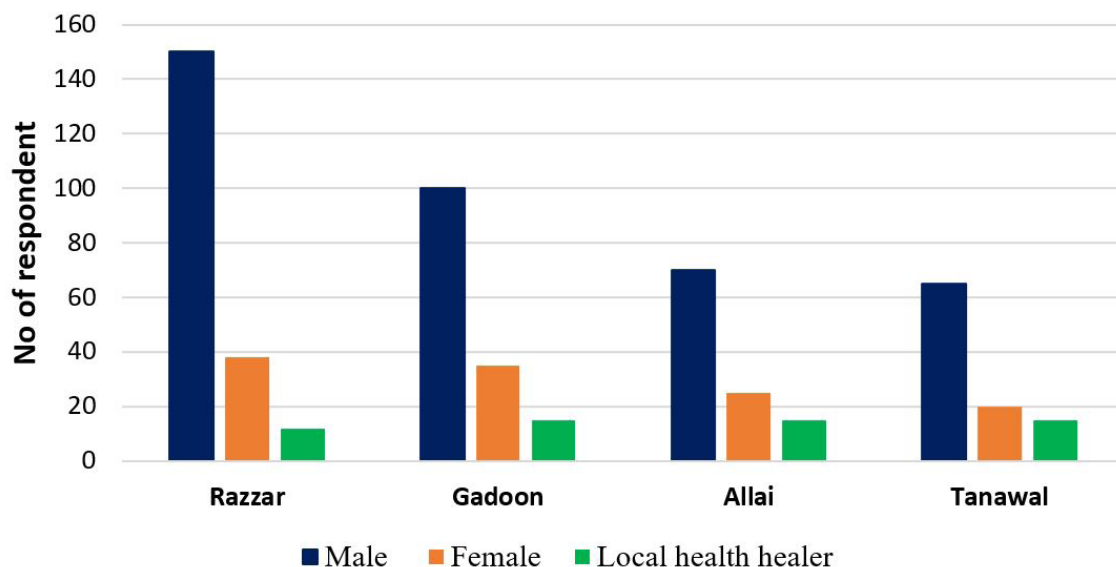


Figure 2. Gender and age character (age limit is <30 >40 year) of peoples interviewed in the study area.

market value of medicinal plants were asked from the elderly well-informed people in the study area. A total of 150 informers were randomly interviewed as can be seen in Figure 2. The informers were comprised of male and female including the herbalists (hakims; indigenous physicians of eastern structure of healthcare system) and Pansaries (medicinal plants traders in the local market).

3. Method Use for Data Analysis

Phillips et al., (1994) used a formula to calculate the relative significance of medicinal plant species (Mahmood et al., 2013. The Equation 1 to determine the UV (UV) is given below.

$$UV (UV): U_{vi} = \sum U_i / N_i \quad (1)$$

In the above Equation 1, U_{vi} represents UV of individual medicinal plant species, U_i represents specific plant species declared pharmaceutically important by the informers and N_i represents the total number of individual species interviewed or reported.

4. Results

4.1. Diversity of Medicinal Plants

The present research work was based on the ethnic knowledge of most frequently used medicinal plants in Swabi (Razzar and Gadoon) and Hazara regions (Allai and Tanawal) of Khyber Pakhtunkhwa province, Pakistan. A total of 140 medicinal plants species were reported from all the sites in the study area. The diversity of medicinal plants in Razzar region of district Swabi was identified in 2016. A total of 54 medicinal plants were identified that belong

to 35 families as summarized in Table 1. Among them, 22 were herbs, 15 shrubs and 4 were found to be trees species. Five plants were representative of Moraceae family and followed by four plants of family Solanaceae, three plants each of family Rhamnaceae, Papilionaceae, two plants, each of family Rosaceae, Mimosaceae, Polygonaceae, Apiaceae, Brassicaceae, Rutaceae, Sapindaceae, Lamiaceae, and one each of family Meliaceae, Cannabinaceae, Malvaceae, Punicaceae, Portulacaceae, Paeoniaceae, Plantaginaceae, Palatanaceae, Amaranthaceae, Asparagaceae, Myrtinaceae, Polypodiaceae, Thymalaceae, Pinaceae, Oleaceae, Tiliaceae, Juglandaceae, Cordiaceae, Caesalpiniaceae, Papaveraceae, Ebenaceae, Labiatae and Berberidaceae. Family Moraceae and Solanaceae family plants are dominantly present in the study area. Similarly, about 57 medicinal plants were identified in Gadoon valley of district Swabi belonging to 39 families as shown in Table 1. Among the families are Alliaceae, Acanthaceae, Apocynaceae, Amaranthaceae, Anacardiaceae, Berberidaceae, Brassicaceae, Buxaceae, Betulaceae, Cannabaceae, Caesalpiniaceae, Caprifoliaceae, Euphorbiaceae, Ericaceae, Fagaceae, Juglandaceae, Liliaceae, Lamiaceae, Mimosaceae, Moraceae, Meliaceae, Malvaceae, Myrsinaceae, Menispermaceae, Pinaceae, Polypodiaceae, Portulacaceae, Paeoniaceae, Papilionaceae, Plantaginaceae, Polygonaceae, Rutaceae, Rhamnaceae, Rosaceae, Sapindaceae, Tiliaceae, Violaceae, Valerianaceae, and Zygophyllaceae. Due to diversity of medicinal plants from various families Gadoon valley is recognized as one of the potential sites for medicinal plants flora in Khyber Pakhtunkhwa, Pakistan.

Various parts of different medicinal plant species were identified from Allai valley of district Batagram, Hazara region used for medicinal purposes. These include 53 ethno-botanically important species. Some of them are used individually, while other plant species are used in mixtures. These plants belong to families such as Moraceae, Mimosaceae, Cannabinaceae, Polygonaceae,

Malvaceae, Solanaceae, Berberidaceae, Labiatae, Sapindaceae, Myrsinaceae, Rutaceae, Tiliaceae, Lamiaceae, Violaceae, Acanthaceae, Euphorbiaceae, Amaranthaceae, Anacardiaceae, Rutaceae, Polygonaceae, Acoraceae, Saxifragaceae, Papaveraceae, Rosaceae, Asteraceae, Umbelliferae, Scrophulariaceae, Equisetaceae, Brassicaceae, Helvelaceae, Geraniaceae, Rosaceae, Myrsinaceae, and Plantaginaceae. Because of medicinal plants from these families, the Allai valley has a significant diversity of medicinal flora in Hazara region, Pakistan. Likewise, a total of 40 medicinal plants were identified that belong to 24 families in Tanawal valley of district Haripur, Hazara division as can be seen in Table 1. The medicinal plants were mostly from the families i.e. Amaranthaceae, Asteraceae, Berberidaceae, Brassicaceae, Cannabaceae, Cappariaceae, Chenopodiaceae, Cupressaceae, Elaeagnaceae, Fabaceae, Juglandaceae, Lamiaceae, Moraceae, Plantaginaceae, Poaceae, Polygonaceae, Ranunculaceae, Rosaceae, Salicaceae, Tamaricaceae, Urticaceae, Zygophyllaceae, Saxifragaceae, Solanaceae. Due to variety of plant families, Tanawal valley is one of the diverse regions for medicinal plants.

4.2. Number of informants

A total of 200 informants (150 males, 38 females and 12 local health therapists) were interviewed in Razzar tehsil of district Swabi, whereas in Gadoon valley of district Swabi total of 150 informants (100 males, 35 females and 15 local health healers) were interviewed. Likewise, in Allai valley of Hazara region, a total of 110 informants (70 males, 25 females and 15 local health healers) were interviewed, while in Tanawal valley a total of 100 informants (65 males, 20 females and 15 local health healers) were interviewed as can be seen in Figure 2. During the questionnaire surveys, local name of the medicinal plant, its distribution, status, plant parts used for therapeutic purposes and threats to

the medicinal plants were recorded from the inhabitants and informants of the study area.

4.3. Plant parts used for indigenous medicines

Plant parts used by native community to treat different ailments were mostly seeds, fruits and leaves in Razzar tehsil of district Swabi. Amongst these plant parts, seeds (29%) were the most commonly used followed by fruits (20%), leaves (19%), roots (10%), whole plant (9%), bark (6%), gum (6%), and flower (1%). Similarly, plant parts used by the local community to treat different ailments were mostly seeds, fruits and leaves in Gadoon valley of district Swabi. Amongst these plant parts, 24% were the leaves comprising the most commonly used followed by fruits (21%), seeds (15%), roots (10%), whole plant (7%), bark (13%), gum (4%), flower (6%), and leaves (11%). In Allai valley of Hazara Division the medicinal plant parts such as leaves were highly used (28%), followed by fruits (24%), whole plants (21%), Roots (12%), leaves (9%), flowers (7%), Seeds (4%), bark (3%) and gum (1%). Whereas, in Tanawal valley of Hazara division, seeds were highly used (20%), followed by the whole plants (18%), flowers (16%), fruits (15%), leaves (13%), bark (12%), roots (4%) and gum (2%) as can be seen in Figure 3.

4.3.1. Relative Importance of medicinal plants

To assess the relative importance of medicinal plants used in the Razzar tehsil of district Swabi use value (UV) was calculated by the formula described by Phillips et al. 1994 with minor modification. Medicinal plants used frequently exhibited higher UV as compared to the least used medicinal plants as can be seen in Table 1. Relative importance of UV showed the importance of medicinal plants in terms of their traditional use in the study area. Therefore, in Razzar tehsil of district Swabi, *Mentha spicata* L. exhibited the highest UV i.e. 0.92, followed by the *Isodon rugosus*

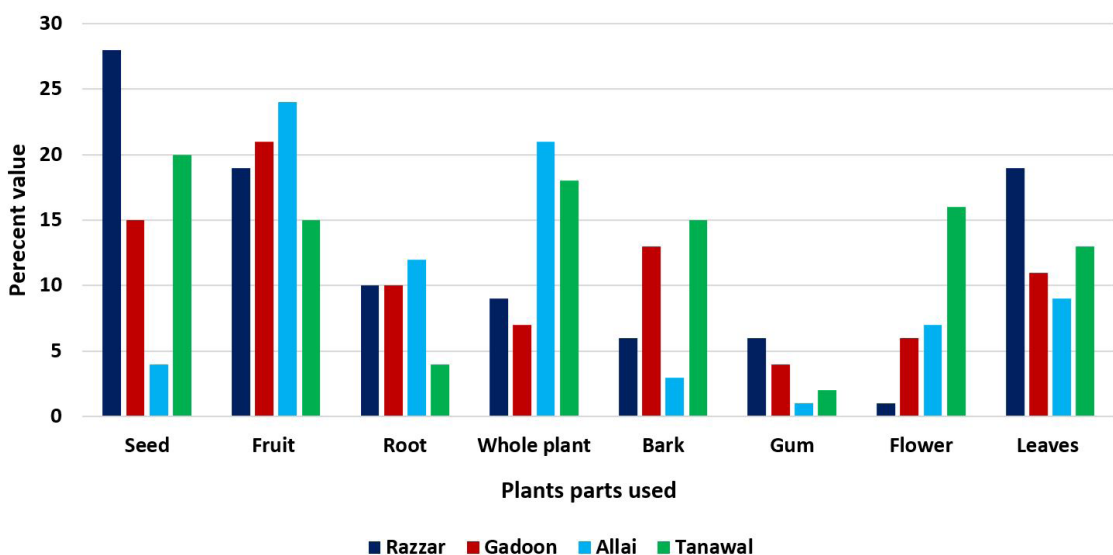


Figure 3. Plant parts used for indigenous medicines in the study area.

L. (0.90), *Solanum nigrum* L. (0.89), *Foeniculum vulgare* M (0.87), *Paeonia emodi* W (0.85), *Plantago Ispaghula* (0.83), *Berberis lycium* R (0.81), *Brassica campestris* L. (0.80) and *Solanum nigrum* L. (0.72). Least UV was reported for *Rumex dentatus* L (0.05) and *Dochesne indica* A (0.03) as can be seen in Figure 4. Medicinal plants of Gadoon valley reported the highest UV for *Berberis lycium* R(0.68) followed by *Mallotus philippensis* L (0.23), *Eucalyptus lanceolata* M (0.22), *Rubus ulmifolius* S (0.19), *Indigofera heterantha* W

(0.18), *Citrus lemon* L (0.18), *Lepediumsativum* L (0.14), *Juglans regia* L (0.13), *Paeonia emodi* W. (0.5) whereas the *Tribulus terrestris* L. (0.02) and *Celtis caucasica* L (0.03), reported the least UV in Gadoon valley of district Swabi as depicted in Figure 5.

Similarly, in Hazara division the important medicinal plants species of Allai valley, district Batagram with highest UV were *Mentha longifolia* (0.65), followed by *Nasturtium officinale* W (0.33), *Skimmia laureola* D (0.14), *Mentha spicata*

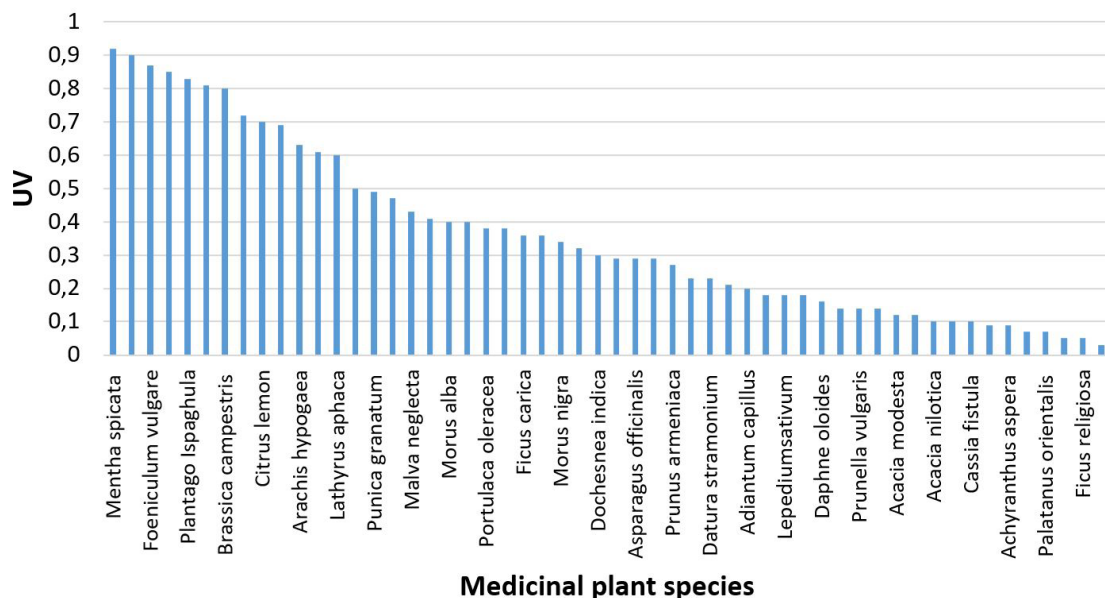


Figure 4. Relative importance of medicinal plants based on UV in Razzar tehsil, District Swabi.

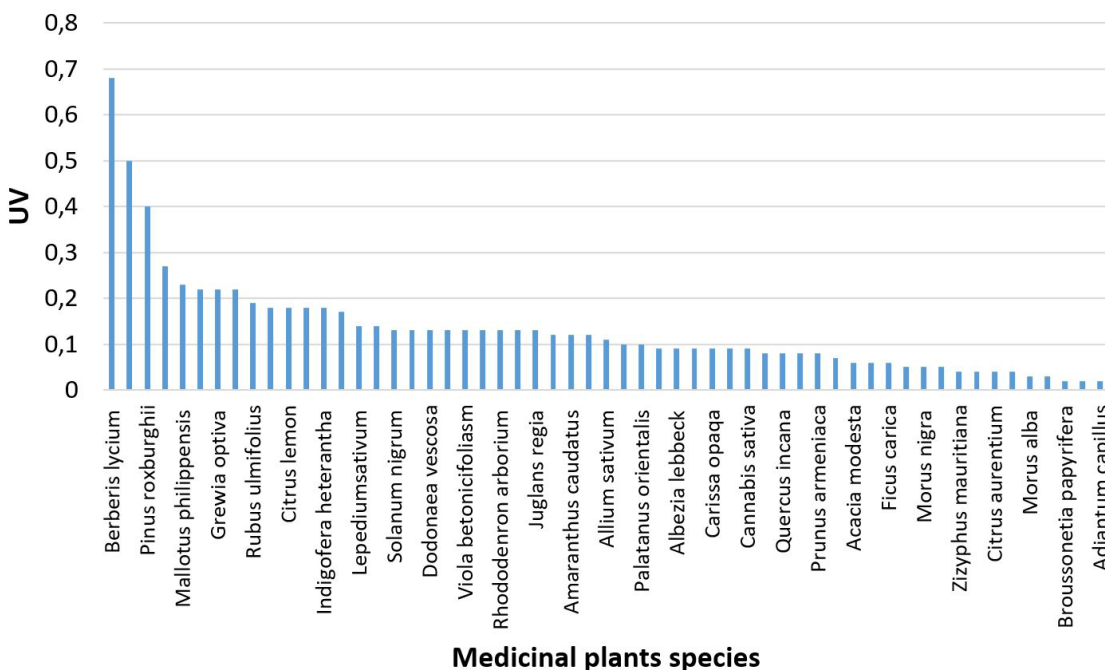


Figure 5. Relative importance of medicinal plants based on UV in Gadoon valley, District Swabi.

L (0.12), *Foeniculum vulgare* M (0.09), *Morchella spp* L (0.09), *Zizyphus oxyphylla* M (0.08), *Polygonum amplexicaule* D (0.07), *Fumaria indica* L (0.07), *Myrsine africana* L (0.07), *Equisetum arvense* L (0.06), *Solanum surratense* L (0.06), *Marrubium vulgare* L (0.06), and *Paeonia emodi* W (0.06) as shown in Figure 6. Likewise, medicinal plants of Tanawal valley, district Haripur reported highest UV for the *Geranium wallichianum* Olive (0.88), followed by *Ricinus communis* L (0.75), *Moringa oleifera* L (0.72), *Berberis Arissata* D (0.68), *Justicia adhatoda* L (0.65), *Aconitum chasmanthum* L (0.54), *Acacia nilotica* L (0.48), *Zizyphus nummularia* M (0.46), *Amaranthus caudatus* L (0.45), *Verbascum thapsus* L (0.35), *Calotropis procera* A (0.33), *Adiantum capillus* L (0.28) and *Morus nigra* L (0.17) whereas *Xanthium strumarium* L and *Ephedra vulgaris* L revealed lowest UV (0.03 and 0.08), respectively as depicted in Figure 7.

4.4. Herbal Therapies of Indigenous Plants

The Razzar tehsil of district Swabi is enriched with medicinal flora that are used to cure different ailments. A single disease is treated by several plants meaning more than single plant is active for different ailments' treatment in Razzar tehsil of district Swabi. More than 13% of medicinal plant species were used for the treatment of cough in Razzar tehsil, followed by constipation (12%), analgesic (12%), antiseptic (12%), sexual debility (9%), body coldness (9%), diabetes (7%), narcotic (7%), fever (7%), antibiotic (4%), carminative (4%), rheumatism (2%), dysentery (2%), stomach (3%), hair strength (3%), kidney problem (3%), and cancer (1%). Similarly, the Gadoon valley of district Swabi is also enriched with medicinal flora, which is used to treat different disorders. Medicinal plants used in treating cough

are more than 18%, followed by stomach (13%), analgesic (12%), body coldness (10%), constipation (10%), antiseptic (10%), tonic (9%), fever (7%), wound (7%) and diarrhoea (4%). It was reported during the study of Allai valley in Hazara division that 14% of medicinal plants were used for treatment of cough and cold, followed by diarrhoea 12%, stomach problems (9%), skin disease (7%), external wound (7%), diabetes (7%), fever (5%), urine infection (5%), bone problems (4%), blood problems (3%), and 1% of plant species for kidney stone. In Tanawal valley is also much diversified in plants that are being used by the local community, herbalists and knowledgeable elderly persons to cure different diseases. Several plants in the study area treat a single disease. About 14% of medicinal plants were used for diarrhoea treatment, which is followed by toxin (8%), diabetes (7%), hepatitis (7%), analgesic (6%), narcotic (7%), cough (7%), fever (7%), asthma (6%), stomach (6%), tonic (6%), liver (5%), abortification (4%), rheumatism (4%) and laxative (4%) as show in the Figure 8.

Local people are well engaged in the cultivation of medicinal plants such as *Mellia azedarach* L, *Zizyphus mauritiana* L, *Ficus carica* L, *Morus alba* L, *Morus nigra* L, *Coriandrum sativum* L, *Citrus aurentium* L, *Prunus armeniaca* L, *Eucalyptus lanceolata* M, *Citrus lemon* L, *Cordia dichotoma* G, *Zizyphus sativa* L, *Mentha spicata* L, *Syzygium cumini* Diospyrus L, *Berberis lycium* R, *Eucalyptus lanceolata* M, *Rubus ulmifolius* S, *Indigofera heterantha* W, *Citrus lemon* L, *Lepidium sativum* L, *Juglans regia* L, *Paeonia emodi* W, *Tribulus terrestris* L, *Celtis caucasica* L, *Moringa oleifera*, *Olea ferruginea*, *Berberis Arissata* D, *Justicia adhatoda* L, *Aconitum chasmanthum* L, *Acacia nilotica* L, *Zizyphus nummularia* B, *Amaranthus caudatus* L, *Ficus benghalensis* L, *Verbascum thapsus* L, *Calotropis P*, *Adiantum capillus* L, *Morus nigra*

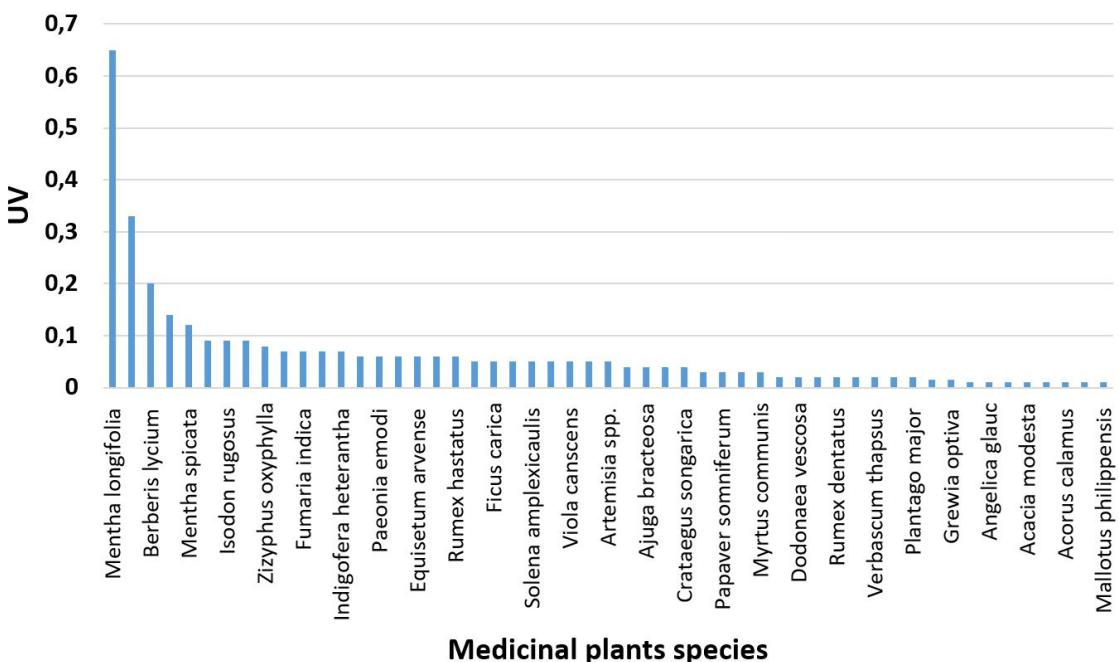


Figure 6. Relative importance of medicinal plants based on UV in Allai valley.

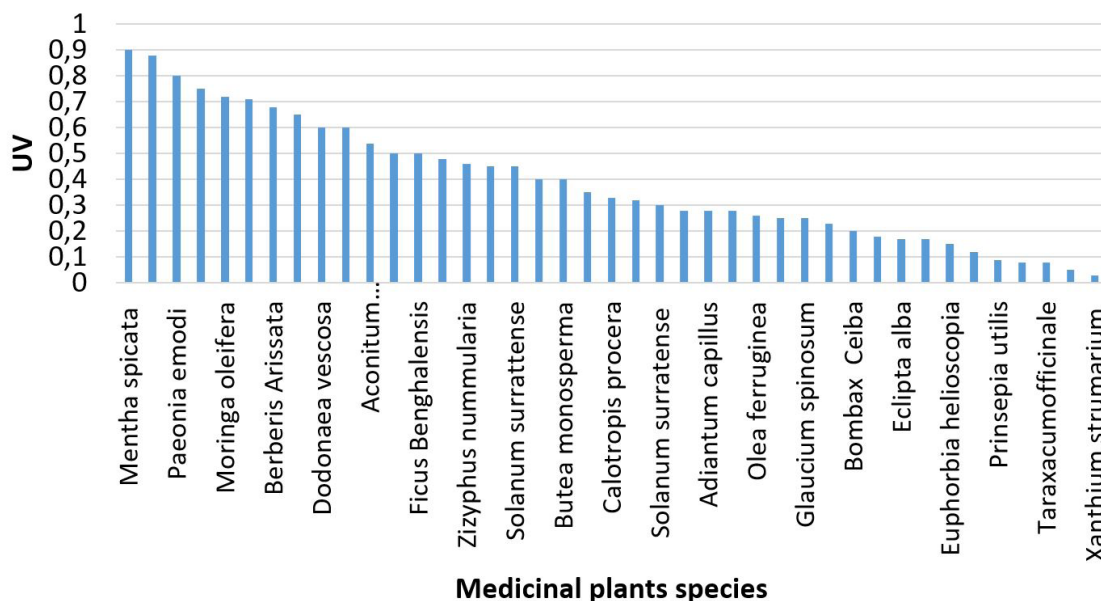


Figure 7. Relative importance of medicinal plants based on UV in Tanawal valley.

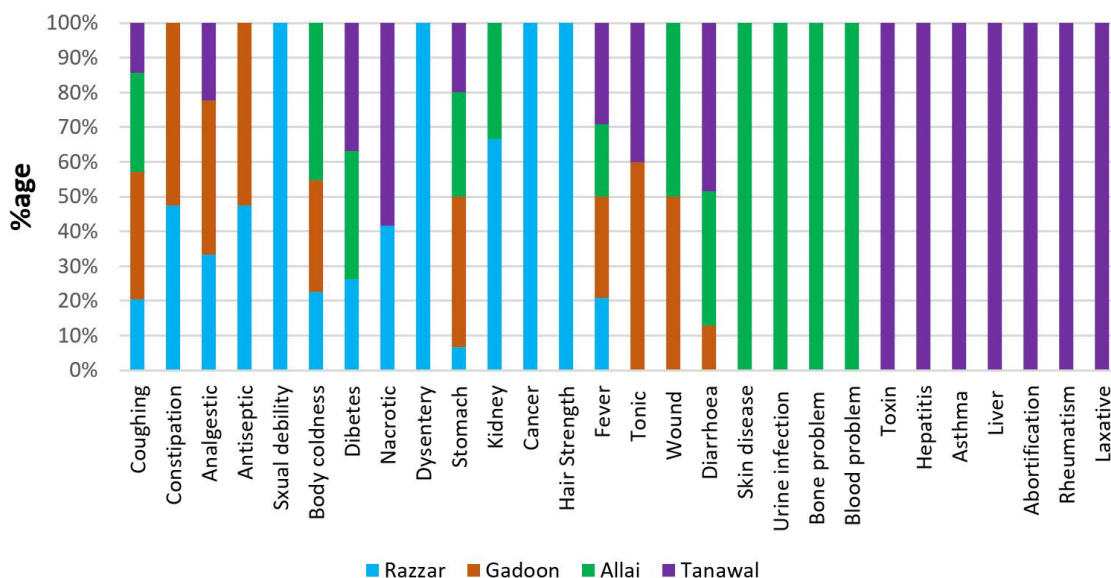


Figure 8. Herbal therapies of indigenous plants in the study area.

L, *Geranium wallichiana* O, *Justicia adhatoda* L, *Aconitum chasmanthum* L, *Acacia nilotica* L, *Amaranthus caudatus* L, *Verbascum thapsus* L, *Calotropis procera* A, *Adiantum capillus* L and *Morus nigra* L Even though medicinal plants are grown in this region, many people still purchase medicinal plants/herbs from herbal shop locally called Pansari shops or herbal stores whereas some medicinal plants are also harvested from natural forests, which could cause threats to their survival and conservation. The present study reported that more than 20 types of ailments including hepatitis, jaundice, diabetes and cardiac problems have been treated using medicinal plants, because the selected sites

are remote areas of the country having diverse medicinal flora. Therefore, these medicinal plants should be focused for detail phytochemical and safety evaluations.

5. Discussion

Pakistan has diverse climatic parameters and its soil is rich with medicinal plants and herbs, which are growing naturally in different period of the year. In rural society of Pakistan, almost 75% of the people are still dependent on traditional medicines for their primary healthcare system

(Ullah et al., 2013), because new amenities of modern healthcare system are not accessible and/or provided to them. Therefore, huge populations are dependent on herbal treatments and native herbalists perform a dynamic role in the healthcare system and ailment treatment of the society in the study area. Easy approachability of herbs or medicinal plants, useful treatment action and reasonable price of healthcare facility are the main factors for the advancement and preference of herbal medicines in the rural and poor communities (Konno, 2004). More than 5,700 medicinal plants are present in Pakistan, out of which, about 372 medicinal plants frequently exist and 350 formulated drugs are manufactured from those medicinal plants (Ahmad and Husain, 2008). History on this planet shows that without medicinal plants' application, human healthcare is not possible (Mahmood et al., 2011c). Therefore, it is in great benefit of the future generations and they will possibly benefit from this treasure of medicinal plants, which is a gift, and blessing of nature for humanity however, in the present period it is alarming that the understanding of ethnobotany is declining very quickly (Mahmood et al., 2011b). Therefore, present young generation does not have enough knowledge about indigenous medical plants and their mode of application for different ailments' treatment. Thus, it is very crucial to transfer this valuable ethno-botanical knowledge from the elderly and resourceful persons to the young generation and document it as well, because through proper documentation of this knowledge we will not lose this unlimited natural wealth, which is going to vanish quickly. Hence, this study provided significant information about the ethno-botanical use of medicinal plants (leaves, bark, roots, fruits, seeds, gum, etc.) in selected remote and hilly regions of Pakistan for treatment of different ailments such as diarrhoea, diabetes, hepatitis, narcotic, coughing, fever, asthma, stomach, tonic, liver, abortification, rheumatism, laxative and other bacterial and fungal infections. However, detailed screening for such medicinal plants should be focused on discovering new pharmacological ingredients because few plants have been screened for their pharmacological and phytochemical belongings in Pakistan. Seeds, fruits and leaves were the most preferred parts in herbal remedies, as these comprise of extraordinary bioactive ingredients. Srithi et al. (2009) also documented that leaves, roots, tubers, seeds and fruits are the most favoured plant parts in the traditional medicines. The use of aerial parts such as leaves and flowers etc. for treatment of different ailments are harmless and sustainable (Giday et al., 2003). During the current study, it was discovered that aerial parts such as leaves, and shoots were used in most of the cases while gum was used in least. However, entire plant is not preferred to be used for ailment treatment because removal of plants will lead to plant species loss. Therefore, the use of aerial parts of plants as medicine is more suitable for sustainable management of medicinal flora (Ghimire et al., 2008). Awaad-Amani et al. (2006) screened the *Alhagi maurorum* for the ulcer due to its antiulcerogenic properties. Likewise, Ismail (2007) conducted a detailed research on pharmacological and pharmacognostic investigations of *Geranium wallichianum* from the KP, Pakistan. Details of phytochemicals and

anthelmintic activities of *Chenopodium album* has been assessed by different pharmacists and further work is being carried out (Jabbar et al., 2007). Antifungal and antibacterial activities of different extracts of *Datura stramonium* have also been assessed and it was found to be a potential plant from KP, Pakistan (Gul et al., 2012). Kusari et al. (2013) assessed *Cannabis sativa* for its potential effects against fungal and bacterial ailments and found best activities against targeted diseases. However, majority of medicinal plants of the present study area are not subjected to the detailed pharmacological screenings.

6. Conclusions

The present study emphasized on exploration and documentation of the indigenous knowledge of medicinal flora from the knowledgeable people of Swabi and Hazara regions of Pakistan. In district Swabi, 54 medicinal plant species were recorded at Razzar tehsil whereas 57 species were reported at Gadoon valley. Similarly, in Hazara region, 60 species were recorded at Allai valley and 50 medicinally important plant species were identified in Tanawal valley. Lack of attention towards medicinal plants and their traditional uses were found amongst young generation because of numerous reasons. The findings of this study clearly indicated that these areas need much attention for medicinal plants documentation, conservation and protection by the government, non-government organization and most local communities. The present study suggested that cultivation of high valued and most wanted medicinal plants is very essential. Trainings for awareness may be organised for the collectors of medicinal plants on cultivation, collection, processing and post-harvest treatment. Harvesting of medicinal plants should be done at the right season. Local people should also be encouraged to participate in conservation and management of threatened and endangered medicinal plants to ensure their sustainability. Therefore, these medicinal plants should be focused for detail phytochemical and safety evaluations.

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