PHYTO-MEDICINAL STUDIES IN DISTRICT LOWER DIR HINDUKUSH RANGE KHYBER PAKHTUNKHWA PAKISTAN

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ABSTRACT

Medicinal plants play a promising role in the primary health care services in Pakistan and elsewhere in the world as their usage in treatment of ailments as well as an important part of the cultural heritage. The aim of this research was to document the indigenous knowledge of the local medicinal plants and their remedies used by the inhabitants of District Lower Dir, Pakistan. The study was conducted in August 2016-April 2017. The Ethno medicinal data were availed from 87 informants by conducting semi-structured interviews and group discussions. As a result it was concluded that a total of 40 plants species belonging to 28 families and 36 genera were used for the treatment of a wide range of problems such as body pain, infertility, cough, digestion, flu, fever, stomach, sexual potency and muscle pain. Herbs (57.50%) were reported as the most common life form followed by shrubs (12.50%), whereas leaves (25%) and fruits (22.5%) were the frequently used plant parts against different diseases. The most commonly used family was Lamiaceae (4 species), followed by Solanaceae and Rosaceae with 3 species each. This study provides useful traditional knowledge of rural communities of the studied area regarding different medicinal plants against a wide range of diseases. Furthermore it provides a documented report to preserve the traditional knowledge of the high valued medicinal plants that can be used for future pharmacological and phytochemical studies for the isolation of different compounds in pharmaceutical industries.

Keywords: Ethno-medicinal data, Khyber Pakhtunkhwa medicinal plants.

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INTRODUCTION

Ethno botanical studies have developed relationship between the local usage of medicinal plants and their promising clinical implications (Verpoorate *et al*.**,** 2005). Usage of medicinal plants is commonly practiced around the globe including Pakistan (Ahmad *et al.,* 2014). The folk remedies are specially practiced by herbal physician, researchers and scientific communities due to their good results and the least side effects. The field studies are important for the identification and documentation of plant species that can further be investigated for the identification of different bioactive compounds through pharmacological, phytochemical and clinical studies (Kayani *et al.*, 2015). Accordingly 64.5-79.5% population of the developing countries prefers to use local traditional remedies for basic health care (Awoyemi e*t al*., 2012). Hamayun *et al*. (2003) have reported that Pakistan is bestowed with 600 important medicinal plants, but very little attention has been given to this very valuable asset by the scientific community (Shinwari and Malik*,* 2009*)*. Ethno botanical studies were conducted in different areas of Pakistan by different prominent botanists. Nasrullah *et al.* (2012) studied the medicinal plants of Jandul valley Samarbagh and enumerated 67 species were recorded which are medicinally and culturally important.. In Mastuj valley Chitral, Shah *et al*. (2012) recorded 82 species along with their local usage and recipes. Another study from Chitral was carried out by Ali *et al*. (2009) with their conservation status. Sixty two plant species were enlisted from Upper Dir, Kohistan (Jan *et al.,* 2011). The above studies are important for the younger generations who are unaware of these secret treasures as they will benefit from the documented data when needed. These information are eroding from our communities due predominantly allopathic medication practice, as compared to the herbal folk remedies practiced. It is estimated that in 2050 all the anti-biotics will lose their efficacy due to build up of resistance in microbes. Hence, people will alternatively start using practice of folk remedies again due to least side effects (Haq *et al.,*2016; Abdullah *et al.,* 2019; Kamran *et al,.*(2018)). This present study was conducted on the medicinal plants of the District Lower Dir, Pakistan to document the indigenous knowledge regarding these medicinal plants in this area, which are commonly used in the treatment of various diseases, before this information is lost, as well as to help inform further phytochemical, pharmacological and clinical studies.

MATERIALS AND METHODS

Study Area

District Lower Dir lies within 32^0 51' 19.52'' North latitude and 71^0 07 '37.37'' east longitude with Timergara as its heaquarter. It is surrounded on the north by District Dir Upper, South by District Malakand, on the west it is bordered by Afghanistan and Bajur District on the southwest (Wikipedia, 2019). The summer season is moderate and warm. June to July are the hottest months and December-January are the coldest. The highest and lowest temperature recorded in winter season is 11.22 °C to -2.39 °C DCR (2018). The district is mainly mountainous, which are part of the southern Hindu Kush range. The main language spoken in the study area is Pushto. Several thno-botanical studies have been carried out in the adjacent areas like Chitral (Ali and Qaiser, 2009), Dir Kohistan valley (Jan *et al.*,. 2011). Dir Upper (Hazrat *et al*. 2011), Jandool (Nasrullah *et al*., 2012), Bajaur Agency (Aziz *et al*. 2017) and Swat valley (Shah *et al*., 2016).

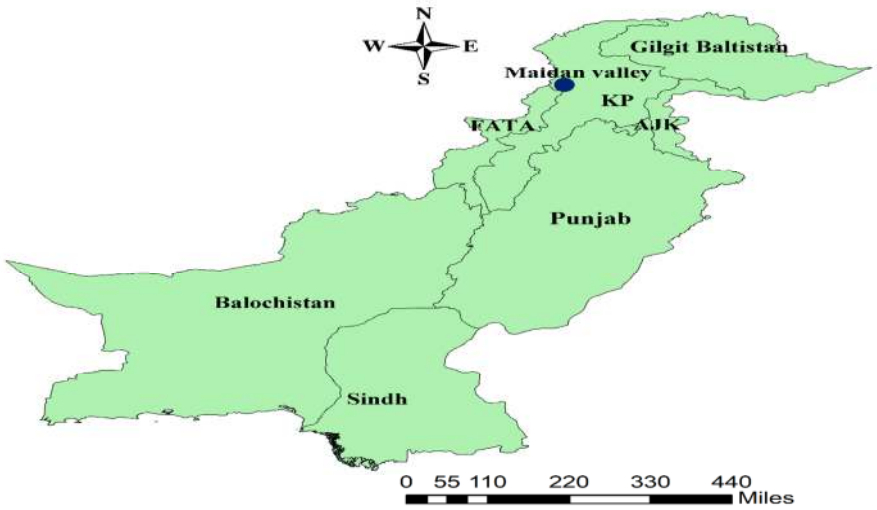

Figure 1. Map of the study area.

Ethno botanical data collection

The data were collected from traditional health practitioners and local informants from 24 various localities in six different areas i.e. Manyal, Gumabatay, Chamgey, Korshung, and Parikas (Hakim Abad) and Kumber were visited to collect the indigenous knowledge regarding the preparation of different remedies. During the field survey, large number of the informants were interviewed randomly, including educationist, different age groups, genders, experience and knowledge of the use of medicinal plants. Additionally, key informants of medicinal plants were also interviewed based on the suggestions of the local informants. The questionnaire which was used for obtaining data from local communities was comprised of two parts; (as per modification from) Croom *et al*. (1983), the first part was dealing with the demographic data of the participant and the second was related with the usage of plants for different diseases.

Plant identification and collection

During field surveys, plant specimens were collected and identified in the Herbarium of the University of Peshawar Botanical Garden (UPBG). The voucher specimens were submitted in the Herbarium of Center of Plant Biodiversity, University of Peshawar (UPBG), and Pakistan for future reference, with voucher specimen code numbers MV-01–MV-40. The plant names were confirmed with the Plant List (the plantlist.org) and Tropicos (http://www.tropicos.org/).

RESULTS AND DISCUSSION

Demographic data of informants

In the present study, 87 Number of informants were interviewed belonging to different professions (Table-1). Out of all, 80.45% were local common men while 1.5% were practitioners. Around 70.11% of the informants were men while 29.88% were women. The greater number of male informants is due to easy access to them in different places for data collection while the limited number of female informants and group discussions is due to the customs of the local community. Another reason for this difference among the local people is that females mostly manage the domestic life, whereas the males manage earning and out-door activities. It was generally noticed that old age females were very traditional and conservative in sharing their knowledge on herbal remedies while males were more involved in sharing their indigenous knowledge regarding local use of these plants. On the basis of age factor, informants were

classified into 5 different groups (Table-1). The old aged people (50-60 years) were having maximum knowledge about medicinal plants as compared to secondary age of 40-50 years. The illiterate community was found well aware about the importance and use of medicinal pant as compare to well-educated sect having recorded value of (45.97% for illiterate and 2.29% for well educated.

Table-1. Demographic data of informants in District Lpwer Dir, Pakistan.

S. No.	Variable	Categories	No. of persons	Percentage
			87	
1	Informant category	Local Hakims (Health practitioners) Local people	17 70	19.54 80.45
2	Gender	Female Male	26 61	29.88 70.11
3	Age	Less than 20 yrs. 20 to 30 yrs. 30 to 40 yrs. 40 to 50 yrs. 50 to 60 yrs. More than 60 yrs.	12 15 17 15 23 15	13.79 17.24 19.54 17.24 26.43 17.24
4	Educational background	Illiterate Completed 5 yrs. education Completed 8 yrs.' education Completed 10 yrs.' education Completed 12 yrs.' education Some under grade degree (16 yrs. education)	40 17 13 5 8 2 2	45.97 19.54 14.94 5.74 9.19 2.29 2.29
5	Experience of the local hakims (local health practitioners)	Less than 2 years 2 to 5 yrs. 5 to 10 yrs. 10 to 20 yrs. More than 20 yrs.	1 3 2 4 2	1.14 3.44 2.29 4.59 2.29

Ethno medicinal plants, preparation modes and utilization pattern

The present ethno botanical study revealed that Maidan valley local people have been using large number of medicinal plants with different formulations. A total of 40 medicinal plants were found to be used in different formulations of 81 ailments. These plant species belong to 28 families and 36 genera. These species were collected from different habitats of the District Lower Dir, Pakistanvalley (Table-1). Botanical names, voucher number, local name, plant part used bioactive compounds, respective formulations, preparation methods and modes of administrations are presented in Table-2.

Among the studied medicinal plant species 23 (57.50%) were herbs, 5 (12.50%) were shrubs and 12 (30%) were trees (Fig. 2).

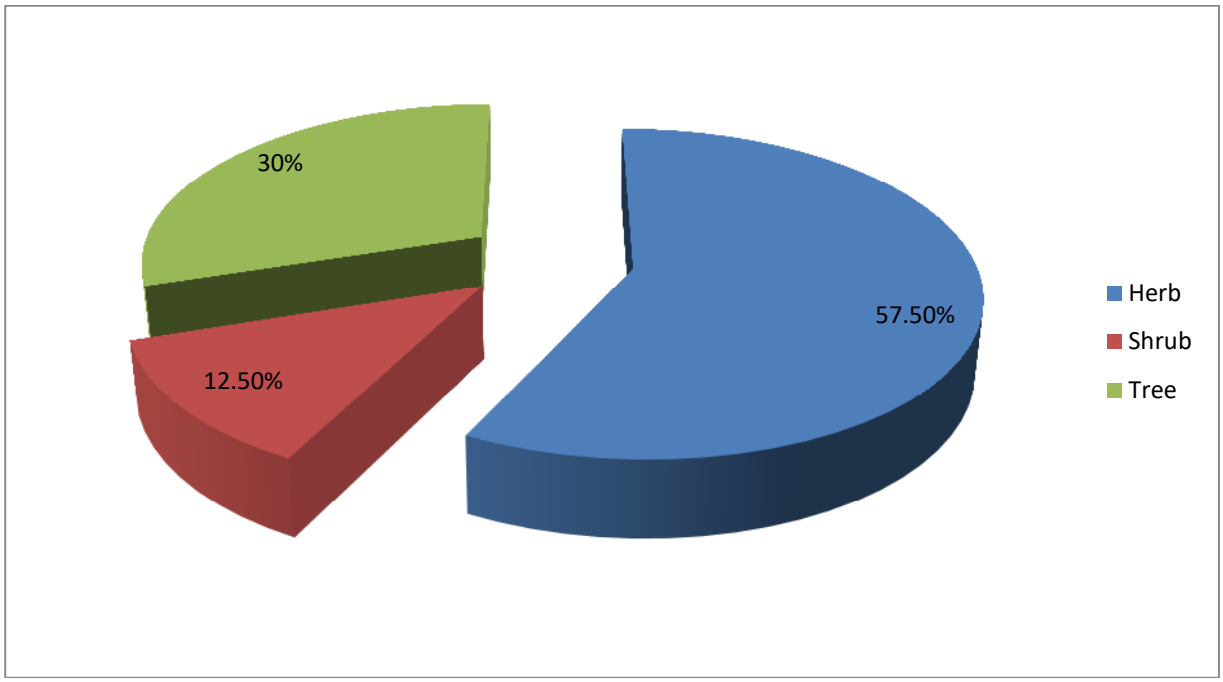

Fig. 2. Percentage of habits of ethno botanical Plants in Maidan valley, Pakistan.

For the use of particular plant parts, leaves were the most commonly used part (10/ 25%) followed by fruit (9/22.05%), seeds (6/15%), whole plant (6/15%), root (2/5%), stem (2/5%) flowers (2/5%). rhizome (1/2.5%), and bark and gum (1/2.5% each) (Fig. 3).

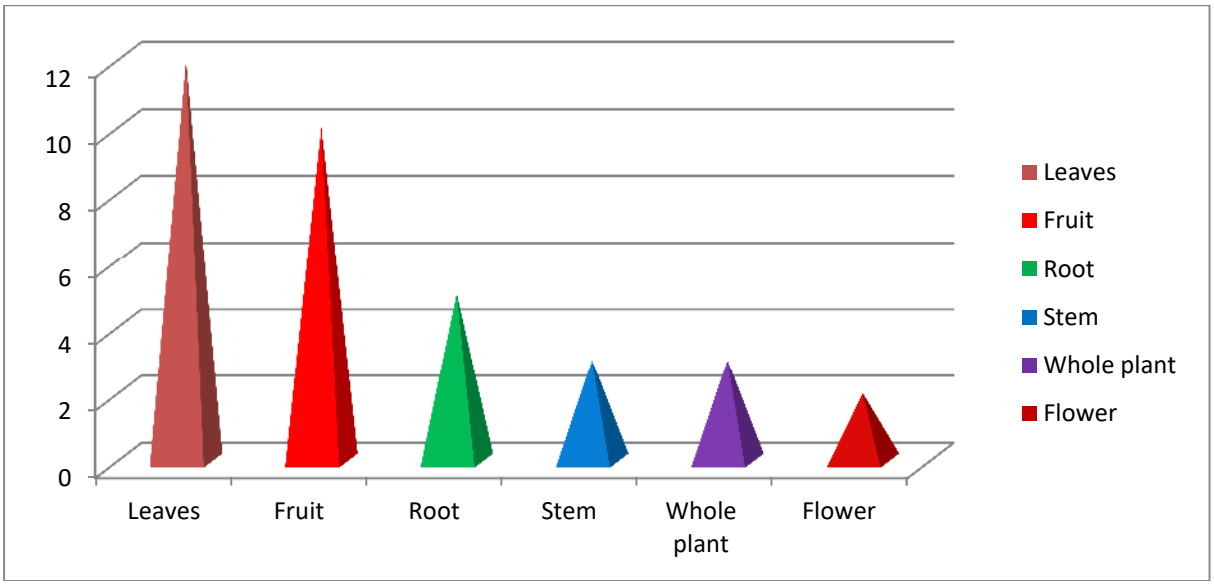

Fig. 3. Graph showing number of different Plant parts used for different Ailments.

The highest number of plants were, comprised of family Lamiaceae (4 plants); followed by Solanaceae and Rosaceae (3 species each). The most common mode of medicinal plant preparation was powder form (32.5%) followed by decoction (17.5%), juice (12.5%), syrup (12.5%), extraction (5%) and oil (5%). While in many formulations, some ingredients such as honey, halwa (a local sweet dish), water, butter and milk were used to change the taste as well as effects of these ailment preparation. The most preferred route of administration was oral followed by external application (Figure 4).

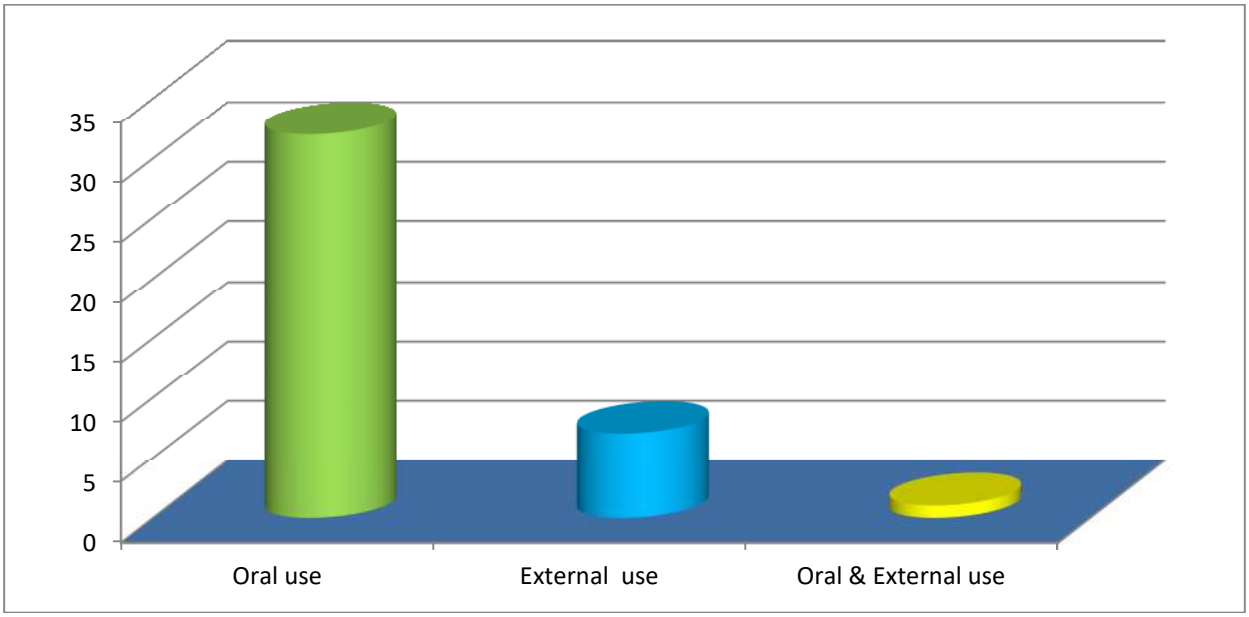

Fig. 4. Graph showing number of plants used orally, externally or both Oral & External use.

Among the eighty-one different problems, highest number of plants (07) were found to be used for curing flu and digestion, followed by (05) plants for curing muscle pain, (4) plants for cough, (3) plants for body pain and (2) plants each for curing hemorrhoids, blood purification, skin problem and dysentery (Fig. 5). The most cured diseases by the remedies revealed by local communities' were indigestion, skin disorders, body pain and flu .

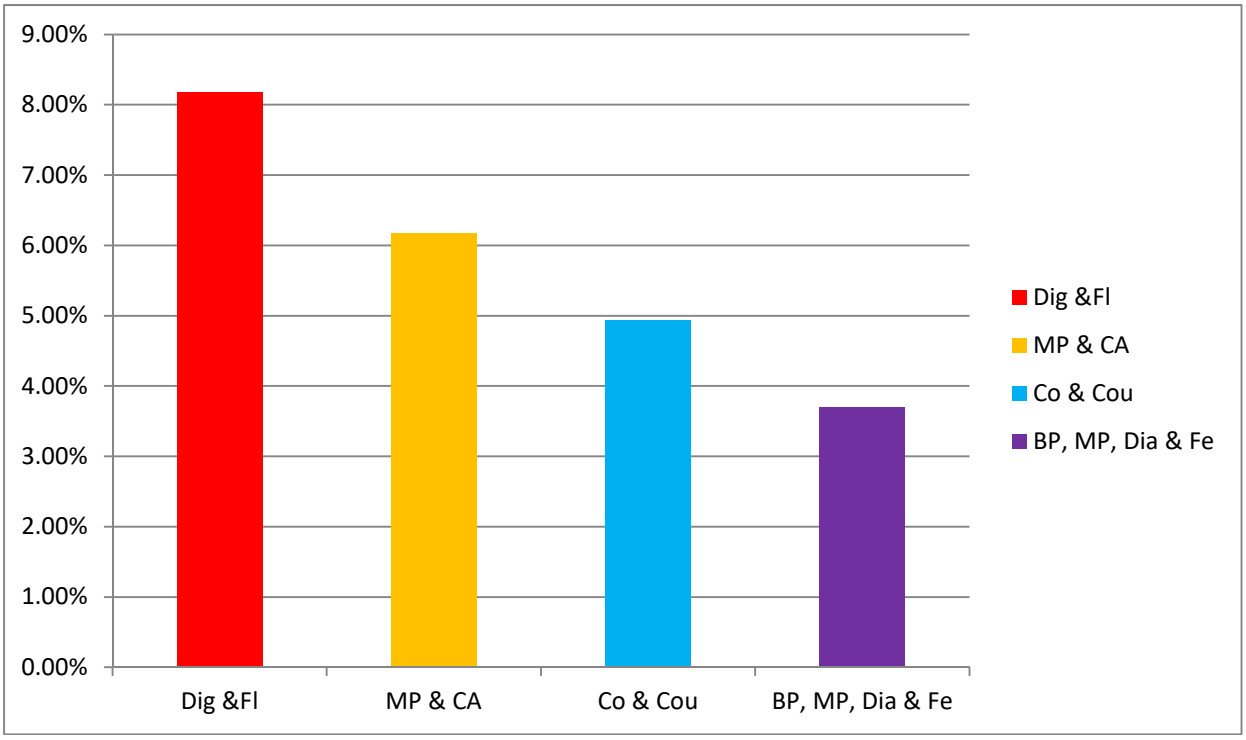

Fig. 5. Percentages of plants used for the various ailments.

Abbreviations: Dig; Digestion, Fl; Flu, MP; Mucus problem, CA; Cooling Agent, Co; Coagulant, Cou; Cough, BP; Body pain, MP, Muscle pain, Dia; Diarrhea, Fe; Fever

CONCLUSIONS

The present ethno botanical documentation provides rich indigenous knowledge of traditional medicine and ethno pharmacological potential of the various medicinal plants used by the local communities of District Lower Dir, Khyber Pakhtunkhwa. A total of 40 medicinal plant species were reported to be used against 81 different ailments. The traditional healers of the local community have marked seven plants (*Verbascum thapsus*, *Fagonia cretica*, *Fumaria indica*, *Malva sylvestris*, *Cydonia oblonga*, *Morus liboensis*, *Solanum surattense*) with high potentials for cure. The present study suggests that in remote areas the local communities even today rely on herbal medicines for curing health disorders. Ethno-botanical studies in general provide a healthy baseline for advance pharmacological research. Therefore, we recommend the important plants highlighted in the present study for phyto-medicinal research to isolate useful bioactive compounds for the synthesis of different drugs.

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Table-2. Ethno medicinal uses of plants in District Lower Dir, Khyber Pakhtunkhwa, Pakistan.
***Seasons S= summer W= winter Sp. = Spring P= perennial**

S.No.	Famil	Botanical name/Voucher number	Local. Name	Habit	Season	Habitat	Part used	Conservation status	Remedy preparation	Admin.	Dosage	Uses
1	**Acanthacea**	*Justicia adathoda* L. (MV-1)	Bekanrh	Shrub	S	Damp places	Flower	Vulnerable	Grinded fresh flower are mixed with honey and sugar	Orally	3 times a day ¼ tea spoon for children 2 tea spoon for adults	Purify blood asthma and mucus problem
2	***Amaranthace***	*Dysphania ambrosioides* (L.) Mosyakin & Clemants (MV-8)	Ganda botey	Herb, Herb	W	Common	Leaves	Vulnerable	Leaves are dried, grinded and mixed with water	Orally	1 glass adults and ½ glass for children	Aphrodisiac, Gastrointestinal problems and dysentery
3	**Apiacea**	*Foeniculum vulgare* Mill. (MV-2)	Sonf	Herb	S	Kotkay	Stem	Vulnerable	Extract is used	Orally	1 tea spoon after meal	Stomach, gas trouble and digestion
4	**Asteraec**	*Artemisia absinthium* L. (MV-3)	Tarkha	Herb	W	Barkhanay,	Leaves ,Root	Vulnerable	Dried and grinded to make powder	Orally	25-g mix with water twice a day	Typhoid & malaria
5	**Asteracea**	*Carthamus itnctorius* L. (MV-4)	Kareza	Herb	S	Navey Kaley Kotkay	Seed	Vulnerable	Powder of dried grinded seeds are used	Orally	Children 1 gram Adults 2 gram before meal	fever, muscles pain and Joints pain

6	**Boraginace**	*Cordia myxa* L. (MV-5)	Lashora	Tree	S	Taran	Fruit	Rare	Boiled in water or in tea and then taken	Orally	2 times a day Only for adults half tea spoon in half glass	Muscle and mucus problem stomachache
7	**Brassicacea**	*Nasturtium officianale* R. Br. (MV-6)	Tarmera	Herb	W	Rivers, wetland standing water	Leaves Stem	Vulnerable	Leaves are dried, grinded and powder is used	Orally	Use 20 g for adults and 10 g for children. Juice ½ teaspoon for infants and 3 teaspoon for adults	Digestion and chest pain
8	**Berberidace**	*Berberis lycium* Royle. (MV-7)	Kwarey	Shrub	S	Mornh & Nowsere y hills	Root bark	Vulnerable	Grinded root bark mixed with water and then filter it to make syrup	Orally	2 times a day morning and evening daily. Only for adults 1 tea spoon in a glass	Blood purification kidney problem and cooling agent
9	***Cucurbitace***	*Citrullus colocynthis* (L.) Schrad (MV-9)	Kalkunday	Herb	S	Fields	Fruit	Vulnerable	Cut fruit	Extern ally	Only for adults As much as you feel acidity upto your abdomen	Hemorrhoids
10	**Euphorbiaceae**	*Mallotus philippensis* (Lam.) Muell. Arg. (MV-10)	Kambela	Tree	S	Hilly areas	Whole plant	Rare	Sulphur, kala zera neela thotha and kambela ground it to make powder and then mix it with mustard oil Make juice and use it with the help of cotton.	Extern ally	1 time a day before sleeping Put soak cotton until one feel relax.	Skin problem and eczema

11	**Euphorbiacea**	*Riccinus communis* L. (MV-11)	Harhanda	Shrub	P	Kotkay dairi river	Fruit	Vulnerable	Inner side of Riccinus seed to be filled in capsule.	Extern ally	One capsule for one year sterility 2 capsule for 2 year sterality and so on.	Any type of sting Sterality.
12	**Fumariacea**	*Fumaria indica* (Hausskn.) Pugsaley (MV-12)	Shahtara	Herb	S	Fields	Whole plant	Vulnerable	Boil it in water to make a syrup	Orally	2 tea spoon for adults ½ tea spoon for children 2 times a day	Flu and fever
13	**Gereniacea**	*Geranium wallichianu m* D. Don (MV-13)	Sra zela	Herb	S	Hilly areas	Root	Rare	Ground it to make powder and then eat it with milk	Orally	Small amount 2 times a day	Back ache
14	**Lamiaceae**	*Mentha longifolia* (L.) L. (MV-14)	Wenaley	Herb	S	Hayaser ai river	Laeves	Vulnerable	Grinded fruit for diarrhea, roots are dried and grinded, wheat size tablets areprepared and used in urine problem .	Orally	Adults 1 g ½ g for children	Diarrhoea dysentry and digestion,
15	**Lamiacea**	*Mentha spic ata* L. (MV-15)	Podina	Herb	Sp	Commo n Cultivat ed	Roots	Vulnerable	Juice/powder mixed in curd or water, it is filtered and taken	Orally	1 glass in curd or 1 full palm with water	Body heat, openly fort, digestion Urea problem,
16	**Lamiacea**	*Ocimum basilicum* L. (MV-16)	Kashmaley	Herb	W	Bandaga i,	Leaves	Vulnerable	Make a man happy after smelling it and extract oil from seed	Orally Extern ally	2 tea spoon Oil is used once dailymix with any other edible item	Digestion and pleasant smell make a man happy

17	**Lamiaceae**	*Salvia moocroftiana* Wall. ex Benth. (MV-17)	Kharghwag	Herb	W	Doba mountain	Flower seed, Roots	Vulnerable	Grounded and mixed with water and taken	Orally	1 Glass only for adults before going to bed.	Pneumonia and muscle pain
18	**Malvacea**	*Malva sylvestris* L. (MV-18)	Panerak	Herb	S	Gumbati	Seeds	Vulnerable	Boil its seed in water and then drink	Orally	2 times a day 2 g for adults 1 g for children	Coolent, flu and cough, Diarrhea.
19	**Meliacea**	*Melia azedirach* L. (MV-19)	Toora shandey	Tree	S	Hayaseray	Seeds	Vulnerable	The seeds are grounded powder is prepared	Orally	Use only for adults 350 mg to 1 g	Hemarrhoides
20	***Mimosace***	*Acacia modesta* Wall. (MV-20)	Palusa	Tree	S	Islam Dara	Acasia gum	Vulnerable	Dried, Grinded with *Berberis,paevoniaRubenia* gum	Orally	2 time a day mixed with milk, only for adults	Increase sexuality, body and muscle pain
21	**Moraecae**	*Morus macroura* Miq. (MV-21)	Shah tooth	Tree	S	Dabonu hills	Fruit	Infrequent	Juice is extracted from its fruit and mixed with water and the filtrate is taken	Orally	2 tea spoon for adults 1 tea spoon for children 2 times a day	Flu, cough and fever
22	**Moraeca**	*Morus nigra* L. (MV-22)	Toor tooth	Tree	S	Korshung	Fruit	Vulnerable	Boiled in water to make syrup mix with sugar or honey	Orally	2 tea spoon for adults 1 tea spoon for children	Chest dieases mucus and cough
23	**Nyctaginace**	*Mirabillus jalapa* L. (MV-23)	Gul abbasi	Herb	P	Cultivated	Leaves	Vulnerable	Fix it with effected place with the help of bandage	Orally	Leaves are used both for children and adults, When abscess is released then remove it	Abscess

24	**Oleaeace**	*Olea ferruginea* Wall. ex Aitch. (MV-24)	Khoona	Tree	W	Graveyards	Fruit	Vulnerable	Extract oil	Externally/ Orally	Before sleeping 3 g for adults and ½ g for children and for massage use as needed	Use for facial, massage for pain, skin problems and body pain
25	**Paevoniace**	*Paeonia emodi* Wall. ex Royle . (MV-25)	Mamekh	Herb	S	Kalpanrey	Rhizome	Infrequent	Ground its rhizome and make powder	Orally	7 g for adults 3 g for child Mix with milk 2 times a day	Body pain
26	Fabaceae	*Melilotus indica* (L.) Ali (MV-26)	Malkhwazey	Herb	S	Fields	Seed	Infrequent	Ground it and mix it with halwa	Orally	According to your desire	Bone pain
27	**Polygonacea**	*Rumex hastatus* D. Don (MV-27)	Tarookey	Herb	S	Mountainous areas	Leaves	Vulnerable	Juice and burn its leaves Use its leaves fresh for coagulation	Orally Externally	Use 1 glass every day for kidney wash and use 1 eaves ash with water for acidity	Urinary problems, stomach acidity also as coagulant
28	**Rosaceae**	*Cydonia oblonga* Mill. (MV-28)	Booyey	Tree	S	Plain fields	Fruit	Rare	Dried its fruit and then mixed it with green tea when a mucus is extracted tea then remove fruit and drink it	Orally	1 time a day Both for children and adults	Throught problem Flu and cough
29	**Rosacea**	*Prunus domestica* L. (MV-29)	Aalocha	Tree	Sp	Nambatai	Fruit	Vulnerable	Boil it in water and then mixed with sugar or honey	Orally	1 tea spoon 2 times a day ¼ tea spoon for children	Cardiotonic, brain en powerment and cooling

30	**Rosacea**	*Rosa indica* Lindl. (MV-30)	Gulab	shrub	Sp	Common	Flower	Vulnerable	Sugar or honey mixed with fresh petals	Orally	10 g for adults 5 g for child	Glucose level, appetite, digestion and diarrhea
31	**Rutacea**	*Zanthoxylum armatum* Dc. (MV-31)	Dambara	Shrub	W	Sar larha and Nambat ai hills	Fruit leaves and bark	Vulnerable	Dried, Grind to powder, and stick any part of plant body outside tooth	Orally	1 g for children 3 g for adults 1 time a day	Tooth ache power and digestion
32	**Salicace**	*Salix babylonica* L. (MV-32)	Walla	Tree	S	River sides	Leaves	Vulnerable	Leaves extraction is filtered	Externally	2 or 3 drops two times a day both for adults and children	Ear ache,
33	**Salicace**	*Salix tetrasperma* Roxb. (MV-33)	Khrawala	Tree	P	Common	Leaves	Vulnerable	Leaves are boiled and extraction is used	Orally	2 drops three times a day	Diarrhoea and dysentery
34	**Scrophularia**	*Verbascum thapsus* L. (MV-34)	Jungali tambaco	Herb	S	Fields terraces	Leaves	Vulnerable	Dried, grinded to make powder put in cigarette	Orally	Make full cigarette	Flu and throat problems
35	**Solanaceae**	*Datura stramonium* L. (MV-35)	Baatora,	Herb	S	Kumber	Seeds	Vulnerable	Ground the seeds and mixed it with 'majoon'	Orally	Two 8 gram 2 times a day before meal only for adults	Muscle pain
36	**Solanace**	*Solanum americanum* Mill. (MV-36)	Karmachoo	Herb	S	Plani field	Leaves	Vulnerable	Grind and make powder mixed with water	Orally	1 gram for children 3 g for adults	Edema and Hepattitis, colitis

37	**Solanace**	*Solanum surattense* Burm. f. (MV-37)	Maraghoney	Herb	S	Field	Fruit	Vulnerable	Cut it fruit and smell it	Externally	Smell it until you feel better only for adults	Open flu
38	**Utricaceae**	*Debregeasia saeneb* (Forssk.) Hepper & J.R.I. Wood (MV-38)	Kharawa	Tree	Sp	Nagotal nalla	Leaves	Vulnerable	Dried and make a powder	Orally	3 times a day 5 g for adults 2 g for children	Worms
39	**Zygophiylace**	*Fagonia indica* Burm .f. (MV-39)	Azghakey	Herb	Sum	Navey dand	Stem	Vulnerable	*Viola, Zizyphus and Asparagus* boiled in water to make syrup mixed sugar with it	Orally	2 tea spoon for adults and ½ tea spoon for children,	Flu
40	**Zygophylac**	*Tribulis terrestris* L. (MV-40)	Malkunday	Herb	S	Kwaro bagh Dokhrai	Seeds	Vulnerable	Dried and grinded to make powder mix with water	Orally	Child 1, 1/4 gram and Adult 3 g	Diuretic and urine burning