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Abstract

In this research study, we have scientifically assessed medicinal species and herbal preparations used by inhabitants of Northern Pakistan to treat joint pain, hypertension, skin diseases and glottis infections. The aim of the study is to document and highlight the ethnopharmacological significance and compare the uses of medicinal herbs for curing prevalent ailments in Northern Pakistan. Ethnomedicinal data were collected from 180 informants using semi-structured interviews and group meetings. A total of 80 plant species in 54 families were reported for the treatment of various health conditions. *Heliotropium lasiocarpum*, *Geranium wallichianum*, *Parkinsonia aculeata*, *Rubia cordifolia* and *Salvadora persica* were the favored plants for curing these diseases. Highest RFC was recorded for *Neolitsea chinensis* (0.956), *Rubia cordifolia* (0.928). The similarity of the informer’s knowledge about used medicines was found in *Aesculus indica* and *Abies pindrow* with high UV. *Cuscuta reflexa* and *Lawsonia inermis* had 98–99% fidelity level for management of joint pain, skin diseases, glottis infection and hypertension respectively. In Northern Pakistan, a rich diversity of medicinal plants was used in curing various diseases. The results of this study help us in screening of herbal plants for further phytochemical and pharmacological study which leads to discovery of natural drug and development with global interest for cure of various ailments.

Keywords: herbaceous diversity, ethnomedicinal, diseases, Northern Pakistan, herbal preparation, frequency of citation

1. Introduction

1.1 Ethnobotany: concept and significance

Ethnomedicinal literature put emphasis on the relation between the indigenous communities and the usage of plants [1]. Plants are important for all biomes and the working of all social societies [2]. Traditional herbal drugs have been effective as a remedy for wide variety of diseases [3]. Traditional medicinal species and plant derivative treatments are extensively utilized in old medicinal systems worldwide,
and the therapeutic use of plant species is becoming gradually popular in modern society as natural alternatives to synthetic medications [4]. Ethnomedicinal assessment of medicinal species is essential for preserving security and valuable for incipient plant medicines [5]. Many people of the rural areas retain indigenous knowledge of therapeutic plant species [6] and such plant material still exists because it is transferred from generation to generation [7]. Thus, the race of human generally relies on plant species and their needs are increasing with passage of time [8].

1.2 Medicinal plants used at global level

The usage of medicinal plant species is common, as they have little side effects, less price, easily accessible, consistent by numerous beliefs and traditional performs [9]. Native utilization of medicinal species becomes unavoidable in giving as a source of food and drugs for health care for the rural communities and low income class. The ethnic system of old herbal drugs rely on the utilization of medicinal flora by the people of native populations and has been experienced for spans [10]. These medicinal plants were commonly used by local inhabitants and were of great value so that lot of people was engaged in the trade of essential medicinal species throughout the world [11]. Medicinal herbs gained attention due to elevation in prices of allopathic drugs for the wellbeing, biomedical benefits and accessibility and maintenance of personal health, [12]. So, conservation and sustainability of traditional medicinal system is needed [13].

World Health Organization (WHO) stated that, in developing nations around 80% of the population of the world dependent on indigenous herbal drugs (THD) for treating various diseases. Internationally, 422,000 flowering species are stated [10]. Out of these, around 50,000 plant species are used as medicinal plants and only 5000 species have separated phytochemically to examine their active chemical compounds [14]. In developed nations, 25% of medications are based on plant species and their derivatives [14]. Consequently pharmaceutical companies have made a huge amount of clinical agents, still traditional knowledge of herbal medications and phytotherapies are running in different areas of the globe. The importance of the indigenous traditional medicinal system was highlighted by the WHO that the most of population the rural communities of the emerging states is still relies on the medications for healthcare [15].

Pakistan has about 6000 medicinal plant species out of which 600 are considered to be significant from medicinal point of view [16]. These medicinal herbs are recommended by the local healers, akhuns and hakims who give health care tips within the rural areas. Around 80% of the rural people of Pakistan depend on Unani medicinal system, derived from medicinal species directly or their products [17].

The rich biodiversity of Pakistan has nine major ecological amplitudes in which the areas of Northern Pakistan are blessed with a unique biodiversity [4]. Variety of economically essential medicinal plant species for indigenous communities is fairly rich in Northern Pakistan [18]. Therapeutic species have remained utilized as a base of herbal medicinal treatment since human civilization in these areas [19]. Because of diverse climatic conditions and unique phytogeography, the area has a high variety of aromatic and medicinal plant species [20]. People living in hilly areas of Pakistan utilized medicinal species for numerous diseases and they also reliant on herbal products for their shelter, fuel, food, health, and further needs [21]. Field of ethnobotany has been presented currently in Pakistan in comparison to other nations however in the recent era much effort was performed in this research study by several scientists in various regions of country [17, 19, 22–33]. Although, a lot of work has been done on medicinal species in several areas in Pakistan, yet, no study
has been carried out on areas of Northern Pakistan in relation to special emphasis on hypertension diseases, skin infections, glottis problems and musculoskeletal disorders. Further, this is the first ever report on these prevalent disorders from Northern Pakistan.

1.3 Objectives

This study has been planned with the objective to document the folkloric knowledge of commonly used therapeutic species from different regions of Northern Pakistan, to save the medicinal knowledge. The current work focused to quantitatively calculate consensus of plants usage for treatment of diseases. This study also aims to form a baseline data for future comprehensive research on bioactive constituents.

2. Methodology

2.1 Study sites

The Northern part of Pakistan in Western Himalayas is situated among world’s largest peaks and high heaps i.e., Himalaya ranges, Alai Ranges, Karakorum, Kunlun, Tien Shan and Hindu Kush [34]. The Himalaya ranges have of world largest peak i.e. Mount Everest and K2 present in this range and the lesser Himalayas Mountains are located on 2000–3000 m elevation. Its topography diverges from desiccated rocky areas in north to forest and green plains in the south. Northern part of Pakistan has rich floral variety particularly of therapeutic plant species [35]. The areas included in the research work were Bannu, Swat, Mahnshera, Dir, Abbottabad, Naran, Khaghan, Hazara division, and other tribal areas of northern parts (Figure 1). It is located at 72°35- to 73°31- east latitude and 33°50- to 34°23- north latitudes. It shares border with FATA (Federal Administered Tribal Areas) in the Western South part, in Northern side Azad Jammu and Kashmir, Gilgit Baltistan in north east while the Punjab in south east. Northern areas of Pakistan are home of the largest peaks these covers 72,496 km$^2$. Mean lowest temperature in January was documented to be 1.7°C, while average highest temperature to be 32.41°C in June. These Northern areas have also very severe winter with heavy rainfall [33]. The chief tribes of the area are Marwat, Shinwari, Afridi, Mohmand, Abbassies, Tareen, Khattak, Mashwani, Jadoon, Tanolis, Awans, Yusufzai, Sardars, Qureshis and

![Dominant families of medicinal plants.](image-url)
Orakzai [30]. Majority of people speaks Pushto other local languages are Potohari, Gujrati and Hindko.

2.2 Ethnobotanical data collection

This work was mainly focused on communities exploiting conventional plant resources for treatment of hypertension, glottis disorders, skin infection, joint pain and throat diseases. The people living in Northern Pakistan have information on the usage of natural resources. The field work was performed for 6 months (from March to September, 2016). Semi-structured interviews were taken from 180 informants having traditional curing methods against variety of ailments after receiving their prior consent. The data about medicinal uses of these plants was collected from local informers and healers and medicinal practionists. Questionnaire forms was comprised of two sections; first section involves the demographic information of participants and the other section contains data about plants vernacular name, part used and mode of administration used against these diseases. Further evaluation of data obtained during field study was done by using quantitative indices.

2.3 Plant collection and preservation

The medicinal plants exploited for different ailments in the Northern Pakistan were first collected and vouchers were constituted for identification at Herbarium of Quaid -i- Azam University Islamabad Pakistan (ISL). Correct scientific families and names were confirmed by database of KEW medicinal plant name services (mpns: http://www.kew.org/mpns) and flora of Pakistan [36]. Each plant sample contains vital parts such as stems, seeds, roots, bark, fruits, flowers and leaves, whole plants was generally collected for small herbaceous plant specimen.

2.4 Quantitative analysis of ethnobotanical data

2.4.1 Use value citations (UV)

UV was assessed by means of standard procedure of [24].

\[ UV = \frac{u}{n} \]  

(1)

“u” denoted the total respondent citing different usages of a medicinal species. Use value is usually larger at close to (1) incase numeral of usage is higher and UV of plant noticeably lowers if it is close to (0). Use values do not deliver data for only one or numerous uses of plants.

2.4.2 Relative frequency of citation (RFC)

The computation of RFC was done by using formula:

\[ RFC = \frac{Fc}{N} \]  

(2)

The number of respondents stated by “Fc” that specified about therapeutic use related to herbal medicinal plants whereas “N” stands for numeral total value related to the respondents [37–39].
2.4.3 Family importance value (FIV)

FIV of the plant species being evaluated by using formula as under [40].

\[ \text{FIV} = \frac{F_c}{N} \times 100 \]  

(3)

where “Fc” is the numeral value of respondents stating the use of the family and N denotes to the total numeral value of respondents contributing in the research work.

2.4.4 Fidelity level (FL)

FL is measured by following formula:

\[ \text{FL} \% (\text{FL}) = \frac{N_p}{N} \times 100 \]  

(4)

where “Np” is the numeral value of participants who defined medicinal plants as a remedy for particular ailments while “N” is the total number of informants [41].

3. Results and discussion

3.1 Socio-demographic profile of informants

Demographic information of the participants was taken from semi structured questionnaires. A total of 180 respondents were questioned in this field survey. Of the 180 informants, 113 were Indigenous people and the rest (67) were local health practitioners, rest of all information is stated in (Table 1).

3.2 Medicinal plant diversity

Present research stated 80 medicinal plants used to treat some prevalent diseases in Northern Pakistan (Table 2). These medicinal plants were distributed in 54 families. They show diversity in growth and presented by all growth forms with high proportion of herbs (54%), shrubs (30%) and trees (16%) (Table 3). The main cause for herbs dominancy in the research area may be the easily accessibility resultant from bulk growing in wild area. The native respondent described that most of the hakims and healers commonly use herbs for treatment of ailments because of their easy attainability and availability.

The recorded medicinal species and medicinal uses along with local name, part used, preparations and mode of utilization had been documented in Table 2. The plant family that have higher number of medicinal specie was Lamiaceae (7 species) followed by (4 species) of Papaveraceae, (3 species) of Malvaceae, Apiaceae, Asteraceae and Brassicaceae, (2 species) Acanthaceae, Pinaceae, Myrtaceae, Rubiaceae, Lythraceae, Plantaginaceae, Cactaceae and Capparaceae, (1 species) Ranunculaceae, Berberidaceae, Saxifragaceae, Umbelliferae, Moraceae, Papilionaceae, Poaceae, Oleaceae, Fabaceae, Salvadoraceae, Solanaceae, Rutaceae, Meliaceae and rest of the families presented one medicinal plant (Figure 1). Lamiaceae documented higher diversity of medicinal species followed by Asteraceae and Solanaceae; Lamiaceae also indicated greater diversity of medicinal flora plants [42]. Lamiaceae a diverse family with mostly herbaceous plants producing volatile aroma over all aerial parts, has been described as dominant plant family by [43]. In ethnobotanical studies of lesser Himalayas the high percentage of medicinal
plants in the families’ Papaveraceae, Moraceae and Fabaceae has previously been stated by [44].

3.3 Plant parts used as a medicine

In this ethnobotanical study, the part of plant most frequently utilized is was leaves (41%), and seeds and roots (10%) (Table 4). Leaves were used as main part of plant, it has been stated within different ethnomedicinal research of Thailand, India, Bangladesh, Colombia, Pakistan, and China [45–51]. Leaves are the dominantly used plant part because it is easily attainable plant part and requires small effort to collect as compared to other plant parts [43]. Moreover, other important fact of leave utilization is important for conservation and maintenances of plant because collection of other plant parts and roots may kill the plant or endangered the specie [52]. Bulk use of whole plant, fruits, seeds, roots and bark in herbal medicinal preparations may results in decreasing population of plants in nature [53].

While fruits (9%), whole plant (7%), stem and aerial part (6%), bark (4%), flower (3%), shoots and rhizomes (2%) were also frequently used (Table 4). Fruits,
| Sr. no | Taxonomic names/voucher no/families | Local name | Life form | Part used | Mode of utilization | Diseases category | Recipes | FC | RFC | UR | UV | FL |
|-------|-----------------------------------|------------|-----------|-----------|-------------------|------------------|---------|----|-----|----|----|-----|
| 1.    | *Abelmoschus esculentus* (L.) Moench KN 1011/Malvaceae | Bindi | Herbs | Seed | Teas | Pimple | Plants seeds are boil in water and make tea which is usage in treatment of pimples for 2 weeks | 25 | 0.139 | 1 | 0.040 | 80.00 |
| 2.    | *Abies pindrow* (Royle ex D. Don) Royle KN 1015/Pinaceae | Kachal/Achal | Trees | Leave and shoot | Decoctions | Throat and cough infection | Leave decoction of are given for 3–4 weeks for treatment of throat diseases | 28 | 0.156 | 2 | 0.071 | 78.57 |
| 3.    | *Achyranthes aspera* L. KN 1017/Amaranthaceae | Put kandha | Herbs | Leave | Juices | Rheumatism | The 20 g fresh leave juice is used for treatment of rheumatism after every meal for month | 18 | 0.100 | 1 | 0.056 | 55.56 |
| 4.    | *Aconitum chasmanthum* Stapf ex Holmes KN 1019/Ranunculaceae | Mori, Bishmoulo | Herbs | Rhizome | Decoctions | Measles and mumps | The rhizomes of the plant is boiled in water and decoction is made, are given for weeks to cure diseases | 42 | 0.233 | 2 | 0.048 | 76.19 |
| 5.    | *Acorus calamus* Linn KN 1010/Acoraceae | Wajh | Herbs | Root | Infusions | Hypertension | 20-30 g of root infusion are given to relief hypertension until it is controlled | 110 | 0.611 | 1 | 0.009 | 92.73 |
| 6.    | *Adiantum venustum* D. Don KN 1013/Pteridaceae | Pata, kakwa | Herbs | Leave | Paste | Healing of wound | The 50 g of leaves are dried and make paste for healing wounds | 144 | 0.800 | 1 | 0.007 | 84.72 |
| 7.    | *Asclepias indica* (Wall. ex Cambess.) Hook. OP KN 1014/Hippocastanaceae | Bankh khore | Trees | Leave | Extracts | Whooping and cough | Leaves extract are used to treat whooping and cough | 22 | 0.122 | 2 | 0.091 | 81.82 |
| 8.    | *Ajuga bracteosa* Benth. AK KN 1017/Lamiaceae | Kahri bhooti | Herbs | Whole plants | Decoction and infusion | Rheumatism and body pain | 20 g of whole plant is boiled in water and decoction is made this is given to treat body pain | 10 | 0.056 | 2 | 0.200 | 80.00 |
| 9.    | *Argemone mexicana* Linn KN 1019/Papaveraceae | Kandiarhi | Herbs | Aerial part | Decoction and infusion | Dislocate pain and joint pain | Infusion and decoction of aerial part of plant is suggested for 5 days | 48 | 0.267 | 2 | 0.042 | 70.83 |
| 10.   | *Barleria cristata* L. KN 1020/Acanthaceae | Jangli pool | Shrubs | Roots and stem | Poultices | Rheumatic pain | 25 g of stem and roots are powdered and mix with water and make paste that is used as poultice to treat rheumatism | 62 | 0.344 | 1 | 0.016 | 85.48 |
| Sr. no | Taxonomic names/voucher no/families | Local name | Life form | Part used | Mode of utilization | Diseases category | Recipes | FC | RFC | UC | UV | FL |
|-------|------------------------------------|------------|-----------|-----------|-------------------|-----------------|---------|----|-----|----|----|----|
| 11    | *Begonia reniformis* Bedd. KN 1021/Begoniaceae | Shrubs     | Flower    | Infusions | Hypertension      | Infusion of dry flower is taken to relieve hypertension | 20      | 0.111 | 1   | 0.050 | 65.00 |
| 12    | *Berberis lycium* Royle KN 1024/ Berberidaceae | ZiarLargay | Shrubs    | Decoction s | Sore throat and throat infection & cough | 2 cups of decoction is taken twice a day for a week for curing throat infections | 36      | 0.200 | 2   | 0.056 | 69.44 |
| 13    | *Bergenia ciliata* (Haw.) & Sternb KN 1026/Saxifragaceae | Batweyaha  | Herbs    | Paste     | Wound healing     | Paste of Bark is used to heal up wounds | 16      | 0.089 | 1   | 0.063 | 75.00 |
| 14    | *Bryophyllum pinnatum* (Lam.) Oken KN 1027/Crasulaceae | Zakam e Hayhat | Herbs | Leave | Decoction s | Hypertension | 15 g of leaves are boiled in water and decoction is made, 1 cup of decoction is used once a day for hypertension | 33      | 0.183 | 1   | 0.030 | 90.91 |
| 15    | *Buxus papillosa* KN 1028/ Buxaceae | Angaroo    | Shrubs    | Oils      | Skin problem      | Oil of leaves are applied on skin to treat skin problem | 22      | 0.122 | 1   | 0.045 | 86.36 |
| 16    | *Camellia sinensis* (L.) Kuntze KN 1029/Camelliaceae | Chaieh    | Shrubs    | Teas      | Throat infection and cough | 50 g of leaves are boiled in water to make tea which is used for 2 weeks for cough and throat infections | 32      | 0.178 | 2   | 0.063 | 90.63 |
| 17    | *Capparis decidua* (Forssk.) Edgew. KN 1030/Capparaceae | Keehra    | Trees     | Decoctions | Healing of wound | Seeds decoction used 3 cups daily for treatment of disease | 21      | 0.117 | 1   | 0.048 | 71.43 |
| 18    | *Capparis spinosa* L. KN 1032/ Capparaceae | Kabhar    | Shrubs    | Powders   | Hypertension | Powder of the seeds is taken with water 3 times a day to cure hypertension | 56      | 0.311 | 1   | 0.018 | 60.71 |
| 19    | *Commelina diffusa* Burm. f KN 1034/Commelinaeae | Herbs     | Whole plants | Juices   | Hypertension | 30–35 g of whole plants are crushed to attain juice which is better for hypertension for 3 weeks | 62      | 0.344 | 1   | 0.016 | 79.03 |
| 20    | *Commiphora rockii* (Engl.). KN 1036/Burseraceae | Chandru   | Shrubs | Leave and root | Paste and Poultice | Backache Joint pain and bone fracture | Leaves paste and poultice are applied on joints for treatment of rheumatic disorders until its cure | 76      | 0.422 | 3   | 0.039 | 88.16 |
| 21    | *Cuminum cyminum* L. KN 1038/ Apiaceae | Zhira     | Herbs    | Infusions | Cough | 80 g of fruits of the plants are dipped whole night in water and make infusion given twice a day for 2 weeks | 40      | 0.222 | 1   | 0.025 | 55.00 |
| Sr. no. | Taxonomic names/voucher no/families | Local name | Life form | Part used | Mode of utilization | Diseases category | Recipes |
|--------|-----------------------------------|------------|-----------|-----------|---------------------|------------------|---------|
| 22.    | *Cuscuta reflexa* Roxb KN 1040/ Convolvulaceae | Aftimhoon | Herbs | Leave | Decoctions | Hypertension | 10-20 g of leave decoction is used for hypertension for 3 weeks |
| 23.    | *Daphne mucronata* Royle. KN 1042/Thymelaeaceae | Daphnee plants | Shrubs | Leave bark & aerial part | Decoctions cooked and Powders | Rheumatism | Powder of aerial parts and bark is taken after each meal for treatment of rheumatic disorders. Leaves are dried mix with water and taken for 4-5 days. Aerial parts are cooked and used for cure of diseases |
| 24.    | *Descurainia sophia* (L.) Webb ex Prantl KN 1043/Brassicaceae | Burriborby | Herbs | Whole plants | Decoctions | Cough and throat infection | 30 g of leave decoctions is used for 2 weeks to cure throat infection |
| 25.    | *Equisetum arvense* L. KN 1045/ Equisetaceae | Jambhoo | Herbs | Aerial parts & Stem | Extracts | Hypertension | 70 g of aerial parts are required for extraction that is used for hypertension for 20 days |
| 26.    | *Eruca sativa* (L.) Cav. KN 1048/ Brassicaceae | Shahtaraha | Herbs | Shoot & seed | Pastes and decoctions | Rheumatic disorders | 2 cups of hot water is taken and add 2 teaspoons of grinded plant mixed well and used thrice a day for treatment. Seeds paste is used for Rheumatism |
| 27.    | *Eucalyptus globulus* Labill. KN 1049/Myrtaceae | Lachi, Suflaida | Trees | Leaf & Stem | Decoctions | Sore throat | 25 g of eaves decoction is used twice a day after every meal |
| 28.    | *Euphorbia helioscopia* L. KN 1051/Euphorbiaceae | Catt milk | Herbs | Leaf | Powder | Healing of wounds | Dried 40 g of leaves are powdered and mix with water and taken orally for 4–5 days |
| 29.    | *Ferula asafoetida* L. KN 1053/ Umbelliferae | Hinhg | Herbs | Rhizomes | Decoction s | Coughs | A rhizomes of the plant is boiled in water and decoction is made taken 2 cups daily for cough |
| 30.    | *Ficus virgata* Reinw. ex Blume KN 1055/Moraceae | Anjheer Zardh | Trees | Fruit | Raw | Hypertension | Fruits are eaten orally for treatment of diseases |
| 31.    | *Punarnia officinalis* L.KN 1057/ Papaveraceae | Shahtaraha | Herbs | Aerial part | Juices and Extracts | Hypertension | 45 g of dried leaves are used for making decoction and juice. 1 cup is used for hypertension |
| Sr. no | Taxonomic names/voucher no/families | Local name | Life form | Part used | Mode of utilization | Diseases category | Recipes | FC | RFC | UR | UV | FL |
|-------|-----------------------------------|------------|-----------|----------|--------------------|------------------|---------|----|-----|----|----|----|
| 32.   | Galium abausense Borbás KN 1058/Rubiaceae | Khrrhatanii | Herbs     | Leave    | Poultices          | Wound healing and skin problem | Poultice of leaves is applied on wounds | 17   | 0.094 | 4   | 0.235 | 52.94 |
| 33.   | Geranium wallichianum D. Don ex sweet KN 1059/Geraniaceae | Malhathii | Herbs     | Root     | Extracts           | Hypertension      | 50 ml of extract of 80 g of dried roots is used for hypertension | 150  | 0.833 | 1   | 0.007  | 92.00 |
| 34.   | Glycyrrhiza glabra L. KN 1060/ Papilionaceae | Tamhar     | Shrubs    | Leave and bark | Decoctions and powders | Rheumatism and bone dislocation | Paste of leaves are apply on bones & plant decoction are used for treatment of diseases | 99   | 0.550 | 2   | 0.020 | 76.77 |
| 35.   | Gymnosporia senegalensis (Lam.) Loes.KN 1064/Celastraceae | Chulai     | Herbs     | Whole root | Decoctions         | Hypertension      | Decoctions of roots and leaves are used for cure of hypertension | 73   | 0.406 | 1   | 0.014 | 93.15 |
| 36.   | Heliotropium laxicarpum Fisch KN 1067/Boraginaceae | Kadupanhra | Herbs     | Whole plants | Decoctions         | Hypertension      | 35 g of whole plant is boiled in water and decoction is made that is used for hypertension | 135  | 0.750 | 1   | 0.007 | 89.63 |
| 37.   | Hippophae rhamnoides L. KN 1069/Elaeagnaceae | Jahoo      | Trees     | Fruit and seed | Decoctions           | Skin problem  | Fruits decoction are used for skin problems | 132  | 0.733 | 1   | 0.008 | 95.45 |
| 38.   | Hordeum vulgare L. KN 1070/ Poaceae | Buntilh    | Herbs     | Seed     | Decoctions         | Whooping cough   | Seeds decoction are used to cure cough, 2 cups of decoctions taken daily twice a day | 28   | 0.156 | 1   | 0.036 | 67.86 |
| 39.   | Heracleum caudicis Wall. ex DC. KN 1072/Apionaceae | Kadupanbra | Herbs     | Whole plants | Juices             | Rheumatic pain   | Whole plant is grinded to make juice and this juice is taken 2 glasses a day | 76   | 0.422 | 1   | 0.013 | 85.53 |
| 40.   | Impatiens edgeworthii Hook. f KN 1074/Balsaminaceae | Sperkaye   | Shrubs    | Whole plants | Pastes             | Skin burns       | Paste of the plant is applied externally for burns | 30   | 0.167 | 1   | 0.033 | 93.33 |
| 41.   | Isodon rugosus (Wall. ex Benth.) KN 1075/Lamiaceae | Sperkaye   | Shrubs    | Leave     | Powders           | Wound healing and skin problem | 15 g of leaves powder is used 2 times a day after each meal | 122  | 0.678 | 2   | 0.016 | 93.44 |
| Sr. no | Taxonomic names/voucher no/families | Local name | Life form | Part used | Mode of utilization | Diseases category | Recipes | FC  | RFC | UR  | UV  | FL  |
|-------|------------------------------------|------------|----------|-----------|-------------------|-------------------|---------|-----|-----|-----|-----|-----|
| 43.   | Juglans regia L. KN 1076/ Juglandaceae | Akhroot    | Trees    | Aerial part, leave and stem | Decoction s | Hypertension | 40 g of dried leaves and roots extract and decoction are used in hypertension for 1 month thrice a day | 52 | 0.289 | 1 | 0.019 | 92.31 |
| 44.   | Justicia adhatoda L. KN 1079/ Acanthaceae | Behkare   | Shrubs   | Leave | Raw | Wound healing | Leaves are directly applied on wounds for healing | 25 | 0.139 | 1 | 0.040 | 72.00 |
| 45.   | Lagenaria siceraria (Molin) KN 1082/Cucurbitaceae | Khushbudhar | Herb     | Fruit | Raw | Muscle and rheumatic pain | Fruit is eaten directly for curing a diseases | 19 | 0.106 | 2 | 0.105 | 68.42 |
| 46.   | Lavandula angustifolia Mill KN 1084/Lamiaceae | Leave | Infusions & decoction | Hypertension | 20 g of leaves are taken and dipped in water for 2 days, its infusion is antihypertensive | 62 | 0.344 | 1 | 0.016 | 69.35 |
| 47.   | Lawsonia inermis KN 1085/ Lythraceae | Mehndi   | Shrubs   | Leaves | Infusions | Boils and skin burn | Dried and crushed leaves are dissolved in water and are applied for 5-6 days | 140 | 0.778 | 2 | 0.014 | 98.57 |
| 48.   | Laphangium affine (D.Don) Tzvelev KN 1086/Asteraceae | Jangli dodhal | Herbs | Leaves | Decoctions | Throat and cough infection | 10-20 g of leaves decoction is use for throat infection twice a day for 2 weeks | 49 | 0.272 | 2 | 0.041 | 59.18 |
| 49.   | Malvastrum coromandelianum (L.) Garcke KN 1087/ Malvaceae | Dhammibhoosti | Herbs | Leave and rhizomes | Powders | Muscular pain | 3-5 rhizomes of the plants are taken, powder them tea can be made by addition of 2-6 g of powder in 3 cups of water. This is used for cure of muscular diseases | 52 | 0.289 | 1 | 0.019 | 88.46 |
| 50.   | Mentha longifolia (L.) Huds. KN 1089/Lamiaceae | Jangli Podhina | Herbs | Flower and leave | Extracts | Hypertension | 50 g of leaves extract o is used to cure hypertension | 75 | 0.417 | 1 | 0.013 | 81.33 |
| 51.   | Musa acuminata Colla KN 1090/ Musaceae | Kelha   | Trees    | Fruits and stem | Decoctions | Hypertension | Stems, fruits and flowers decoctions are effective in relieving from hypertension | 51 | 0.283 | 1 | 0.020 | 90.20 |
| 52.   | Myrme africana L. KN 1092/ Myrtaceae | Gugal    | Shrubs   | Leave | Decoctions | Skin problems | Leaves were especially used against cough, cold, flu and skin diseases | 39 | 0.217 | 1 | 0.026 | 76.92 |
| 53.   | Myrte communis L. KN 1094/ Myrtaceae | Manrboo  | Trees    | Fruit | Decoctions and boils | Muscle pain | 25 g of fruit decoction is taken for muscle disorder for 2 weeks, twice a day | 67 | 0.372 | 1 | 0.015 | 70.15 |
| Sr. no | Taxonomic names/voucher no/families | Local name | Life form | Part used | Mode of utilization | Diseases category | Recipes | FC  | RFC | UR  | UV  | FL  |
|-------|-----------------------------------|------------|----------|-----------|--------------------|-------------------|---------|-----|-----|-----|-----|-----|
| 54.   | *Neolitsea chinensis* Chun KN 1096/Lauraceae | Maiddakasak | Trees    | Shoot & bark | Powders and pastes | Muscular problem | Paste of the 39 g of bark and shoot are apply over muscles for several days until pain is cured | 172  | 0.956 | 1   | 0.006 | 97.09 |
| 55.   | *Nepeta praetervisa* Rech. f. KN 1098/Lamiaceae | Simskok | Herbs | Leave | Teas | Cough and throat infection | Leaves are boil in water, make tea which is used for throat infection | 32   | 0.178 | 2   | 0.063 | 53.13 |
| 56.   | *Nerium oleander* L. KN 1099/Apocynaceae | Kaneer | Shrubs | Leave | Extracts | Hypertension | 30 g of leave extracts are mixed with oil are used for hypertension | 54   | 0.300 | 1 | 0.019 | 75.93 |
| 57.   | *Ocimum basilicum* L. KN 1100/Lamiaceae | JangliTuls | Herb | Leave | Infusions | Hypertension | Leaves infusion in 1 l water is prepared and taken two times/day as needed until improvement occurs | 81   | 0.450 | 1 | 0.012 | 81.48 |
| 58.   | *Oenothera rosea* L’Hér. ex Aiton KN 1101/Onagraceae | Junglilealh | Herbs | Whole plants | Infusions | Whooping Cough | Leaves are dipped in water for 2 days than infusion is used for cough for a week | 20   | 0.111 | 1 | 0.050 | 50.00 |
| 59.   | *Olea europaea subsp. cuspidata* (Wall. & G. Don) Cif KN 1104/Oleaceae | Ghawarejha | Shrubs | Seed and leave | Teas | Skin problem | 70 g of dried leaves of plants are boiled and tea is used orally for mouth ulcer and skin diseases for 1 month | 32   | 0.178 | 1 | 0.031 | 84.38 |
| 60.   | *Opuntia dillenii* (Ker Gawl.) Haw. KN 1106/Cactaceae | Zuqham | Shrubs | Fruit | Juices | Cough and throat infection | Juice of 90 g of fruit is good in throat infection | 32   | 0.178 | 2 | 0.063 | 56.25 |
| 61.   | *Opuntia ficus-indica* (L.) Mill KN 11071/Cactaceae | Zahqam | Shrubs | Fruit | Raw | Muscular pain | Raw fruits are taken daily to treat muscle pain | 117  | 0.650 | 1 | 0.009 | 96.58 |
| 62.   | *Pinus sylvestris* L. KN 1108/Pinaceae | Snobber | Trees | Leave | Extracts | Hypertension | Few grams of leaves extract is good for curing disease for 3 weeks | 56   | 0.311 | 1 | 0.018 | 76.79 |
| 63.   | *Papaver somniferum* L. KN 1110/Papaveraceae | Post | Herbs | Fruit | Teas | Whooping cough | Fruits are boil in water to make tea and 2 cups of tea are taken thrice a day for cough | 43   | 0.239 | 1 | 0.023 | 65.12 |
| 64.   | *Parkinsonia aculeata* L. KN 1112/Fabaceae | Jangli baabar | Shrubs | Leave, seed and root | Oils | Joint pain and body swelling | Seeds oil of plants are used for joints pain | 163  | 0.906 | 2 | 0.012 | 85.28 |
| 65.   | *Picrorhiza kurrooa* Royle. ex Benth KN 1114/Plantaginaceae | Kutakhi safed | Herbs | Root | Raw | Skin burns | It is beneficial in the treatment of burning sensation | 40   | 0.222 | 1 | 0.025 | 50.00 |
| Sr. no | Taxonomic names/voucher no/families | Local name | Life form | Part used | Mode of utilization | Diseases category | Recipes | FC | RFC | UR | UV | FL |
|-------|-------------------------------------|------------|----------|-----------|-------------------|------------------|---------|----|-----|----|----|----|
| 66.   | Plantago major L. KN 1117/ Plantaginaceae | Barthange | Herbs   | Leave     | Decoctions        | Hypertension      | Leaves decoction is taken for 3 week to cure hypertension | 97    | 0.539 | 1   | 0.010 | 81.44 |
| 67.   | Prunus persica (L.) Batch KN 1118/Rosaceae | Aruu      | Trees   | Leave and fruit | Decoctions    | Skin problem | 20 g of dry leaves are taken boiled in water, decoction is made that is given for week for skin problems | 18    | 0.100 | 1   | 0.056 | 50.00 |
| 68.   | Bhaanya stricta Decne. KN 1120/ Apocynaceae | Harmaal, venna | Shrubs | Leave | Infusions | Sore throats | 65 g of leaves are dipped in water whole night and infusion is made that is used to cure sore throat | 28    | 0.156 | 1   | 0.036 | 64.29 |
| 69.   | Rhododendron arboresum Sm. KN 1122/Ericaceae | Rantool    | Trees   | Leave  | Powders  | Rheumatic disorder | 13 g of leaves are dried and powder are taken against chronic rheumatic disorders for 2 weeks | 124   | 0.689 | 1   | 0.008 | 95.16 |
| 70.   | Rubia cordifolia L. KN 1124/ Rubiaceae | Majithe    | Herbs   | Whole plants and root | Decoction s and Pastes | Joint pains | 40 g of roots are powdered and make paste that are applied at joints for 2 weeks | 167   | 0.928 | 1   | 0.006 | 79.64 |
| 71.   | Rodyingia limbata (Benth.) Scheen & V. A. Albert KN 1127/ Lamianae | Ghawarejha | Shrubs | Leave | Extracts | Skin problems | 30 ml of extracts of leaves are taken orally against mouth ulcers and skin diseases | 117   | 0.650 | 1   | 0.009 | 86.32 |
| 72.   | Salvadora persica L. KN 1128// Salvadoraceae | Pilu      | Shrubs   | Stems and leave | Poultices  | Rheumatic diseases | Leaves of plants are heated and tied in cloth and applied over pain areas | 138   | 0.767 | 1   | 0.007 | 72.46 |
| 73.   | Senecio chrysanthemoides DC KN 1129/Asteraceae | Herbs     | Leave   | Oils    | Skin problems | Oil of 60 g of leaves are used for treatment | 102    | 0.567 | 1   | 0.010 | 87.25 |
| 74.   | Symbrism trio L.KN 1131/ Brassicaceae | Jangli sarso  | Herbs   | Leave | Infusions | Throat infection & cough | 50 ml of infusion of leaves is effective against throat and cough ailment | 30    | 0.167 | 2   | 0.067 | 76.67 |
| 75.   | Tagete serecta L. KN 1134/ Asteraceae | Satveerga | Herbs   | Leave | Poultices | Muscular pain & swelling of body | Hot oil is mixed in leaves and applied on used on swelling body parts | 153   | 0.850 | 2   | 0.013 | 95.42 |
| 76.   | Trachyspermum ammi (L.) Sprague KN 1136/Apiciaceae | Ajwaain    | Herbs   | Seed   | Decoctions | Throat infection and cough | 50 g of seed decoction is used for 3 weeks for throat infections | 139   | 0.772 | 2   | 0.014 | 88.49 |
| Sr. no | Taxonomic names/voucher no/families | Local name | Life form | Part used | Mode of utilization | Diseases category | Recipes | FC    | RFC   | UR   | UV   | FL |
|-------|-----------------------------------|------------|-----------|-----------|-------------------|-------------------|---------|-------|-------|------|------|----|
| 77.   | Urtica dioica L. KN 1137/ Urticaceae | Bichoo bhooti | Herbs    | Root     | Decoctions        | Cough and throat infection | 30-40 g of root are boiled in water and make decoction that is used for throat infection | 129 | 0.717 | 2 | 0.016 | 86.05 |
| 78.   | Verbascum thapsus L. KN 1138/ Scrophulariaceae | Gadikhand | Herbs | Aerial part | Infusions | Pimples and skin problems | Aerial plants are grinded and dissolved in water and make infusion that is taken for 3-4 days | 109 | 0.606 | 2 | 0.018 | 96.33 |
| 79.   | Withania somnifera (L.) Dunal KN 1139/Solanaceae | Aksaan | Herbs | Leave & root | Pastes and powders | Joint pains | Root of plant are taken, rinse with water, dried and crushed to make powder then it is given in lessen amount for joint disorders. Paste of leaves is used to cure pain | 112 | 0.622 | 1 | 0.009 | 87.50 |
| 80.   | Zanthoxylum armatum DC. KN 1142/Rutaceae | Trees | Seed | Decoctions | Sore throat | 18 g of seeds decoction are given for 3 week to treat sore throat | 132 | 0.733 | 1 | 0.008 | 75.00 |

Table 2. Medicinal plants use for some prevalent diseases in Northern Pakistan.
leaves and stem were the key source of herbal medicines in the research study area. In earlier described studies from various parts of the Pakistan whole plant, flower and fruit therapy is very common and it is present among the top of the plant parts usage [54]. Rhizomes, roots and fleshy parts of the plant species have a high amount of bio-active compounds [55].

3.4 Types of herbal preparations

Medicinal species utilized and administrated in herbal medicines in numerous forms in the area. The common preparation methods were categorized into decoction (33%), powder (14%), paste and extracts (11%), infusion (10%), Juice (5%), tea (7%), poultice (3%), raw (2%) and Oil and cooked (2%) (Table 5). There are several routes of administration, such as, topical use and oral ingestion for the treatment of different diseases (Table 2). Local traditional healers use ingestion to cure most diseases, but topical use is an important route of intake to cure diseases such as skin disorders, glottis diseases, joint pain, hypertension, wounds, and body pain, weakness and poisonous bites [54]. The particular parts of plants and definite quantity of dosages taken for ailments control mainly depends on patients physical health [35]. Some individuals use, orange peel, sugar, lemon, banana pulp, tobacco leaf, black pepper and camphor, as adjuvant with various diluents.

Large number of the plant drugs (74%) was made from fresh part of plants neither the dry parts of plants. In this study it was observed that there are ambiguities in taking exact quantities of medicines between the respondents due to

| S/No | Life form | Percentage (%) |
|------|-----------|----------------|
| 1.   | Herbs     | 54             |
| 2.   | Shrubs    | 30             |
| 3.   | Trees     | 16             |

Table 3. Life form of medicinal plant.

| S/No | Part used   | Percentage (%) |
|------|-------------|----------------|
| 1.   | Leaves      | 41             |
| 2.   | Seeds       | 10             |
| 3.   | Roots       | 10             |
| 4.   | Fruits      | 9              |
| 5.   | Whole plant | 7              |
| 6.   | Stem        | 6              |
| 7.   | Aerial parts| 6              |
| 8.   | Bark        | 4              |
| 9.   | Flowers     | 3              |
| 10.  | Rhizomes    | 2              |
| 11.  | Shoots      | 2              |

Table 4. Plant part used as medicines.

Medicinal Plants Used for Treatment of Prevalent Diseases in Northern Pakistan of Western... DOI: http://dx.doi.org/10.5772/intechopen.89932
variation of person's experiences and difference in ethnical information of the respondents.

3.5 Use of phototherapies

This ethnobotanical survey showed indigenous people utilized therapeutic plant species most often for the cure of hypertension (20 reports) followed by cough (14 reports), skin problem (11 reports), rheumatism (10 reports). This survey specified fact that indigenous communities used medicinal plants frequently exploited in skin diseases, respiratory disorders, cough, throat infections, joint pain and hypertension specified that the plant of this zone have versatile medicinal usages against disease [56]. The other noticeable diseases were throat infections (10 reports), wound healing (7 reports), Sore throat (5 reports), joint pain (4 reports), skin burn (3 reports). Though, skin problems were followed by pimples and swelling of body (2 reports) and boils and body pain (1 report) (Tables 2 and 6). Recent studies shown that maximum of local populations were dependent on a diversity of native plant species to treat several diseases as the modern health services were out of reached. It was noticed in throughout the field study that old information of indigenous therapeutic species is about to vanishing upcoming age groups belonging to research region. This is because of absence of attention by modern cultures, as they thought herbal medicines are less useful in comparison to allopathic medicines. Despite the fact when these elder persons die than these conventional medicinal practices might be quickly disappeared [57].

3.6 Quantitative analysis

3.6.1 Relative frequency of citation

For examining the ethnobotanical knowledge quantitative analysis was recorded in this study. Most stated plant species identified by a large number of respondents for medicinal purposes. Maximum RFC was documented for Neolitsea chinensis (0.956), Rubia cordifolia (0.928), Parkinsonia aculeate (0.906) and Tagetes erecta (0.850) (Table 2). These findings are related to the fact that a large number of respondents cited the plant species and RFC directly related to the number of

| S/No | Mode of preparation | Percentage (%) |
|------|---------------------|----------------|
| 1.   | Poultice            | 3              |
| 2.   | Decoction           | 33             |
| 3.   | Infusion            | 10             |
| 4.   | Powder              | 14             |
| 5.   | Paste               | 11             |
| 6.   | Extract             | 11             |
| 7.   | Juice               | 5              |
| 8.   | Tea                 | 7              |
| 9.   | Oil                 | 2              |
| 10.  | Raw                 | 2              |
| 11.  | Cooked              | 2              |

Table 5. Mode of utilization of medicinal plant.
respondents describing the usage of this medicinal species [19]. It was followed by *Lawsonia inermis* (0.778), *Zanthoxylum armatum* (0.733), *Uitcha dioica* (0.717), *Opuntia ficus-indica* (0.65), *Rhododendron arboreum* (0.689), *Geranium wallichianum* (0.833), *Hippophae rhamnoides* (0.73), *Cuscuta reflexa* (0.617) and *Ficus virgate* (0.556).

Another cause of why medicinal plant stated repeatedly because of; (1) the trust of people on medicinal plant and old age relationship of the easily accessible medicinal species with people and (2) the comparatively high price of synthetic drugs and non-approach to the systems of medicine [41].

3.6.2 Use value of medicinal plants

Mostly local health practitioners in study area used these species to cure diseases from other communities. The current research showed that the use value varies from 0.094 to 0.006 (Table 2). Plant species recorded with high use values were *Aesculus indica*, *Abies pindrow*, *Opuntia dillenii*, **Nepeta praetervisa**, *Begonia reniformis* and *Berberis lyceum*. These plants were commonly found in people’s homes, the decoction, tea, extract made from leaves was found very effective in hypertension, joint pain and glottis infection. Thus it should be recommended that medicinal plants have maximum UV values, would be further studied for phytochemical and pharmacological evaluation for developing medicinal system of herbal drugs [58]. *Neolitsea chinensis* (Use value 0.006) revealed least UVs because they were not abundant in the research area. Used value was less in some conditions due to the lower information of the informants about the medicinal plants, that may be of exotic source [59].

| S/No | Mode of preparation | Percentage (%) |
|------|---------------------|----------------|
| 1.   | Hypertension         | 22             |
| 2.   | Cough               | 15             |
| 3.   | Throat infection     | 11             |
| 4.   | Sore throat          | 6              |
| 5.   | Wound healing        | 8              |
| 6.   | Rheumatism           | 11             |
| 7.   | Joint pain           | 4              |
| 8.   | Swelling of body     | 2              |
| 9.   | Muscular pain        | 2              |
| 10.  | Body pain            | 1              |
| 11.  | Skin problem         | 12             |
| 12.  | Skin burn            | 3              |
| 13.  | Boils                | 1              |
| 14.  | Pimples              | 2              |

Table 6. Categories of disease.

3.6.3 Fidelity level (FL)

To find the plant that is most chosen by the respondents for the cure of specific disease is fidelity level. FL in the present study varied from 50 to 99%. *Cuscutareflexa* (99%), *Lawsonia inermis* (98%), *Daphne mucronata* (96%),...
Hippophae rhamnoides (95%), Impatiens edgeworthii, Isodon rugosus and Gymnosporia senegalensis (93%), Geranium wallichianum and Acorus calamus (92%) Bryophyllum pinnatum, Camellia sinensis and Eruca sativa (90%), Heliotropium lasiocarpum, Equisetum arvense and Ficus virgata (89%), Commiphora stockiana and Malvastrum coromandelianum (88%), Withania somnifera (87%), Buxus papillosa (86%), Heracleum candicans and Barleria cristata (85%), Adiantum venustum (84%), Descurainia sophia (83%), Mentha longifolia and Aesculus indica (81%), Abelmoschus esculentus and Ajuga bracteosa (80%) had high fidelity levels for the treatment of muscular pain, skin infections, dermatological diseases and hypertension (Table 2). High FL values of medicinal plant shows the selection of plant by respondents to cure particular disease [60, 61]. These plants might be confirmed as significant medicinal species by further evaluation and assessment by pharmaceutical, phytochemical and biological actions [62]. The species with least FL cannot be ignored as it causes the next generation to control the risk of gradually decreasing medicinal knowledge [63].

3.6.4 Family importance value (FIV) of medicinal flora

The evaluation of family importance value of plant species revealed that Lamiaceae was most prevailing group of plants having FIV of (142.50) then Asteraceae (86.50), Apiaceae (72.50), Rubiaceae (52.22), Malvaceae (50.56), Geraniaceae (42.22) and Elaeagnaceae (37.22) etc. Lower values of FIV were calculated for Saxifragaceae (5.00), Amaranthaceae, Rosaceae and Umbelliferae (5.56), Cucurbitaceae (5.83), Euphorbiaceae (6.39), Hippocastanaceae and Buxaceae (6.67), Fabaceae (6.94) and Poaceae (8.33) (Figure 2). The ethnobotanical study revealed by [35] showed that maximum FIV was observed by family Asclepiadaceae (FIV 18.5) then Punicaceae (FIV 17.9) whereas minimum value was observed by Myrtaceae (FIV 2.3). All these findings are dissimilar from current research as the numerical ethnomedicinal facts varies because of change in geo-climate and vegetation of the region [19].

4. Conclusion

The ethnobotanical data revealed that the conventional knowledge of therapeutic plants in the Northern Pakistan is mostly sustained by elders, and this knowledge was transferred from their forefathers. This study revealed that the most frequently exploited plants were present in Lamiaceae and Papaveraceae, The common method of utilization was decoction. Numerical indices of FC, UV, RFC, FL, and FIV reveal that a greater variety of medicinal species is still utilized between the native inhabitants as treatment of various ailments in the study site. Particularly,
this ethnobotanical study suggested that the studied species of far-off valley should be further assessed for appropriate research and pharmacological activities to validate their present traditional usage that may help as the primary means to produce plant-derived prescriptions. Future study on the security and usefulness of medicinal herbs, along with ecological and traditional management works, which are required intended for the maintainable development of herbal drugs in the Northern Pakistan.

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Abbreviations

WHO World Health Organization
THD traditional herbal drugs
FATA federal administered tribal areas
ISL Islamabad
UV used value
FC frequency of citation
RFC relative frequency of citation
FIV family importance value
FL fidelity level
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References

[1] Pereira JA, Oliveira I, Sousa A, Ferreira IC, Bento A, Estevinho L. Bioactive properties and chemical composition of six walnut (Juglans regia L.) cultivars. Food and Chemical Toxicology. 2008;46(6):2103-2111

[2] Smita R, Sangeeta R, Kumar SS, Soumya S, Deepak P. An ethnobotanical survey of medicinal plants in Semiliguda of Koraput District, Odisha, India. Research Journal of Recent Sciences. 2012;2277:2502

[3] Malik K, Ahmad M, Bussmann R, Tariq A, Alqahtani A, Shahat A, et al. Ethnobotany of anti-hypertensive plants used in northern Pakistan. Frontiers in Pharmacology. 2018;9:789

[4] Malik K, Ahmad M, Zhang G, Rashid N, Zafar M, Sultana S, et al. Traditional plant based medicines used to treat musculoskeletal disorders in northern Pakistan. European Journal of Integrative Medicine. 2018;19:17-64

[5] Rashid N, Gbedomon RC, Ahmad M, Salako VK, Zafar M, Malik K. Traditional knowledge on herbal drinks among indigenous communities in Azad Jammu and Kashmir, Pakistan. Journal of Ethnobiology and Ethnomedicine. 2018;14(1):16

[6] Ahmad M, Malik K, Tariq A, Zhang G, Yaseen G, Rashid N, et al. Botany, ethnomedicines, phytochemistry and pharmacology of Himalayan paeyony (Paeonia emodi Royle.). Journal of Ethnopharmacology. 2018;220:197-219

[7] Sadia S, Tariq A, Shaheen S, Malik K, Ahmad M, Qureshi H, et al. Ethnopharmacological profile of anti-arthritic plants of Asia—a systematic review. Journal of Herbal Medicine. 2018;13:8-25

[8] Sher H, Hussain F. Ethnobotanical evaluation of some plant resources in northern part of Pakistan. African Journal of Biotechnology. 2009;8(17):4066-4076

[9] Gradé JT, Tabuti JR, Van Damme P. Ethnoveterinary knowledge in pastoral Karamoja, Uganda. Journal of Ethnopharmacology. 2009;122(2):273-293

[10] Ahmad M, Sultana S, Fazl-i-Hadi S, Ben Hadda T, Rashid S, Zafar M, et al. An Ethnobotanical study of medicinal plants in high mountainous region of Chail valley (district swat-Pakistan). Journal of Ethnobiology and Ethnomedicine. 2014;10(1):36

[11] Sher H, Elyemeni M, Sher H, Hussain K. Ethnobotanical and economic observations of some plant resources from the northern parts of Pakistan. Ethnobotany Research and Applications. 2011;9:027-041

[12] Yabesh JM, Prabhu S, Vijayakumar S. An ethnobotanical study of medicinal plants used by traditional healers in silent valley of Kerala, India. Journal of Ethnopharmacology. 2014;154(3):774-789

[13] Shah NA, Khan MR, Nadhman A. Antileishmanial, toxicity, and phytochemical evaluation of medicinal plants collected from Pakistan. BioMed Research International. 2014:1-7

[14] Ali H, Sannai J, Sher H, Rashid A. Ethnobotanical profile of some plant resources in Malam Jabba valley of swat, Pakistan. Journal of Medicinal Plants Research. 2011;5(18):4676-4687

[15] Murad W, Azizullah A, Adnan M, Tariq A, Khan KU, Waheed S, et al. Ethnobotanical assessment of plant resources of Banda Daud Shah, district Karak, Pakistan. Journal of
Ethnobiology and Ethnomedicine. 2013; 9(1):77

[16] Jan G, Khan MA, Farhatullah JF, Ahmad M, Jan M, Zafar M. Ethnobotanical studies on some useful plants of Dir Kohistan valleys, KPK. Pakistan. Pak J Bot. 2011;43(4):1849-1852

[17] Ali H, Qaiser M. The ethnobotany of Chitral valley, Pakistan with particular reference to medicinal plants. Pakistan Journal of Botany. 2009;41(4):2009-2041

[18] Alam N, Shinwari Z, Ilyas M, Ullah Z. Indigenous knowledge of medicinal plants of Chagharzai valley, district Buner. Pakistan. Pak J Bot. 2011; 43(2):773-780

[19] Bibi T, Ahmad M, Tareen RB, Tareen NM, Jabeen R, Rehman S-U, et al. Ethnobotany of medicinal plants in district Mastung of Balochistan province-Pakistan. Journal of Ethnopharmacology. 2014;157:79-89

[20] Bano A, Ahmad M, Zafar M, Sultana S, Rashid S, Khan MA. Ethnomedicinal knowledge of the most commonly used plants from Deosai plateau, Western Himalayas, Gilgit Baltistan, Pakistan. Journal of Ethnopharmacology. 2014;155(2):1046-1052

[21] Ahmad S, Islam M, Bano G, Aslam S, Koukab S. Seasonal variation in current season and dead biomass of chrysopogon aicheri (boiss) stapf. And cymbopogon jwarancusa (jones) schult. in highland Balochistan, Pakistan. Pakistan Journal of Botany. 2009;41(2):519-527

[22] Ahmad F, Khan MA, Ahmad M, Zafar M, Mahmood T, Jabeen A, et al. Ethnomedicinal uses of grasses in the salt range region of northern Pakistan. Journal of Medicinal Plant Research. 2010;4(5):362-369

[23] Hazzrat A, Nisar M, Shah J, Ahmad S. Ethnobotanical study of some elite plants belonging to Dir, Kohistan valley, Khyber Pukhtunkhwa, Pakistan. Pakistan Journal of Botany. 2011;43(2):787-795

[24] Rashid S, Ahmad M, Zafar M, Sultana S, Ayub M, Khan MA, et al. Ethnomedicinal survey of medicinally important shrubs and trees of Himalayan region of Azad Jammu and Kashmir, Pakistan. Journal of Ethnopharmacology. 2015;166:340-351

[25] Gilani SA, Qureshi RA, Gilani SJ. Indigenous uses of some important ethnomedicinal herbs of Ayubia National Park, Abbottabad, Pakistan. Ethnobotanical Leaflets. 2006; 2006(1):32

[26] Hussain K, Shahazad A, Zia-ul-Hussnain S. An ethnobotanical survey of important wild medicinal plants of Hattar district Haripur, Pakistan. Ethnobotanical Leaflets. 2008;2008(1):5

[27] Afzal S, Afzal N, Awan MR, Khan TS, Gilani A, Khanum R, et al. Ethno-botanical studies from northern Pakistan. Journal of Ayub Medical College, Abbottabad. 2009;21(1):52-57

[28] Ahmad M, Qureshi R, Arshad M, Khan MA, Zafar M. Traditional herbal remedies used for the treatment of diabetes from district Attock (Pakistan). Pakistan Journal of Botany. 2009;41(6):2777-2782

[29] Qureshi RA, Ghufran MA, Gilani SA, Yousaf Z, Abbas G, Batool A. Indigenous medicinal plants used by local women in southern Himalayan regions of Pakistan. Pakistan Journal of Botany. 2009;41(1):19-25

[30] Abbasi AM, Khan M, Ahmad M, Zafar M, Jahan S, Sultana S. Ethnopharmacological application of medicinal plants to cure skin diseases and in folk cosmetics among the tribal...
communities of North-West Frontier Province, Pakistan. Journal of Ethnopharmacology. 2010;128(2):322-335

[31] Ishtiaq M, Mumtaz AS, Hussain T, Ghani A. Medicinal plant diversity in the flora of Leepa Valley, Muzaffarabad (AJK), Pakistan. African Journal of Biotechnology. 2012;11(13):3087-3098

[32] Butt MA, Ahmad M, Fatima A, Sultana S, Zafar M, Yaseen G, et al. Ethnomedicinal uses of plants for the treatment of snake and scorpion bite in northern Pakistan. Journal of Ethnopharmacology. 2015;168:164-181

[33] Khan MPZ, Ahmad M. Traditional preference of wild edible fruits (WEFs) for digestive disorders (DDs) among the indigenous communities of Swat Valley-Pakistan. Journal of Ethnopharmacology. 2015;174:339-354

[34] Abbas Z, Khan SM, Abbasi AM, Pieroni A, Ullah Z, Iqbal M, et al. Ethnobotany of the Balti community, Tormik valley, Karakorum range, Baltistan, Pakistan. Journal of Ethnobiology and Ethnomedicine. 2016;12(1):38

[35] Kayani S, Ahmad M, Zafar M, Sultana S, Khan MPZ, Ashraf MA, et al. Ethnobotanical uses of medicinal plants for respiratory disorders among the inhabitants of Gallies-Abbottabad, northern Pakistan. Journal of Ethnopharmacology. 2014;156:47-60

[36] Ahmad M, Khan MPZ, Mukhtar A, Zafar M, Sultana S, Jahan S. Ethnopharmacological survey on medicinal plants used in herbal drinks among the traditional communities of Pakistan. Journal of Ethnopharmacology. 2016;184:154-186

[37] Shah G, Ahmad M, Arshad M, Khan M, Zafar M, Sultana S. Ethnophyto-veterinary medicines in northern Pakistan. Journal of Animal and Plant Sciences. 2012;22:791-797

[38] Kayani S, Ahmad M, Sultana S, Shinwari ZK, Zafar M, Yaseen G, et al. Ethnobotany of medicinal plants among the communities of alpine and sub-alpine regions of Pakistan. Journal of Ethnopharmacology. 2015;164:186-202

[39] Fatima A, Ahmad M, Zafar M, Yaseen G, Khan MPZ, Butt MA, et al. Ethnopharmacological relevance of medicinal plants used for the treatment of oral diseases in Central Punjab-Pakistan. Journal of Herbal Medicine. 2017;166:340-351

[40] Bibi T, Ahmad M, Tareen NM, Jabeen R, Sultana S, Zafar M, et al. The endemic medicinal plants of northern Balochistan, Pakistan and their uses in traditional medicine. Journal of Ethnopharmacology. 2015;173:1-10

[41] Yaseen G, Ahmad M, Sultana S, Alharrasi AS, Hussain J, Zafar M. Ethnobotany of medicinal plants in the Thar Desert (Sindh) of Pakistan. Journal of Ethnopharmacology. 2015;163:43-59

[42] Saqib Z, Mahmood A, Malik RN, Mahmood A, Syed JH, Ahmad T. Indigenous knowledge of medicinal plants in Kotli Sattian, Rawalpindi district, Pakistan. Journal of Ethnopharmacology. 2014;151(2):820-828

[43] Mardani-Nejhad S, Vazirpour M. Ethno-botany of medicinal plants by Mobarakeh’s people (Isfahan). Journal of Herbal Drugs (An International Journal on Medicinal Herbs). 2012;3(2):111-126

[44] Ai AM, Khan MA, Shah MH, Shah MM, Pervez A, Ahmad M. Ethnobotanical appraisal and cultural values of medicinally important wild edible vegetables of lesser Himalayas-Pakistan. Journal of Ethnobiology and Ethnomedicine. 2013;9(1):66
[45] Singh H, Husain T, Agnihotri P, Pande P, Khatoon S. An ethnobotanical study of medicinal plants used in sacred groves of Kumaon Himalaya, Uttarakhand, India. Journal of Ethnopharmacology. 2014;154(1):98-108

[46] Kadir MF, Sayeed MSB, Setu NI, Mostafa A, Mia M. Ethnopharmacological survey of medicinal plants used by traditional health practitioners in Thanchi, Bandarban Hill tracts, Bangladesh. Journal of Ethnopharmacology. 2014;155(1):495-508

[47] Ismail M, Ibrar M, Iqbal Z, Hussain J, Hussain H, Ahmed M, et al. Chemical constituents and antioxidant activity of Geranium wallichianum. Records of Natural Products. 2009;3(4):193

[48] Ibrar M, Hussain F. Ethnobotanical studies of plants of Charkotli hills, Batkhela district, Malakand, Pakistan. Frontiers of Biology in China. 2009;4(4):539

[49] Teklehaymanot T. Ethnobotanical study of knowledge and medicinal plants use by the people in Dek Island in Ethiopia. Journal of Ethnopharmacology. 2009;124(1):69-78

[50] Tabuti JR, Kukunda CB, Waako PJ. Medicinal plants used by traditional medicine practitioners in the treatment of tuberculosis and related ailments in Uganda. Journal of Ethnopharmacology. 2010;127(1):130-136

[51] Upadhyay B, Dhaker AK, Kumar A. Ethnomedicinal and ethnopharmacological studies of eastern Rajasthan, India. Journal of Ethnopharmacology. 2010;129(1):64-86

[52] Kadir MF, Sayeed MSB, Mia M. Ethnopharmacological survey of medicinal plants used by indigenous and tribal people in Rangamati, Bangladesh. Journal of Ethnopharmatomi, Bangladesh. Journal of Ethnopharmacology. 2012;144(3):627-637

[53] Ghimire SK, Gimenez O, Pradel R, McKey D, Aumeeruddy-Thomas Y. Demographic variation and population viability in a threatened Himalayan medicinal and aromatic herb Nardostachys grandiflora: Matrix modelling of harvesting effects in two contrasting habitats. Journal of Applied Ecology. 2008;45(1):41-51

[54] Mahmood A, Mahmood A, Tabassum A. Ethnomedicinal survey of plants from district Sialkot, Pakistan. Journal of Applied Pharmacology. 2011;3:212-220

[55] Munir M, Khan MA, Ahmed M, Seema N, Ahmed SN, Tariq K, et al. Foliar epidermal anatomy of some ethnobotanically important species of wild edible fruits of northern Pakistan. Journal of Medicinal Plant Research. 2011;5(24):5873-5880

[56] Akhtar N, Rashid A, Murad W, Bergmeier E. Diversity and use of ethno-medicinal plants in the region of swat, North Pakistan. Journal of Ethnobiology and Ethnomedicine. 2013;9(1):25

[57] Khan SW, Khatoon S. Ethnobotanical studies on some useful herbs of Haramosh and Bugrote valleys in Gilgit, northern areas of Pakistan. Pakistan. Journal of Botany. 2008;40(1):43

[58] Qureshi R, Bhatti GR, Memon RA. Ethnomedicinal uses of herbs from northern part of Nara desert. Pakistan. Pak J Bot. 2010;42(2):839-851

[59] Rokaya MB, Münzbergová Z, Timsina B. Ethnobotanical study of medicinal plants from the Humla district of western Nepal. Journal of
Ethnopharmacology. 2010;130(3):
485-504

[60] Rajakumar N, Shivanna M. Ethnomedicinal application of plants in the eastern region of Shimoga district, Karnataka, India. Journal of Ethnopharmacology. 2009;126(1):64-73

[61] Islam MK, Saha S, Mahmud I, Mohamad K, Awang K, Uddin SJ, et al. An ethnobotanical study of medicinal plants used by tribal and native people of Madhupur forest area, Bangladesh. Journal of Ethnopharmacology. 2014; 151(2):921-930

[62] Ugulu I, Baslar S, Yorek N, Dogan Y. The investigation and quantitative ethnobotanical evaluation of medicinal plants used around Izmir province, Turkey. Journal of Medicinal Plants Research. 2009;3(5):345-367

[63] Shinwari S, Qureshi R, Baydoun E. Ethnobotanical study of Kohat pass (Pakistan). Pakistan Journal of Botany. 2011;43(SI):135-139