Ethnomedicinal use of some plant species by Gujjar and Bakerwal community in Gulmarg Mountainous Region of Kashmir Himalaya

Muatasim Jan, Tawseef Ahmad Mir, Aijaz Hassan Ganie and Rakesh Kumar Khare

Research

Abstract

Background: Plants are being used since the time immemorial to alleviate sufferings and ailments. Herbal medicine forms an essential part of the traditional primary medical system of Kashmir Himalaya. Present study attempts to report the essential ethnomedicinal plant species used against various ailments by Gujjar and Bakerwal community of Gulmarg Mountainous region of district Baramulla, Jammu and Kashmir.

Methods: Extensive surveys were conducted in the study area in different seasons during March 2019 to July 2020 for the collection of medicinally important plants and the traditional knowledge associated with them. Ethnomedicinal data was obtained through group discussions, semi-structured interviews, questionnaires and field observations. During the study a total of 54 informants (36 males and 18 females) were interviewed aged between 29-78 years. The interviews were carried out in local dialect and all the documented data was then translated into English.

Results: A total of 60 plant species belonging to 56 genera and 35 different families were reported to be used by Gujjar and Bakerwal community in order to treat various ailments. Asteraceae was recorded to be the dominant plant family in the area and leaves were the most commonly utilized plant part with decoction as the major mode of herbal recipe preparation. The highest ICF value of 0.83 was reported for dermatological disorders. Present study reported two plant species Taraxacum officinale and Viola odorata with a FL of 100% and Achillea millefolium, Chenopodium album, Phyttolaca acinosa, Ajuga bracteosa, Cannabis sativa, Senecio chrysanthemoides were reported to be the most important medicinal plants according to their use value.

Conclusions: It was observed that herbal medicine plays a significant role in meeting primary health care needs of tribal communities living at high altitudes. Traditional knowledge of plants is passing on from one generation to another through the word of mouth only and this knowledge is on the verge of extinction. Hence there is a dire need to document these valuable medicinal plants and the traditional treasure associated with them. The species reported with high use value (UV) and fidelity level value (FL) should be employed for further phytochemical and
for the treatment of various ailments such as cough, facilities, the tribal people of the study area still Despite good development in the rural health care study in Gulmarg Mountainous region of Baramulla. 1995). This is the first elaborated ethnomedicinal al. Himalaya (Ara & Naqshi 1992, Kaul 2010, Khan et al. 2009). The inhabitants of the tribal areas are the main source of livelihood for these people in area faces severe cold and a pleasant wea. The total area of Gulmarg is 180 sq. km, which covers the forests surrounding Gulmarg. The area is surrounded in North by Jhelum valley forest division, Forest division of Poonch and Pir-Panchal in South and Special forest division-Tangmarg in West. Gulmarg is home to various ethnic tribes mostly Gujjars and Bakerwals. During the winters the study area faces severe cold and a pleasant weather during summers. The temperature ranges between -9° C minimum in winter and up to 28° C maximum in summers (Ahmad and Qayoom 2019).

A total of 40 visits with each visit of 2 days was made to the study area to collect the plants and information from total 17 sites/villages (Wahipora, Solinda, Gogal dara, Rajpora, Kulhama, Tetran, Kralwat, Ferozpora, Wanigam, Hardu, Gulnar, Fajapora, Gonipora, Hajibal, Khaipora, Ratnipora and Gulrez) richly populated with ethnic communities, where these people are solely dependent on medicinal plants to cure a variety of diseases. Plants were collected with the help of local guides who were aware about the region. Plants with mature leaves, stem, roots and flowers were selected for collection. Agriculture (animal husbandry and crop production) is the main source of livelihood for these people in the region. In addition, collection of non-timber forest products including medicinal plants is the other source of income in this region.

Background
Since prehistoric times, medicinal plants have played a vital role for the treatment of various diseases (Sullivan & Sheally 1997). Medicinal plants constitute the base of health-care system in many rural and tribal societies. People all over the world depend on plants and plant derived products for their primary healthcare needs either directly or indirectly (Kala 2005). Traditional herbal medicine has sustained its popularity in developing countries of the world, and its usage is rapidly spreading in the developed and industrialized countries as well (Singh & Kachroo 1994). More than 75,000 plant species have been estimated to be used by about 4,635 ethnic communities for the treatment of various ailments across India (Baba et al. 2012, Mir et al. 2018b). Besides treating human ailments, a number of medicinal plant species are used in veterinary healthcare (Dar et al. 2018, Khuroo et al. 2007). The traditional knowledge related to usage of plants and plant derived products for human survival is old age practices in Indian Himalayan region, where people by experience have learnt to identify, collect, formulate and utilize these medicines for the treatment of day to day diseases (Rajadurai et al. 2009). The inhabitants of the tribal areas are the reservoir of accumulated traditional knowledge related to medicinal plants, but due to the invasion of modernization, knowledge about the use of herbal medicinal wealth is vanishing at an alarming rate (Rajadurai et al. 2009). Medicinal information related to plants and their uses by ethnic communities is beneficial not only in the preservation of traditional cultures and biodiversity but also for primary healthcare and development of novel drugs (Farooq et al. 2014). Being a part of Indian Himalayan region, Kashmir valley is recognized for its economically important plant species and their products including, food, fodder, medicine, fiber etc. Because of the plant richness and its unique floral biodiversity, a large number of plant species are used as medicine in this region in one or another form (Lone et al. 2014, Malik et al. 2015). A number of ethnobotanical studies have been conducted across the Kashmir Himalaya (Ara & Naqshi 1992, Kaul 2010, Khan et al. 2004, Lone 2003, Navchoo & Bhat 1994, Singh 1995). This is the first elaborated ethnomedicinal study in Gulmarg Mountainous region of Baramulla. Despite good development in the rural health care facilities, the tribal people of the study area still depend on indigenous medicines to a greater extent for the treatment of various ailments such as cough, cold, skin disorders etc. But this valuable traditional information is being passed on from one generation to another on oral basis.

Keeping the dependency of local populations on medicinal plants in view, we hypothesized that, (i) Due to its remoteness the traditional knowledge of the local population would differ considerably from other regions in J&K, as well as the wider Himalayas, (ii) Participants will have a high consensus, fidelity level and use value for the use of ethnomedicinal plants, (iii) New ethnomedicinal claims will be reported from the area. With these hypotheses, our research focused on (i) documentation of ethnomedicinal plants used by the local population (ii) assessment of informant consensus, fidelity level and use value of ethnomedicinal plants. By the use of various ethnobotanical indices the more useful plants of the area can be determined which can be subjected to further pharmacological and phytochemical analysis.

Keywords: Ethno-medicinal uses, Gulmarg mountainous region, Traditional knowledge, Documentation.

Materials and Methods
Study area
Current study was carried out in Gulmarg Mountainous region of district Baramulla Jammu and Kashmir (Fig. 1). Gulmarg is located across 74°.13’ to 74°.42’ N latitude and 34°.03’ to 34°.10’ E longitude at an altitude of 2100-2800 m. It is located about 52 km from capital city Srinagar and some 39 km from district headquarter Baramulla. A total of 40 visits with each visit of 2 days was made to the study area to collect the plants and information from total 17 sites/villages (Wahipora, Solinda, Gogal dara, Rajpora, Kulhama, Tetran, Kralwat, Ferozpora, Wanigam, Hardu, Gulnar, Fajapora, Gonipora, Hajibal, Khaipora, Ratnipora and Gulrez) richly populated with ethnic communities, where these people are solely dependent on medicinal plants to cure a variety of diseases. Plants were collected with the help of local guides who were aware about the region. Plants with mature leaves, stem, roots and flowers were selected for collection. Agriculture (animal husbandry and crop production) is the main source of livelihood for these people in the region. In addition, collection of non-timber forest products including medicinal plants is the other source of income in this region.

Pharmacological investigation to authenticate this indigenous knowledge.
Demographic features of informants
To explore the traditional knowledge regarding the ethnomedicinal uses of plant species in the area, a total of 54 informants (36 males, 18 females) were interviewed aged between 29-78 years (Table 1). Among these, male informants (36 informants) were found to have more experience in terms of knowledge sharing than female informants (18 informants). Most of the selected informants were illiterate, and a small number were having education up to higher secondary level and few were job holders. All the selected informants were of one religion (Muslims), as it is the most practiced religion of the area. Gujri and Pahari are the two main languages of communication. The informants were selected on the basis of their traditional knowledge about the use of plants for treating various diseases. To ensure the validity of traditional knowledge, continuous relationship was maintained with the local population throughout the survey.

Data collection
The practice of herbal medicine to cure various ailments is a widely accepted system by the Gujjar and Bakarwal community of Gulmarg upper reaches. Extensive surveys were conducted in the study area in different seasons during March 2019 to July 2020 for the collection of medicinally important plants and the traditional knowledge associated with them. Prior to interview, brief group discussions were held with the key informants to explain the objective of the present research and a formal written consent was taken from all the informants. Ethnomedicinal data was obtained through group discussions, semi-structured interviews, questionnaires and field observations. The interviews were carried out in local dialect and all the documented data was then translated into English. Guided field walk to the forest area allowed us to collect best possible information about the identification and utilization of important medicinal plant species. The information collected included local name of the plant, habit, part(s) used, ethnomedicinal use, method of administration preparation.

Preservation and taxonomic verification of collected plants
The medicinal plant species reported by informants were collected during field trips guided by local people. The specimens were dried, pressed and mounted on herbarium sheets and good quality voucher specimens were made according to standard techniques (Jain & Rao 1997). Voucher specimens were identified with the help of Flora of Jammu and Kashmir (Singh et al. 2002), Flora of British India (Hooker 1879), various other available literatures (Nawchoo & Kachroo 1995, Singh & Kachroo 1994) and help was sort from taxonomists and experts of J&K. All the identified plant specimens were then verified at KASH herbarium of Department of Botany, University of Kashmir, Srinagar, Jammu and Kashmir. The preserved specimens were then deposited at the aforementioned herbarium for future reference.
Table 1. Demographic status of informants.

| Variable          | Total | Percentage |
|-------------------|-------|------------|
| Gender            |       |            |
| Male              | 36    | 67         |
| Female            | 18    | 33         |
| Age groups        |       |            |
| 29-40             | 6     | 11         |
| 41-50             | 9     | 17         |
| 51-60             | 13    | 24         |
| 61-70             | 15    | 28         |
| 71-78             | 11    | 20         |
| Educational qualification |     |            |
| Illiterate        | 29    | 54         |
| Primary           | 11    | 20         |
| Secondary         | 8     | 15         |
| Above secondary   | 6     | 11         |
| Occupation        |       |            |
| Males             |       |            |
| Shopkeepers       | 6     | 11         |
| Farmers           | 24    | 44         |
| Job holders       | 6     | 11         |
| Females           |       |            |
| Housewives        | 15    | 28         |
| Job holders       | 3     | 6          |
| Religion          |       |            |
| Muslim            | 54    | 100        |

Data Analysis
The data collected through interviews with the informants was analyzed using three different quantitative indices viz. fidelity level (FL%), informant consensus factor (ICF) and use value (UV).

Fidelity level
Since a particular ailment may be treated with more than one plant species, it is interesting to figure out the most preferred plant species used for the treatment of that particular ailment (Musa et al. 2011), which can be determined with the help of fidelity level (FL%). Fidelity level shows the percentage of informants claiming the use of a particular plant species for the same major ailment. It is aimed to enumerate the importance of the medicinal plant species for a given ailment (Frieden et al. 1986).

\[
FL(\%) = \frac{I_p}{I_u} \times 100
\]

Where, \( I_p \) is the number of informants who cite the use of a plant species for a particular ailment and \( I_u \) is the total number of informants who cite the use of plant species for any ailment. The plant species that are frequently used by the people have higher FL values and plants that are less used have lower FL values (Trotter et al. 1986).

Informant consensus factor
Informant consensus factor (ICF) was used to test the uniformity of knowledge about medicinal plant species (Heinrich et al. 1998). To develop the informant consensus factor, diseases were categorized into different ailment categories based on the information provided by the informants (Table 2).

Table 2. Disease categories based on ailments recorded.

| Disease Category | Ailments                                                                 |
|------------------|--------------------------------------------------------------------------|
| Gastrointestinal | Abdominal pain, Worms, Diarrhoea, Stomach disorders , Constipation, Vomiting, Stimulate bowel movement, Stomach cramps, Indigestion, Purgative, Dysentery, Vermifuge, Expel poisonous substances from stomach, Anthelmintic |
| Dermatological   | Burns, Bruises, Hair fall, Rashes, Swellings, Cleansing agent, Killing lice, Allergy, Itching, Chilblain, Hair growth, Skin allergies, Insect sting, Sunburn, Cracked heals, Boils, Snake bite, Skin irritation, Fungal infections, Anti-inflammatory, Measles, Scabies |
| Wounds           | Wounds                                                                   |
| Nervous disorder | Headache, Depression                                                     |
| Respiratory      | Chest congestion, Common cold, Cough, Asthma, Bronchitis, Throat infections |
| Gynaecological   | Fertility, Post-partum haemorrhage, Lactation, Menorrhagia, Oligomenorrhea, Swelling of nipples, Dysmenorrhea, Morning sickness |
| Skeltonmuscular  | Rheumatism, Fractured bones, Strengthening bones, Muscular pain, Arthritic pain, Swelling of joints, Poliomyelitis, Back pain |
| Cardiovascular   | Blood pressure, Blood purifier                                           |
| Antipyretic      | Fever, Malaria                                                           |
| Ear, Mouth, Eye (EME) | Inflamated gums, Toothache, Eye diseases, Ear-ache, Bad smell, Mumps, Ulcers, Tonsillitis |
| Liver and Kidney | Excessive urination, Urine infection, Jaundice, Diuretic                 |
| Body weakness    | General weakness, Body tonic                                             |
Informant consensus factor was calculated as:

$$F_{ic} = \frac{N_{ur} - N_{t}}{N_{ur} - 1}$$

Where, Nur denotes the number of use reports for a particular disease category and Nt denotes the number of taxa used for that particular disease category by all informants.

ICF values range from 0-1, an ICF value of 0 means that there is no exchange of information regarding the usage of plant species among informants and ICF values approaches 1, when the information is exchanged between the informants (Gazzaneo et al. 2005). Informant’s consensus within a population and between ethnic groups shows which plant species are rigorously used and hence helps in the selection of plant species for pharmacological and phytochemical analysis (Giday et al. 2007).

Use value

The use value (UV) demonstrates the importance of a medicinal plant species by taking into account the number of use reports mentioned by the informants. In the present study, use value was calculated by the following formula (Phillip and Gentry 1993).

$$UV = \sum \frac{U_{i}}{N}$$

Where U_i is the total uses reported by each informant for a given plant species and N is defines the total number of informants participating in the study.

Results and Discussion

Diversity of ethnomedicinal flora

During the present study a total of 60 medicinally important plant species belonging to 32 families and 56 genera were reported (Table 3). Each plant species is provided with botanical name, vernacular name, voucher number, family, habit, Part(s) used, mode of preparation, disease(s) treated, mode of administration, fidelity level (FL %) and use value (UV). Most of the documented medicinal plant species were herbs (72%) followed by shrubs (13%) and trees (15%) (Fig. 2). These findings are in consistent with other studies carried out in Jammu and Kashmir (Malik et al. 2011, Bhatia et al. 2014) and other parts of the world (Bolson et al. 2015, Hu et al. 2020; Kadir et al. 2014). As per Simbo (2010), occurrence of pharmacologically active substance in greater concentration in herbs makes them valuable for treating various ailments. Herbs have the ability to grow in diverse habitats including kitchen gardens, pavements, lawns, croplands etc. and therefore are easily accessible to the local population for use in traditional medicine.

Among 32 families representing 1-11 plant species, Asteraceae was the dominant family with 18% contribution of the total reported taxa followed by Lamiaceae (8%), Pinaceae, Solanaceae Fabaceae and Polygonaceae (5%). All other families contributed less than 5% varying from 2-3% (Table 4). Our results regarding the abundant utilization of family Asteraceae are in line with other studies carried out in different parts of Jammu & Kashmir (Tali et al. 2019, Lone et al. 2014, Mir et al. 2021) and other parts of the world (Abbas et al. 2016, Kadir et al. 2014, Hu et al. 2020). The dominance of this family can be attributed to its widespread distribution, herbaceous life form and its abundance in the area (Gazzaneo et al. 2005, Mehraj et al. 2018). Moreover, Asteraceae has been reported to contain a large number of bioactive compounds used against different ailments (Leonti et al. 2003, Hamill et al. 2000).

Plant part(s) used

Data presented in Fig. 3, shows that the native people of the study area use 17 different plant parts in order to cure various ailments. Among these, leaves were found to be the most preferred plant part, with a percentage contribution of 34% followed by whole plant (21%) fruit and seed (8% each), root (6%), flower, rhizome, aerial part (4% each) whereas, the use of bark, stem, resin, twig, latex, tuber, bulb, wood and thorn was less than 4%.

In other studies (Hussain et al. 2019, Savikin et al. 2013, Bussmann & Glenn 2010) as well, leaves were found to be the most abundantly utilized plant part as medicine. Easy collection, effortless storage and easy preparation as medicinal product mark the dominance of leaves in traditional healthcare system (Dutt et al. 2015). In contrast, some other ethnomedicinal studies (Tali et al. 2019, Hu et al. 2020) reported whole plant as the most exploited plant part to treat various diseases. The utilization of specific plant part gives an indication that such parts have a strong therapeutic potential and therefore phytochemical investigation should be done to validate this indigenous knowledge. It was reported that different parts of a same plant are used for the treatment of different disorders because of the varying healing property of these plant parts against a particular disorder. These plant parts are a rich source of compounds that can be used to develop drug synthesis. The active compounds in most parts of the medicinal plants have direct or indirect therapeutic effects and are used as medicinal agents. But these compounds are not the same in all the parts of the plant. This may be the reason why different parts of a same plant are used for different purposes (Bassam 2012).
Table 3. Medicinal plants used by the Gujjar and Bakerwal community of Gulmarg mountainous region of Baramulla, Jammu and Kashmir

| Botanical name (Vernacular name)/Voucher number | Family | Habit | Part(s) used / Preparation | Application | Disease(s) treated | Mode of administration | FL (%) | UV  |
|-----------------------------------------------|--------|-------|----------------------------|-------------|-------------------|------------------------|--------|-----|
| *Abies pindrow* (Royle ex D. Don) Royle. (Budul) 3464-KASH | Pinaceae | Tree | LF: Paste, BR: Decoction, RS: Resin, LF: Infusion | External | Rashes (3), Rheumatism (2), Wounds (2), Swellings (1) | Leaf paste is applied as an indigenous remedy on skin rashes. Decoction of bark is used against rheumatism. Resin is directly applied to cuts and wounds for quick healing. Leaf extract is used as water bath for swellings. | 37.5 | 0.148 |
| *Achillea millefolium* L. (Pahal-gassh) 3024-KASH | Asteraceae | Herb | LF and FL: Paste, LF: Paste | External | Inflamed gums (11), Toothache (3), Burns (2), Bruises (2) | Leaves and flowers are crushed and used to cure inflammed gums and toothache. Leaves are made into paste and corn flour is added to and is directly applied on burns and bruises in children. | 61 | 0.33 |
| *Adiantum capillus-veneris* L. (Guetheer) 3467-KASH | Pteridaceae | Herb | LF: Paste, WP: Infusion | External | Chest congestion (6), Headache (2), Hair fall (2) | Leaves made into paste are applied directly to treat chest congestion and headache. Extract of whole plant is used to wash hair to treat hair fall. | 60 | 0.19 |
| *Ajuga bracteosa* Wall ex Benth. (Janiadam) 3469-KASH | Lamiaceae | Herb | LF: Decoction, LF: Decoction | Internal | Abdominal pain (12), Worms (2), Diarrhoea (2) | Decoction obtained from leaves is taken orally for the treatment of abdominal pain and in case of worms. Decoction is also taken to treat diarrhoea. | 75 | 0.30 |
| *Allium sativum* L. (Rohun) 3472-KASH | Liliaceae | Herb | BL: Roasted, BL: Paste | Internal | Blood pressure (7), Fertility (4) | Bulb is roasted and eaten empty stomach early morning for blood pressure. Paste of bulb is applied into uterus to enhance fertility. | 63.63 | 0.20 |
| **Anagallis arvensis L.**  
| **Primulaceae** | **Herb** | **WP: Rubbed, WP: Decoction** | **External and Internal** | **Cleansing agent (4), Killing lice (3), Allergy (3)** | **Fresh herb is rubbed between hands, a large quantity of leather is formed which removes dirt.**  
| | | | | | **Extract of plant is applied for killing lice and allergy.** |
| **Anthemis cotula L.**  
| **Asteraceae** | **Herb** | **AP: Decoction, LF: Rubbed, WP: Poultice, WP: Paste** | **External** | **Body muscular pain (6), Skin infection (3), Insect sting (2), Sunburn (2)** | **Extract of aerial portion is used to wash body for muscular pain and skin infections.**  
| | | | | | **Leaves are rubbed on insect sting as pain reliever.**  
| | | | | | **Plant is crushed and applied as poultice to treat piles.**  
| | | | | | **Paste of plant is used to treat sun burn.** |
| **Artemisia absinthium L.**  
| **Asteraceae** | **Herb** | **LF: Powder** | **Internal** | **Worms (13), Stomach disorders (1)** | **Powdered dried leaves taken with water is used to expel worms and for the treatment of stomach disorders.** |
| **Artemisia vulgaris L.**  
| **Asteraceae** | **Herb** | **WP: Powder, WP: Infusion, WP: Powder** | **Internal** | **Malaria (6), Fever (2), Oligomenorrhea (2), Headache (2)** | **Whole herb is dried, powdered and taken with water to treat malaria, fever.**  
| | | | | | **Extract of whole plant is taken by women to treat irregular menstruation.**  
| | | | | | **Root is dried, powdered and taken with milk or water to get relief from headache.** |
| **Berberis lycium Royle**  
| **Berberidaceae** | **Shrub** | **FR: Paste, RT: Decoction** | **External** | **Wound healing (6), Eye diseases (5)** | **Paste obtained from fruits is applied externally on wounds for enhanced healing**  
| | | | | | **Water extract of root is used externally to treat eye diseases.** |
| **Cannabis sativa L.**  
| **Cannabinaceae** | **Herb** | **LF: Smoked, LF: Paste, LF: Paste** | **Internal and External** | **Depression (7), Excessive urination (5), Ear-ache (3)** | **Leaves dried are smoked through pipe and called Hukkah to relieve depression.**  
| | | | | | **Powdered leaf mixed with egg yolk is given to children to treat excessive urination.**  
| | | | | | **Leaf essence is used to relieve earache.** |
| **Capsella bursa-pastoris** (L.) Medik. (Kralmund) | Brassicaceae | Herb | AP: Cooked | Internal | Postpartum haemorrhage (9), Constipation (1), Abdominal pain (1), Vomiting (1) | Above ground part is cooked and given to ladies after delivery to cure prolonged bleeding. It is also taken against constipation, abdominal pain and vomiting. | 75 |
|---|---|---|---|---|---|---|---|
| **Cedrus deodara** (Roxb. Ex D. Don) G.D. Don. (Deodar) | Pinaceae | Tree | WD: Oil | External | Wound healing (8), Itching (2), Rheumatic pain (2) | Wood chipped into pieces and the oil obtained is applied directly on wounds and cracked heals as antiseptic. Oil extracted from wood is applied on hands against itching. Oil is also massaged to treat rheumatic pain. | 67 |
| **Centauria iberica** Trevir & Spreng. (Kreach) | Asteraceae | Shrub | TH: Paste, FL: Powder | External | Skin rashes (10), Wound healing (3) | Thorns are burnt and the ash is made into paste with added ghee and applied to treat skin rashes. Dried flowers are powdered and sprinkled on wounds for quick healing and as antiseptic. Powder | 77 |
| **Chenopodium album** L. (Liss) | Chenopodiaceae | Herb | LF: Cooked, AP: Decoction | Internal | Stimulate bowel movement (12), Intestinal worms (3), Diarrhoea (2) | Leaves are cooked as vegetable and used to stimulate bowel movement. Water extract f aerial portion is taken to expel intestinal worms and against diarrhoea. | 79 |
| **Cichorium intybus** L. (Kaw-Handh) | Asteraceae | Herb | WP: Decoction, WP: Poultice | Internal and External | Fever (6), Diarrhoea (3), Fractured bones (1), Wound healing (1) | Whole plant is boiled in water and the extract is taken against fever and diarrhoea. Whole plant is crushed, made into paste and used as poultice on fractured bones and also for wound healing. | 54.54 |
| **Coneza bonariensis** (L.) Cronquist (Shashedra) | Asteraceae | Herb | WP: Infusion, WP: Infusion | Internal | Dysmenorrhea (3), Diarrhoea (2), Abdominal pain (2), Anthelmintic (2), Urinary infections (2) | Extract of whole plant is taken to treat painful menstruation. Extract is taken against diarrhoea, abdominal pain, as anthelmintic and urinary infections. | 33.33 |
| Common Name                           | Family       | Type           | Parts Used       | Internal and External Uses                                                                                          | Traditional Uses                                                                                           | Modern Uses                                                                                           | Efficacy | Quantity |
|--------------------------------------|--------------|----------------|------------------|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|----------|----------|
| Cotula anthemoides L. (Thol-Babul)   | Asteraceae   | Herb           | WP: Decoction, WP: Infusion, WP: Poultice | Chilblain (7), Headache (3), Fever (1), Blood purifier (1), Fractured bones (2) | Whole herb is boiled in water and the extract is used to wash feet in order to get relief from chilblain.   | Water extract of whole plant is used to treat headache and fever and as blood purifier. Plant crushed is made into paste and used directly as poultice on fractured joints. | 50       | 0.26     |
| Cynodon dactylon L. (Dramun)         | Poaceae      | Herb           | WP: Decoction, WP: Paste, WP: Poultice, WP: Juice | Common cold (4), Anti-inflammatory (3), Skin rashes (2), Wound (1) | Decoction of whole plant is taken in case of common cold. Whole plant is made into paste and used as anti-inflammatory. Poultice of whole herb is applied to treat skin rashes. Juice of plant is extracted on wounds to stop bleeding. |                                                                         | 40       | 0.19     |
| Datura stramonium L. (Datur)          | Solanaceae   | Shrub          | SD: Oil, SD: Powder | Hair growth (6), Wounds (3), Cough (4) | Oil obtained by crushing seeds is applied directly on head to enhance hair growth and to treat wounds. Seeds are dried, powdered and taken with water to treat cough. |                                                                         | 46.15    | 0.24     |
| Equisetum arvense L. (Bandakey)      | Equisetaceae | Herb           | AP: Paste, AP Infusion | Skin allergies (3), Strengthening bones (2), Hair fall (2), Urine infection (2), Stomach cramps (2), Wound (2) | Plant is crushed, made into paste and used for skin allergies and strengthening of bones. Paste of the aerial portion is applied on scalp for hair growth. Whole herb is dried, powdered and taken with water to cure urine infection and stomach troubles. Infusion of whole herb is used to stop bleeding from an injury. |                                                                         | 23.07    | 0.24     |
| Plant Name                                      | Family         | Type    | Parts Used          | Internal Uses                                                                 | External Uses                                                                 |
|------------------------------------------------|----------------|---------|---------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Ficus carica L. (Anjeer)                       | Moraceae       | Tree    | FR: Raw, FR: Decoction | **Lactation** (8), **Cough** (2), **Stomach disorders** (2)                  | Dried fruit is taken by women to increase breast milk. Decoction obtained from fruits is used to cure cough, cold and stomach disorders. |
| Geranium wallichianum D. Don. ex Sweet (Ratanjog) | Geraniaceae    | Herb    | RT: Paste           | **Fever** (5), **Muscular pain** (2), **General weakness** (1)               | Halwa made by mixing root powder of plant, with corn flour and ghee is taken to treat fever, muscular pain and general body weakness. |
| Hypericum porforatum L. (Ring-Chai)            | Hypericaceae   | Herb    | WP: Powder, WP: Decoction | **Rheumatism** (5), **Cough and chest infection** (3), **Menorrhagia** (2)  | Whole plant is dried, powdered and taken with water to treat rheumatism. Tea is made of whole plant and used against cough and chest infections and to check excessive menstrual bleeding and abdominal pain |
| Indigofera heterantha L. (Zand)                 | Fabaceae       | Shrub   | RH: Powder, ST: Rubbed, RT: Powder | Abdominal pain (4), **Toothache** (2), **Cough** (2) | Powdered rhizome added with water is taken orally to treat abdominal pain. Young branches are used as brush to treat toothache. Powder of root bark is used to treat cough. |
| Juglans regia L. (Doon)                        | Juglandaceae   | Tree    | BR: Rubbed, LF: Decoction | **Toothache** (10), **Intestinal worms** (2)                                | Bark of the plant is rubbed on teeth to get relief from toothache. Decoction of leaves is taken to cure intestinal worms. |
| Lavatera cashmeriana L. (Saz-posh)             | Malvaceae      | Herb    | FL: Decoction, FL: Powder | Skin irritation (12), **Mumps** (1)                                         | Decoction of flowers is given to pregnant women to treat skin infection. Flowers are dried, crushed and given with milk to children to treat mumps. |
| Malva neglecta Wall. (Sochal)                  | Malvaceae      | Herb    | LF: Cooked          | **Body tonic** (6), **Constipation** (1), **Abdominal pain** (1)             | Leaves are cooked as vegetable and taken with meals as body tonic, to treat constipation, and abdominal pain |
| Mentha arvensis L. (Pudneh)                    | Lamiaceae      | Herb    | LF: Powder          | **Diarrhoea** (9), **Low blood pressure** (1)                               | Dried leaves are powdered and mixed with curd and taken against diarrhoea and low blood pressure. |
| Scientific Name                          | Family           | Type   | Form Used | Use                                      |
|----------------------------------------|------------------|--------|-----------|------------------------------------------|
| Mentha longifolia L. (Yen-pudneh)      | Lamiaceae        | Herb   | Powder, Decoction | Internal: Bad smell (4), Abdominal pain (3), Stomach cramps (3), Indigestion (1) 
Crushed leaves with added salt are taken as mouth freshener. 
Tea made from leaves is taken to cure abdominal pain, stomach cramps and indigestion. |
| Nepeta cataria L. (Bair-gass)          | Lamiaceae        | Shrub  | Powder, Infusion | Internal: Fever (7), Worms (2), Diarrhoea (4), Vomiting (1) 
Leaves are dried, powdered and used against fever, worms and diarrhoea. 
Extract of fresh leaves is taken to prevent vomiting. |
| Phytollaca acinosa Roxb. (Brand-hakh) | Phytolaccaceae   | Herb   | Cooked, Oil | Internal and External: Stomach disorders (7), Swelling of nipples (5), Arthritic pain (5) 
Young leaves cooked and taken as vegetable against stomach disorders. 
Oil obtained from roots is used to treat swelling of the nipple and arthritic pain. |
| Pinus wallichiana A. B. Jack. (Kayar) | Pinaceae         | Tree   | Resin, Oil | External: Cracked heals (4), Wounds (2), Skin rashes (2), Boils (2) 
Resin obtained from the tree is directly applied on cracked heals and wounds for quick healing. 
Stem oil is applied on skin rashes and boils. |
| Plantago lanceolata L. (Gull)          | Plantaginaceae   | Herb   | Juice, Powder, Decoction | External and Internal: Skin infections (9), Cough (2), Cold (1), Purgative (1) 
Juice of leaves is applied on skin infections. 
Tea obtained from leaves is taken in case of cough, cold. 
Seeds are taken with sugar and water as purgative. |
| Plantago major L. (Bead-gull)          | Plantaginaceae   | Herb   | Poultice, Powder, Decoction | External and Internal: Rheumatic pain (6), Fractured bones (2), Dysentery (4) 
Leaves crushed and made into paste are used as poultice for rheumatic pain and on fractured bones. 
Seeds are boiled in water and the water extract is taken to treat dysentery. |
| Podophyllum hexandrum Royle (Wanwangun)| Berberidaceae    | Herb   | Decoction, Paste | Internal and External: Body tonic (4), Vermifuge (3), Snake bite (2) 
Decoction obtained from rhizome is taken orally as a good body tonic and as vermifuge. 
Paste of rhizome is applied on snakebite. |
| Common Name                  | Family      | Type   | Use | Conditions                    | Preparation                                                                 |
|-----------------------------|-------------|--------|-----|-------------------------------|-----------------------------------------------------------------------------|
| *Polygonum aviculare* L.   | Polygonaceae| Herb   | LF: Paste, LF: Poultice, WP: Cooked | External and Internal Boils (5), Joint pain (3), Menorrhagia (3)           | Paste of leaves is applied on boil to get quick relief. Dried leaves made into paste are used as poultice on joints to get relief from pain. Whole plant is cooked and taken as vegetable for excessive menstrual bleeding. |
| *Potentilla indica* (Andrews) Th. Wolf (Ringrish) | Rosaceae    | Herb   | RH: Decoction LF: Poultice | Internal and External Headache (5), Fever (3), General body weakness (1), Diarrhoea (2) | Dried rhizome decoction mixed with milk is taken in case of headache, fever general body weakness and diarrhoea. Poultice of leaf is applied in case of snake bite. |
| *Prunella vulgaris* L. (Kalweuth) | Lamiaceae   | Herb   | WP: Infusion, LF: Paste, LF: Poultice, LF: Decoction | External Muscle pain (7), Wounds (1), Tonic (1) | Extract of whole plant is used as water bath to treat muscle pain. Leaves crushed and made into paste are applied to wounds for enhanced healing. Leaf decoction is taken for energy. |
| *Punica granatum* L. (Daen) | Punicaceae  | Shrub  | FR: Juice, FR: Juice | Internal General body tonic (6), Diarrhoea (4), Jaundice (2) | Juice obtained from fruits is used as general body tonic and to treat diarrhoea. Juice of fruit is taken in jaundice. |
| *Ranunculus arvensis* L. (Dimm-gash) | Ranunculaceae| Herb   | WP: Poultice, WP: Juice | External and Internal Fungal infections (10), Diarrhoea (1) | Whole plant is crushed and used externally as poultice for fungal infections. Juice of whole plant is taken against diarrhoea. |
| *Rheum emodi* Wall. ex Meisn (Pumbchalan) | Polygonaceae| Herb   | RH: Powder | External Burns (10), Ulcers (1), Wounds (1) | Rhizome is dried and made into powder; powder is sprinkled on burns, ulcers and non-healing wounds for enhanced healing. |
| *Robinia pseudoacacia* L. (Kikar) | Fabaceae    | Tree   | LF: Decoction, LF: Decoction | External Chilblains (6), Swelling of joints (4), Fever (1) | Hot water extract from plant leaves is obtained and is used to wash feet in case of chilblains. Extract is also used for bathing to treat swelling of joints and fever. |
| Scientific Name                        | Family         | Type   | Parts Used                | Uses                                                                 |
|---------------------------------------|----------------|--------|---------------------------|----------------------------------------------------------------------|
| *Rubus niveus* Thunb. (Chaanch)       | Rosaceae       | Shrub  | LF: Decoction, FR: Juice, LF: Decoction | Internal: Menorrhagia (3), Fever (2), Tonsillitis (1) Tea made from leaves is taken by women against heavy menstrual bleeding. Juice of fruit is taken to treat fever. Leave are boiled in water and used as gargle to treat tonsillitis. |
| *Rumex nepalensis* L. (Abijj)         | Polygonaceae   | Herb   | RT: Decoction, WP: Paste  | Internal and External: Stomach pain (8), Abdominal pain (3), weakness (1), Skin diseases (2) Root decoction is taken to treat stomach pain and abdominal pain. Whole plant is dried, powdered and made into paste to treat skin diseases. |
| *Salix alba* L. (Veer)                | Salicaceae     | Tree   | LF: Infusion, BR: Decoction, LF: Decoction | External: Joint pain (4), Skin Infection (2), Headache (3) Extract obtained from leaves is used to wash joints to get relief from joint pain. Bark is kept in water for some time and this water is used to bath new born babies in order to prevent them from infection. Extract of leaves is used to cure headache. |
| *Sambucus wightiana* Wall. (Gundula)  | Caprifoliaceae | Shrub  | FR: Juice, RT: Decoction, RT: Decoction | Internal: Expel poisonous substances from stomach (6). Poliomyelitis (4), Diuretic (4) Fruit juice is given orally to stimulate vomiting to expel poisonous substances from stomach. Extract of root is used to treat poliomyelitis in children. Also used as diuretic. |
| *Senecio chrysanthemoides* DC.        | Asteraceae     | Herb   | FL: Poultice LF: Paste    | External: Wounds (6), Asthma (4), Bronchitis (5) Flowers are crushed and applied directly on wounds to prevent infection and for rapid healing. Leaf paste is applied to chest to get relief from asthma and bronchitis. |
| *Sisymbrium irio* L. (Tilgogul-gash)  | Brassicaceae   | Herb   | SD: Paste, LF: Cooked     | External and Internal: Fever (4), Headache (2), Measles (2), Throat and chest infections (3) Seeds are crushed and made into paste and applied in case of fever, headache and measles. Leaves are cooked and taken to treat throat and chest infections. |
| Plant Name                              | Family     | Life Form | FR: Paste, FR: Raw | External and Internal | Conditions                                                                 | Quantity | Price |
|----------------------------------------|------------|-----------|--------------------|-----------------------|----------------------------------------------------------------------------|----------|-------|
| Solanum nigrum L. (Kambai)             | Solanaceae | Herb      |                    | External              | Burns (5), Skin disorders (2), Anti-inflammatory (2), Weakness (1)          | 50       | 0.19  |
|                                        |            |           |                    | Internal              | Leaves made into paste are directly applied on burns and skin disorders.    |          |       |
|                                        |            |           |                    |                       | Also used as anti-inflammatory.                                            |          |       |
|                                        |            |           |                    |                       | Fruit is taken as energiser for general body weakness.                    |          |       |
|                                        |            |           |                    |                       |                                                                           |          |       |
| Solanum tuberosum L. (Alua)            | Solanaceae | Herb      |                    | External              | Burn (3), Bruises (2), Wound healing (2).                                  | 42.85    | 0.13  |
|                                        |            |           |                    |                       | Paste obtained from tuber is applied directly on burn and bruises and for wound healing. |          |       |
| Sonchus arvensis L. (Dudiji-kand)      | Asteraceae | Herb      | LF: Poultice, LT:  | External              | Swelling (6), Boils (2), Wounds (2).                                      | 60       | 0.19  |
|                                        |            |           | Paste              |                       | Leaves are crushed and used as poultice on swelling.                      |          |       |
|                                        |            |           |                    |                       | Latex obtained from plant is applied externally on boils and wounds for quick healing. |          |       |
| Stellaria media (L.) Vill. (Nikhakh)   | Caryophyllaceae | Herb | WP: Cooked, SD: Powder, WP: Paste | Internal and External | Stomach pain (4), Bone fracture (3), Skin infections (3), Swelling (2) | 33       | 0.22  |
|                                        |            |           |                    |                       | Whole plant is taken as a vegetable to treat stomach pain.                |          |       |
|                                        |            |           |                    |                       | Seeds are crushed, made into powder and given with milk to children to treat skin infections. |          |       |
|                                        |            |           |                    |                       | Whole plant is made into paste and applied on affected part to treat bone fracture and swelling. |          |       |
| Taraxacum officinale L. (Handh)        | Asteraceae | Herb      | LF: Cooked         | Internal              | Post-partum haemorrhage (9)                                               | 100      | 0.17  |
|                                        |            |           |                    |                       | Dried leaves are cooked and taken by women after delivery to prevent excessive blood loss. |          |       |
| Trigonella foenum graecum L. (Meth)    | Fabaceae   | Herb      | SD: Decoction, SD: Decoction | Internal | Oligomenorrhea (6), Fever (2), Constipation (2)                          | 60       | 0.185 |
|                                        |            |           |                    |                       | Decoction with added turmeric is taken to check menstrual irregularities in women. |          |       |
|                                        |            |           |                    |                       | Seed decoction is also taken to cure fever, constipation.                 |          |       |
| Species                        | Family     | Type | Uses                                      | Common Uses                                                                 |
|-------------------------------|------------|------|-------------------------------------------|-----------------------------------------------------------------------------|
| *Triticum aestivum* L. (Kaenak) | Poaceae    | Herb | SD: Decoction, SD: Decoction, SD: Infusion | Wormicide (4), Abdominal pain (2), Fever (1), Back pain (2), Toothache (1) |
|                               |            |      | External and Internal                     | Decoction of seeds is given to children as wormicide and for abdominal pain.|
|                               |            |      |                                            | Grain husk is boiled in water for long time and this hot water extract is used by women for bathing to cure fever and back pain. |
|                               |            |      |                                            | Seeds are soaked in water and placed on aching teeth to relieve toothache.   |
| *Urtica dioica* L. (Soi)      | Urticaceae | Herb | LF: Poultice, RT: Paste, LF: Infusion     | Joint pain (5), Wound (3), Stomachic (3)                                    |
|                               |            |      | External and Internal                     | Leaves are made into paste and applied as poultice in case of joint pain.   |
|                               |            |      |                                            | Paste of root is used for wound healing.                                   |
|                               |            |      |                                            | Extract of leaves is stomachic.                                            |
| *Viola odorata* L. (Bunfsha)  | Violaceae  | Herb | FL: Paste                                 | Throat infection (11)                                                      |
|                               |            |      | Internal                                   | Flowers crushed with some added sugar is used to make a jaggery called Khambir and is used to cure throat infection during winters. |
| *Vitis vinifera* L. (Daech)   | Vitaceae   | Tree | FR: Juice, LF: Decoction, TW: Juice       | Fever (6), Headache (2), Indigestion (2), Skin rashes (2), Blood purifier (1)|
|                               |            |      | Internal and External                      | Fruit juice is taken orally against fever, headache and indigestion.       |
|                               |            |      |                                            | Leaves are boiled in water and the extract is used as water bath to treat skin rashes. |
|                               |            |      |                                            | Sap obtained from the twig is used as blood purifier.                       |
| *Zizyphus jujuba* (L.) Gaertn. (Brai) | Rhamnaceae | Tree | FR: Decoction, LF: Juice, LF: Decoction   | Lactation (6), Cough (1), Cold (1), Fever (1), Scabies (1)                |
|                               |            |      | Internal and External                      | Dried fruit decoction given to nursing women to increase the breast milk.   |
|                               |            |      |                                            | Juice obtained from fruits is used to treat cough, cold and fever.          |
|                               |            |      |                                            | Leaf extract is used as water bath to treat scabies.                        |
Table 4. Percentage contribution of different families to ethnomedicinal flora in the study area.

| Family        | Number of species | Percentage contribution |
|---------------|-------------------|-------------------------|
| Asteraceae    | 11                | 18                      |
| Lamiaceae     | 5                 | 8                       |
| Pinaceae      | 3                 | 5                       |
| Fabaceae      | 3                 | 5                       |
| Solanaceae    | 3                 | 5                       |
| Berberidaceae | 2                 | 3                       |
| Brassicaceae  | 2                 | 3                       |
| Malvaceae     | 2                 | 3                       |
| Poaceae       | 2                 | 3                       |
| Plantaginaceae| 2                 | 3                       |
| Rosaceae      | 2                 | 3                       |
| Polygonaceae  | 3                 | 5                       |
| Others        | 1-each            | 2                       |

Herbal preparation and administration
During the present study, it was found that Decoction was the most frequently used mode for herbal recipe preparation with a percentage contribution of 24% followed by Paste (21%), Powder (11%), Poultice (10%), Infusion (9%), Cooked (7%), Juice (7%), Oil (3%), rubbed (3%), raw (2%), smoked (1%) and roasted (1%) (Fig. 4). Our results are in line with other studies (Ribeiro et al. 2010; Shah et al. 2015) showing decoction to be the most preferred herbal preparation to cure various diseases. Since decoction is easy to handle and prepare, and hence is the most favored herbal remedy preparation of local communities in the study area. Some studies (Barkaoui et al. 2017) reported that decoction enhances the effectiveness of plant extracts and thereby increasing its bioactivity. People of the study area use 53% of the herbal recipes internally, while 46% were used externally which is in line with some other studies (Bussmann & Glenn 2010) carried out in different parts of the world.

Informant consensus factor
Different diseases reported from Gulmarg Mountainous region were classified into 12 ailment categories (Table 2) in order to develop consensus of the informants on medicinal plant species. The informant consensus factor (ICF) values ranged from 0.67-0.83 (Table 5), with highest value of 0.83 for dermatological disorders. Ranunculus arvensis, Lavetera cashmeriana, Rheum emodi, Centaurea iberica, Plantago lanceolata were most frequently used plants to treat dermatological problems. During the study it was found that around 29 plant species with 162 use reports were used to treat different skin diseases. These medicinal plant species also find mention in traditional medicine all over the world and some have already been objectively validated using experimental pharmacological assays. Rananculus arvensis produces chemicals that belong to many secondary metabolite classes, such as triterpenes, saponins, alkaloids, flavonoids, and others, and have been proven to have antioxidant, antibacterial, antiviral, anti-inflammatory, and nematocidal properties (Hachelaf et al. 2015). The phytochemical examination of Lavetera cashmeriana root and leaf extracts revealed a wide range of bioactive compounds. Steroids, saponins, glycosides, alkaloids, flavonoids, gums and mucilages. Antibacterial activity of L. cashmeriana has been documented in human pathogenic bacteria including E. coli, B. cereus, S. aureus, P. aeruginosa, K. pneumoniae, and C. perfringens. It was also found that, if appropriately exploited, the roots and leaves of L. cashmeriana might be used as an antibacterial source in the pharmaceutical, food, and cosmetic industries (Mir et al. 2017).
Table 5. Value of informant consensus factor (ICF) for each disease category.

| Disease Category     | Number of use reports (Nur) | Number of taxa (Nt) | ICF  |
|----------------------|------------------------------|---------------------|------|
| Gastrointestinal     | 158                          | 29                  | 0.82 |
| Dermatological       | 162                          | 29                  | 0.83 |
| Wounds               | 45                           | 15                  | 0.68 |
| Nervous disorder     | 26                           | 8                   | 0.72 |
| Respiratory          | 51                           | 11                  | 0.80 |
| Gynaecological       | 60                           | 12                  | 0.81 |
| Skeletomuscular      | 67                           | 18                  | 0.74 |
| Cardiovascular       | 10                           | 4                   | 0.67 |
| Antipyretic          | 40                           | 12                  | 0.72 |
| Ear, Mouth, Eye (EME)| 42                           | 11                  | 0.76 |
| Liver and Kidney     | 15                           | 5                   | 0.71 |
| Body weakness        | 20                           | 7                   | 0.68 |
**Rheum emodi** is a valuable medicinal plant with a wide range of pharmacological properties. More than 56 compounds have been found in the roots and rhizomes of this plant, including flavonoids, lignins, phenols, esters, and anthraquinones, which have antimicrobial, hepatoprotective, antioxidant, and anti-diabetic properties (Rokaya et al. 2012). **Rheum emodi** is used in the Unani system of medicine to treat constipation, cough, and cold (Uniyal et al. 2006). *Plantago lanceolata* have been shown to contain Steroids, alkaloids, flavonoids, tannins, saponins, glycosides, phenols, and terpenoids and the presence of these key phytochemicals in the plant provides scientific support for its use as a medical treatment for a variety of human ailments (Fayera et al. 2018). The second highest value i.e., 0.82 was calculated for gastrointestinal disorders. **Artemisia absinthium**, **Ajuga bracteosa**, **Chenopodium album** and **Rumex nepalensis** are commonly utilized by the people of study area for the treatment of gastrointestinal disorders. For treatment of gastrointestinal disorders 29 plant species with 158 use reports have been recorded in the present study. The third highest value i.e., 0.81 was reported for gynecological disorders (12 plant species with 60 use reports). **Capsella bursa-pastoris**, **Taraxacum officinale**, **Zizyphus jujube**, **Trigonella foenum graecum** are abundantly utilized by the tribal people for treating gynecological disorders. The next ICF value of 0.80 was calculated for respiratory disorders (11 plant species with 51 use reports) followed by 0.76 for Ear, Mouth, Eye (EME) diseases (11 plant species with 42 use reports); 0.74 for Skeletomuscular disorders (18 plant species with 67 use reports); 0.72 for Nervous disorder (8 plant species with 26 use reports); 0.71 for Liver and Kidney disorders (5 plant species with 15 use reports) and 0.68 for both wound and body weakness. The lowest ICF value of 0.67 was calculated for cardiovascular disorders. 4 species including, **Allium sativum**, **Cotula anthemoides**, **Mentha arvensis** and **Vitis vinifera** were utilized to treat such disorders with 10 use reports (Table 4).

Some other ethnomedical studies carried out in India and other parts of the world also reported a high value of ICF for dermatological disorders (Yabesh et al. 2014, Umar et al. 2017, Tounekti et al. 2019). The highest ICF for dermatological disorders suggests that there is a better communication among the informants and that the knowledge regarding the use of medicinal plants for treating various diseases of skin is shared among them. It can also be attributed to the fact that such disorders are relatively high in the study area.

**Fidelity value**

Fidelity level value recognizes the most preferred medicinal plant species used to treat different ailments and illustrates the fraction of informants reporting the use of a particular plant species. In the present study the fidelity value of medicinal plants range from 23-100% (Table 2). Plant species *Taraxacum officinale* and *Viola odorata* (for post-partum hemorrhage and throat infection respectively) have the highest fidelity value (100%). The second highest fidelity value i.e., 93% was reported for *Artemisia absinthium* used against worms; followed by *Lavatera cashmeriana* used against skin irritation by pregnant women (92%); *Ranunculus arvensis* used against fungal infections (91%); *Mentha arvensis* for diarrhea (90%); *Juglans regia*, *Rheum emodi* used against toothache and burns respectively (83%); *Chenopodium album* used to stimulate bowel movement (79%); *Prunella vulgaris* for muscle pain (78%); *Centauria iberica* for skin rashes (77%); *Ajuga bracteosa*, *Capsella bursa-pastoris*, *Malva neglecta* for Postpartum haemorrhage, body tonic and abdominal pain respectively (75%). Plant species having high fidelity value are more commonly utilized by the native population of the study area to treat various ailments as compared to those plants with low fidelity value. Farooq et al. (2019) reported the highest fidelity value for *Taraxacum officinale* which in in line with our study. *Taraxacum officinale* is well-known for its therapeutic potential among the local population of Kashmir valley for treating post-partum disorders (Yousuf et al. 2012, Mir et al. 2021). *Viola odorata* is also considered an important medicinal plant in Unani and Ayurvedic system of medicine for respiratory disorders (Vohora 1986). Various studies in Kashmir as well have reported *Viola odorata* to be used against respiratory disorders (Malik et al. 2011). It has also been reported to possess antioxidant and diuretic properties (Vishal et al. 2009).

**Use value**

To estimate the relative importance of medicinal plant species in the study area, use value (UV) was calculated on the basis of informant’s citations. In our study use value ranged from 0.13-0.33 (Table 2). *Achillea millefolium* had the highest use value of 0.33 followed by *Chenopodium album*, *Phytolacca acinosa*, (0.31 each); *Ajuga bracteosa* (0.30); *Cannabis sativa* and *Senecio chrysanthemoides* (0.28 each). Least use value of 0.01 was exhibited by *Solanum tuberosum*. High use value of medicinal plant species indicates the richness of these plants in the region and the dependence of local population on such species for treating various ailments (Hussain et al. 2019).

Many of the plants used by native people in Baramulla district that were found to have high use value have been mentioned in previous medicinal literatures and are also used in Unani and Ayurvedic medicine systems, and some of the plants
mentioned in this study have already been scientifically validated using pharmacological assays. Savink et al. (2013) in their study on traditional use of medicinal plants in South-western Serbia, Zlatibor district reported a high use value for Achillea millefolium which is in agreement with our study. The presence of many chemical constituents, such as essential oils, sesquiterpenes, phenolic compounds, and others, gives Achillea millefolium a broad variety of pharmacological properties, including spasmylytic, anti-inflammatory, analgesic, haemostatic, anti-diabetic, cholagogue, antitumor, antioxidant, antifungal, antiseptic, and liver protective effects (Ali et al. 2017). Local people of the study area use Chenopodium album to stimulate bowel movement, against intestinal worms and Diarrhoea. This plant has been found to have antiviral, antifungal, anti-inflammatory, antiallergenic, antiseptic, and immunomodulatory properties (Amjad and Alizad 2012). Chenopodium album has also been claimed to possess strongest anti-breast cancer efficacy (Khoobchandani et al. 2009).

Phytolacca acinosa is another multi utility medicinal plant species used against stomach disorder, swelling of nipples and arthritic pain. Tannins, flavonoids, carbohydrates, proteins, polyphenol, tannins, and phenolic compounds were found in preliminary phytochemical screening of Phytolacca acinosa plant extract, which showed significant antibacterial and antifungal activity (Manzoor et al. 2017). Ajuga bracteosa is used by the locals to relieve abdominal pain. Malik et al. (2011) also reported Ajuga Bracteosa to cure abdominal pain whereas, Uniyal et al. (2006) reported it to cure mouth ulcers and breathing problems and Gairola et al. (2014) reported its use against leucorrhoea, diarrhoea, malaria. Ajuga bracteosa has been used in medicine since ancient times, with anti-inflammatory, antifungal, antibacterial, and anthelmintic properties (Israili and Lyoussi 2009). In the present study Cannabis sativa is reported to treat depression, excessive urination and ear-ache. This plant is well-known around the world for its stimulating and therapeutic effects, and its formulations have also been employed in antibacterial experiments (Kreji 1958).

Herbal remedies comparative analysis and novelty of the study

The ethnomedicinal data reported in the present study was compared with previously published national and international articles (Malik et al. 2011, Bhatia et al. 2014, Shah et al. 2015, Dutt et al. 2015, Kumar et al. 2015, Singh et al. 2016, Ishiyab & Hussain 2017, Jeelani et al. 2018, Mir et al. 2021) similar to our study from Northwestern Himalaya. It was observed during comparison that a total of 26 different medicinal plants were reported to have some of the novel medicinal uses (designated in bold letters in Table 3). Of the total 55 ailments treated by using these 26 medicinal plants, 33 were recorded as novel ailments reported for the first time. Our study adds some novel ethnomedicinal claims of different medicinal plants used in the study area, which may serve for pharmacological and phytochemical analysis for the discovery of new drugs.

Conclusions

Medicinal flora forms the pillar of our traditional healthcare structure with a huge part of population still dependent on traditional medicines in most of the developing countries. Present study was an attempt to underline the potential medicinal plants used by the Guijar and Bakerwal communities of Gulmarg mountainous region of Baramulla for obtaining their primary healthcare. It can be concluded from present research that people of the study area possess a rich traditional knowledge inherited from their forefathers and documentation of this valuable knowledge has provided novel information from the area. Native populations still rely on medicinal plant for their primary health care, but at the same time are alarmed about the degradation of the flora in wild. It was found that the elderly people possessed a great wealth of indigenous knowledge in comparison to the younger ones, this difference in knowledge might be due to the changing lifestyle of younger folk, changing views of ethnic communities and the increasing influence of industrialization, due to which traditional medicinal knowledge of plant species is frequently vanishing at an alarming rate. Therefore, there is a need to speedily document the important plants and associated knowledge and to take necessary measures for the conservation of these resources so as to save this treasure; otherwise a great number of medicinally important plants will become extinct in wild. Thus, our research could prove helpful in the direction of the local biodiversity catalogues for the conservation of biodiversity. We recommend that species reported with high use value (UV) and fidelity level value (FL) should be employed for further phytochemical and pharmacological investigation to authenticate this indigenous knowledge.

Declarations

List of abbreviations: LF-Leaf, BR-Bark, RS-Resin, WP-Whole plant, BL-Blub, AP-Aerial portion, FR-Fruit, RT-Root, WD, Wood, TH-Thorn, FL-Flower, SD-Seed, RH-Rhizome, ST-Stem, TB-Tuber, TW-Twig.

Ethics approval and consent to participate: The study was conducted after approval from the local government organizations of the area. Prior consent
was also taken from the participants before their participation in the study.

Consent for publication: Not applicable.

Availability of data and materials: The plant specimens were deposited in KASH herbarium of Department of Botany, University of Kashmir, Srinagar, India.

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