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Ethnomedicinal Plants of Pangna Region of Karsog Valley, Himachal Pradesh

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ABSTRACT

Traditional knowledge of native plants in a particular culture and religion to treat various diseases has been a part of rural life since ancient times. More than 80% of world's population is dependent on medicinal plants for healthcare.A varieties of herbal drugs are used traditionally to treat various health disorders and to prevent different ailments in Indian Himalayan Region (IHR). The present study documented the unexplored traditional knowledge of medicinal plants used by the local inhabitants of Pangna region of Tehsil Karsog, Himachal Pradesh. Medicinal plants are traditionally used by the rural populace of the region to maintain health, prevent diseases and to cure different ailments. The study region is rich in biodiversity as it falls under sub-temperate region of the North Western Himalaya. The present paper provides information about 39 medicinal plants (17 herbs, 9 shrubs, 11 trees and 2 climbers) belonging to 37 genera and 28 families.The ethnomedicinal data were statistically analyzed by using ethnobotanical indices such as Use Value (UV) and Informant Consensus Factor (ICF) to have a better and clear idea of ethnobotanical wisdom in the study area.

Keywords: *Ethnobotany, Medicinal plants, Traditional knowledge, Ailments, Conservation.*

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INTRODUCTION

Ethnobotany is the study of native plants in a particular culture and region. The term 'Ethnobotany' was given by J.W. Harshberger in 1896; considered as mutual interaction between plants and traditional people [1]. Local plants are used bypeople as source of food, medicine, shelter, clothing and for religious rituals.Traditional knowledge of medicinal plants to treat various diseases has been a part of rural life since ancient times. According to World Health Organisation, more than 80% of world's population in developing countries are reliant on the medicinal plants and traditional healthcare system [2]. A variety of drugs derived from plants are traditionally used to treat health disorders and to prevent different ailments.

Indian Himalaya Region (IHR) covers approximately 5.3 lakh square kilometer area and physiographically, extends from the foothills of Shivalik in south to Tibetan plateau in the north. IHR is home of more than 9000 plant species out of which nearly 33% are endemic [3].These include some 1,748 species of medicinal plants with various traditional and modern therapeutic uses [4]. Himachal Pradesh is a part of Indian Himalayan Region (IHR), situated in the lap of Western Himalayas between 30º 22' 40'' and 33º 12' 40'' N latitude and 75º 45' 55'' and 79º 04' 20'' E longitude, covering an area of 55,673 square kilometers. This Himalayan state has an immense wealth of rich diversity of medicinal plants due to its unique phytogeography and diverse range of altitude (350-6800 m), climate and topography. Himachal Pradesh is a reservoir of medicinal plants and home of about 643 medicinal plants [5]. In Himachal Pradesh, a large no. of studies is carried on medicinal plants [6-12].

The present study was undertaken in the Pangna region of Karsog valley of district Mandi, Himachal Pradesh. Recently, large number of ethno-medicinal studies has been carried out in different part of district Mandi [13-18]; but the information specific to Pangna region is meagre.

Pangna region is rich in biodiversity and culture but still unexplored. The local people and rural populace of Pangna are still dependent on the medicinal plants and have deep faith on their traditional medicines for remedies. So, a number of field surveys were conducted in the flowering/fruiting season (2021-2022) to investigate and document the traditional ethnobotanical knowledge of the rural populace of Pangna region. Medicinal plant-based remedies are used to cure different ailments like respiratory problems, skin

problems, gastro-intestinal disorders, jaundice, diabetes, arthritis etc. Ethno-medicinal traditional knowledge is based on experiences and only limited to traditional "Vaidya" and old people. Young generation is least interested in conservation of traditional ethnomedicinal knowledge. So, the present study was conducted to document and conserve the traditional ethnobotanical knowledge of the region for future generations.

MATERIAL AND METHOS

STUDY AREA

Present study was conducted in the Pangna region of Karsog in district Mandi, Himachal Pradesh. Study area falls under Sub-temperate humid region of 'North-Western Himalayan Hill Zone' and lies in the lap of Shikari Devi Wildlife Sanctuary. Geographically the area lies between 31º 36' 55'' to 31º 40' 55'' N latitude and 77º 10' 34'' to 77º 14' 34'' E longitude with an elevation varies from 1,200 to1,750 meters. Historically, Pangna was the first capital of Sen dynasty of Suket state. This region is rich in biodiversity and culture. A small water stream (Pangna-Bithari khad) flows in the region which is the main source of drinking water and irrigation. The main crops of the region are wheat, rice and maize. The soil of the region is mainly sandy loam to clay loam.

Extensive and intensive field surveys were carried out in the selected areas of sub-tehsil Pangna from October 2021 to December 2022 across all the seasons to collect maximum information from the informants. Selected areas included 27 villages of 9 panchayats. Ethnomedicinal data was collected through group discussions and semi-structured interviews from the local people. The interviews were carried out in informal way and in the local dialect of the region.

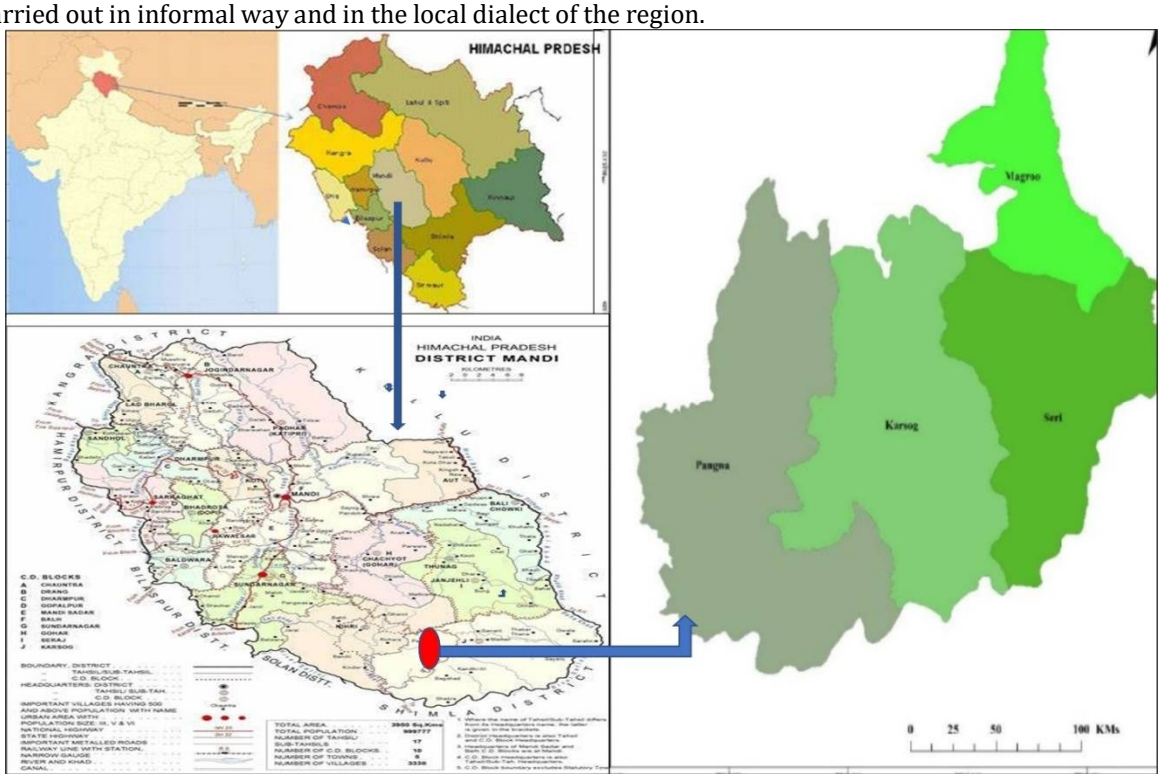

Fig 1| Location map of study area (Pangna region)

The collected ethnomedicinal data included:

- Local ethnomedicinal uses of the plants within the study area
- Vernacular/ local name of plant
- Habit of plant (herb/shrub/tree/climber)
- Plant part/s used in formulation
- Nature of ailment treated
- Mode of preparation

This ethno-medicinal data had been collected from local people including local healers (vaids), elderly people and lady practitioner (dai). A total of 65 informants (30 male and 35 female) of different the age group (20-80 and 80 above) were interviewed during the survey (Table 1). Herbarium of collected plant specimens was prepared by following standard methods [19].

Table 1 | Statistical profile of informants

Gender	Number	Percentage (%)
Male	30	46.15
Female	35	53.84
Age groups	**Male (Percentage)**	**Female (Percentage)**
20-40	4 (13.33%)	7 (20%)
40-60	13 (43.33%)	15 (42.85%)
60-80	11 (36.66%)	12 (34.28%)
80 and above	2 (6.66%)	1 (2.85%)
Education	**Male (Percentage)**	**Female (Percentage)**
0-5th	11 (36.66%)	13 (37.14%)
5th-8th	7 (23.34%)	9 (25.72%)
8th-10th	5 (16.66%)	6 (17.14%)
10th-12th	5 (16.66%)	5 (14.28%)
Above 12th	2 (6.67%)	2 (5.71%)

Quantitative Ethnobotany

A comprehensive data analysis was done by using two different quantitative indices *i.e.,* Informant Consensus Factor (ICF) and Use Value (UV).

Informant Consensus Factor (ICF)

ICF was calculated by using following formula (Heinrich *et al*., 1998) [20]:

$$ICF = \frac{Nur - Nt}{Nur - 1}$$

Here, 'Nur' refers to number of use reports for particular disease category and 'Nt' is the number of plant species used in the same disease category by all informants. ICF value ranges from 0 to 1. IFC value near to one (1) indicates that plant species are used by large proportion of population and the information is exchanged among informants eagerly. Low ICF value indicates that plant is chosen randomly (used by a small portion of population) or there is disagreement of the informants on the use of plant species [21].

Use Value (UV)

The Use Value (UV) determines the relative importance of utilized local plants. In the present study, UV was calculated by using following formula (Philips *et al*., 1994) [22]:

$$UV = \frac{\sum U}{N}$$

Here, 'U' is the number of uses mentioned for a given plant species by each informant and 'N' is the total number of informants interviewed for the present study. UV of a plant species is directly proportional to uses report or importance of the plant species. Use values are high when there are many uses reports for a plant species and thus plant is important. If use reports for a plant species is low, UV is also low or approaches to zero.

RESULTS & DISCUSSION

Demography of informants

The characteristics description of the interviewed informants is given in Table 1. A total of 65 informants between the age group 20-80 years and above were interviewed.The demographic distribution of informants (age, gender and qualifications) was also noted. Out of total, 30 (46.15%) were male and 35 (53.84%) were female. Most of the informants were belonging from the age group of 40-60 (28 informants) followed by age group 60-80 (23 informants). Least information was provided by the informants of age group between 20-40 years.

Attributes of Documented Plant Species

A total of 39 medicinal plant species belonging from 37 genera and 28 families were reported from the study area. All the documented species are indicated in Table 2 with their family, local name, common name and ethnomedicinal uses along with the quantitative indices *i.e*., use value (UV). Predominant families were Lamiaceae, Rosaceae, Rutaceae and Solanaceae (03 spp., each) followed by Apiaceae, Moraceae, Oxalidaceae with plant species (02, each) and remaining families with one plant species (Fig 1). Among the genera, *Ficus* and *Solanum* (02 spp., each) were the species rich.

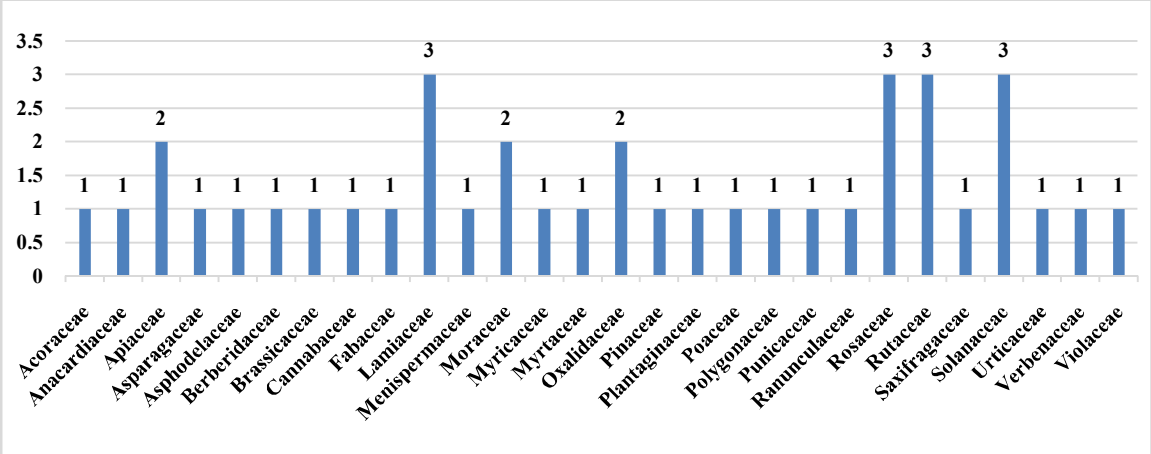

Fig 1| Families with number of reported plant species

Table 2 | Documented medicinal plant species along with their uses from the study area:

Botanical Name	Family	Local Name	Common Name	Habit	Part(s) Used	Disease/Ailment treated (no. of informants)	Total citations (∑U)	Use value (UV)	Treatment/ Mode of usage
Acorus calamus L.	Acoraceae	Barja	Calamus	Herb	Rhizome	Memory enhancer (3), Stomachache (5), cold (4) cough (5), sore throat (2).	19	0.29	Tea prepared from rhizome cures sore throat, cold and cough. Dried rhizome powder is good for stomachache and dysentery. It is also a good memory enhancer.
Ajuga parviflora Benth.	Lamiaceae	Neelkanthi	Small-Flowered Bugleweed	Herb	Leaves	Diabetes (3), Throat infection (7), Nasal bleeding (2)	12	0.18	5-6 g of powdered leavesis recommended twice daily for diabetes. Leaf decoction is used in throat infection and nasal bleeding.
Aloe vera (L.) Burm.f.	Asphodelaceae	Kwar-patha	Aloe vera	Herb	Leaves	Wounds (5), Burn (2), Skin problems (11)	18	0.27	Gel of leaves is applied to heal wounds, burning skin and other skin problems.
Asparagus adscendens Roxb.	Asparagaceae	Sansarpali	Climbing Asparagus	Climber	Rhizome	Galactagogue (4), Memory enhancer (3), Genital dysfunction (2)	9	0.13	1 teaspoon of rhizome powder twice a day helps in increasing lactation after delivery. It is also useful in male genital dysfunction and act as a brain tonic.
Bauhinia variegata L.	Fabaceae	Karyale	Mountain Ebony	Tree	Flowers	Piles (2), Dysentery (6)	8	0.12	1 teaspoon (twice a day) of dried flower buds powder is used in treatment of piles and helpful in dysentery.
Berberis aristata DC.	Berberidaceae	Kmshad	Indian Barberry	Shrub	Fruits, Roots	Diabetes (7), Boils (11), Wound (4)	22	0.33	Ripe fruits are eatenand considered good for diabetes. Paste of roots are used against boils, wounds and other skin problems.

									Roots are used in ayurvedic formulation "Rasaut".
Bergenia ciliata (Haw.) Syernb.	Saxifragaceae	Pathan-beg	Elephant Eared Saxifrage	Herb	Rhizome	Kidney stone (3), Cough (5), Cold (4)	12	0.18	Tea prepared from the rhizome is used against cold, cough and kidney stone.
Boenninghausenia albiflora (Hook.) Meisn.	Rutaceae	Pilia-ki-dawai	White Himalayan Rue	Herb	Roots, Leaves	Jaundice (2), Piles (3), Headache (2)	7	0.1	8-10 ml of root extract given on empty stomach to cure jaundice and also considered effective against piles. Leaves juice is applied externally to relieve headache.
Cannabis sativa L.	Cannabaceae	Bijya, Bhang	Indian Hemp	Herb	Leaves	Wasp bite (3), Nettle sting (8)	11	0.17	Paste of fresh leaves used as antidote for wasp bites and nettle sting.
Cedrus deodara (Roxb. *ex* D. Don) G. Don	Pinaceae	Keol, Dyar	Himalayan Cedar	Tree	Roots, Leaves	Eczema (4), Joint pains (6)	10	0.15	Keula', an oil extracted from the roots by steam distillation is applied externally to cure joint pains, Eczema and other skin problems.
Centella asiatica (L.) Urb.	Apiaceae	Brahmi	Indian Pennywort	Herb	Leaves	Memory enhancer (13), cuts (2), wounds (2).	17	0.26	One teaspoon of dried herbal powder of leaves is taken with milk during night help in strengthen in memory. Paste of leaves is used to heal cuts and wounds.
Coriandrum sativum L.	Apiaceae	Beehn	Coriander	Herb	Seeds	Cough (9), Diarrhea (3), Constipation (2)	14	0.21	One teaspoon of crushed seeds taken orally with Luke warm water daily for 7 days is recommended for cough and stomach problems.
Cynodon dactylon (L.)	Poaceae	Drubdi, Durba	Doorva	Herb	Whole plant	Nasal bleeding (5), Headache (3), Allergy (2)	10	0.15	5 ml of plant juice (3-4 days twice) is used for nasal bleeding, headache and skin allergy.
Eucalyptus globulus Labill.	Myrtaceae	Safeda	Blue Eucalyptus	Tree	Leaves	Joint pains (8)	8	0.12	Leaves are boiled with water and wrapped around the joints for treatment of joint pains.
Ficus palmata Forssk.	Moraceae	Fegda	Wild Fig	Tree	Fruits	Constipation (2), wounds (9)	11	0.17	Ripe fruits are eaten and are good for constipation. Milky latex is applied to heal cut and wounds.
Ficus religiosa	Moraceae	Pipal	Holy Fig Tree	Tree	Fruits	Infertility (3)	3	0.04	5-8 grams of powder of dried fruit (twice a day) is given with milk for 12 days after the menstruation period, to

									overcome infertility in women
Murraya koenigii (L.) Spreng.	Rutaceae	Kadhipata	Curry Leaf Tree	Tree	Leaves	Diabetes (3), Constipation (2)	5	0.07	6-8 grams of powdered leaves are taken with luke warm water (twice a day) is good for diabetes, constipation and other digestive problems.
Myrica esculenta Buch. -Ham. ex D. Don	Myricaceae	Kaphal	Leafy Meadow-Rue	Tree	Fruits	Nasal bleeding (4), Mouth ulcer (3)	7	0.1	Ripe fruits consumed and helps in preventing nasal bleeding. Leaves are chewed as remedy for mouth ulcers.
Oxalis corniculata L.	Oxalidaceae	Khatti-mitthi	Creeping oxalis	Herb	Whole plant	scurvy (3), Urinary tract infection, (2) Insect bite (2)	7	0.1	Plant is a good source of vitamin C and is chewed for treatment of scurvy. 15-20 ml of plant extractis given on empty stomach for 3-5 days in treatment of urinary tract infection. Extract of plant is applied externally on insect bites.
Phyllanthus emblica L.	Oxalidaceae	Ambla	Indian Goose Berry	Tree	Fruits	Immunity enhancer (5), Hair tonic (11)	16	0.24	Amla extract is used to enhance immunity. Powdered fruits used as hair dye and help in hair growth.
Pistacia integerrima Stew.ex Brandis.	Anacardiaceae	Kakru, Kakar-sighi	Krab's claw	Tree	Leaves (gall)	Asthma (3), Cough (12), Cold (5)	20	0.3	8–10-gram dried gall powder along with honey or Luke warm water is given in cough, cold and asthma.
Plantago lanceolata L.	Plantaginaceae	Isabgol	Common plantain	Herb	Leaves	Cough (3), wounds (5)	8	0.12	Infusion of leaves is used to treat cough. Leaves juice is applied to heal wounds.
Prinsepia utilis Royle	Rosaceae	Bhekhal	Himalayan Cherry Prinsepia	Shrub	Seeds	Rheumatism (4)	4	0.06	Seed oil is applied externally for rheumatism.
Prunus cerasoides D. Don	Rosaceae	Paaja	Wild Himalayan Cherry	Tree	Leaves	Nasal bleeding (5), Headache (3), Allergy (2)	10	0.15	20-30 ml of leaf extract along with Aloe vera juice and water is given the morning to cure nose bleeding.
Punica granatum L.	Punicaceae	Daadu	Wild Pomegranate	Tree	Fruits	Nasal bleeding (4), Diarrhea (3), Dysentery (6)	13	0.2	Ripe fruits consumed, also good for nasal bleeding. 5-8 gram of fruit rind ashgiven with luke warm water for treatment of diarrhea and dysentery (twice a day for 3 days).
Rosa brunonii Lindl.	Rosaceae	Kachhih	Himalayan Musk Rose	Shrub	Flowers	Allergy (2), Eye problems (4)	6	0.09	Paste of fresh flowers applied externally to cure skin and eye problems.

Roylea cinerea (D.Don) Baill.	Lamiaceae	Kadwya	Ashy Roylea	Shrub	Stem, Leaves	Jaundice (5), Itching (3)	8	0.12	3-5 ml of stem extractis given twice a day to infants to cure jaundice. Paste of leaves is used against itching and other skin problems and is applied externally.
Rumex hastatus D. Don	Polygonaceae	Malori	Arrow leaf Dock	Shrub	Leaves	Bloody dysentery (4), Nasal bleeding (2)	6	0.09	Juice of leaves acts as coolantand is given orally (3-4 days; 1 dosage daily) in the treatment of bloody dysentery and nasal bleeding.
Solanum nigrum L.	Solanaceae	Jangalita matar	Black Nightshade	Herb	Fruits	Fever (6), Diarrhea (3), Eye problems (3)	12	0.18	Ripened fruits are consumed for the treatment of fever, diarrhea and eye disease.
Solanum tuberosum L.	Solanaceae	Aloo	Potato	Herb	Tuber	Burn (9), blemishes (4)	13	0.2	Paste of tuber is applied externally in treatment of burns. Juice of raw potato is useful to clear skin blemishes.
Thalictrum foliolosum DC.	Ranunculaceae	Pili-jari	Leafy Meadow-Rue	Herb	Roots	Piles (2), Snake bite (3)	5	0.07	Extract of roots (5ml daily) is taken after night meal and is used to cure piles and also for treatment of snake bite.
Thalpsi arvense L.	Brassicaceae	Chopdi	Fan weed	Herb	Seeds	Joint pains (4)	4	0.06	Oil obtained from its seeds used to relieve joint pain.
Thymus linearis Benth.	Lamiaceae	Banjwain	Himalayan Thyme	Herb	Whole plant	Mouth ulcer (9), Toothache (7), Cough (3)	19	0.29	Leaves are chewed to cure mouth ulcers, sore throat and toothache.
Tinospora cordifolia (Willd.) Hook.f. & Thomson	Menispermaceae	Guljya	Giloy	Climber	Stem	Fever (8), Stomachache (6)	14	0.21	20-30 ml of stem juice mix with luke warm water andtulsi leaves given on empty stomach (twice a day) is helpful in treatment of fever and stomachache.
Urtica diocia L.	Urticaceae	Kugsi	Stinging nettle	Herb	Leaves	Urinary tract infection (4), Heavy menstrual flow (2), muscular Strain (9)	14	0.23	A paste of leaves mixed with rock salt and clay soil is used for the treatment of muscular strain. Herbal green tea is prepared from its leaves used for urinary tract infection and to control heavy menstrual flow in the women.
Viola canescens Wall.	Violaceae	Banfsha	Banfasha	Shrub	Flowers	Bronchitis (3), Cough (7), Cold (10)	20	0.3	Herbal tea of flowers is used to cure cold, cough and acute bronchitis.
Vitex negundo L.	Verbenaceae	Banya	Chinese Chaste tree	Shrub	Leaves	Arthritis (7)	7	0.11	Leaves are boiled with water, filtered and used against rheumatoid arthritis.

Withania somnifera (L.) Dunal.	Solanaceae	Ashwagandha	Winter cherry	Shrub	Roots	Stress (4), Insomnia (2)	6	0.09	4-5 gram of root powder given with cow's milk is helpful in insomnia and help the body cope with stress.
Zanthoxylum armatum DC.	Rutaceae	Tira-mir, Timbr	Winged Prickly Ash	Shrub	Fruits	Mouth ulcer (8), Toothache (5)	13	0.2	Fruits are chewed for mouth ulcer and toothache.

Out of 39 plant species, predominant plant species were herbs 43.58% (17 spp.) followed by trees (11 spp.) 28.20%, shrubs (9 spp.) 23.07% and climbers (2 spp.) 5.12% (fig. 2.) Leaves were mostly used (34.88%) in traditional medicines, followed by fruits (18.6%), roots (11.62%), flowers, seeds, whole plant, rhizome (6.97%), stem (4.65%) and tubers (2.32%) (Fig. 3).

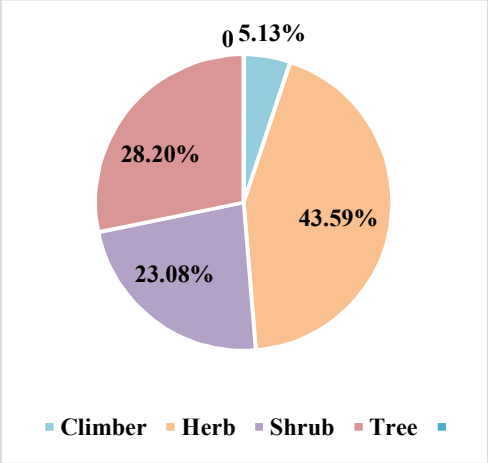

Fig 2 | Habit of plant species

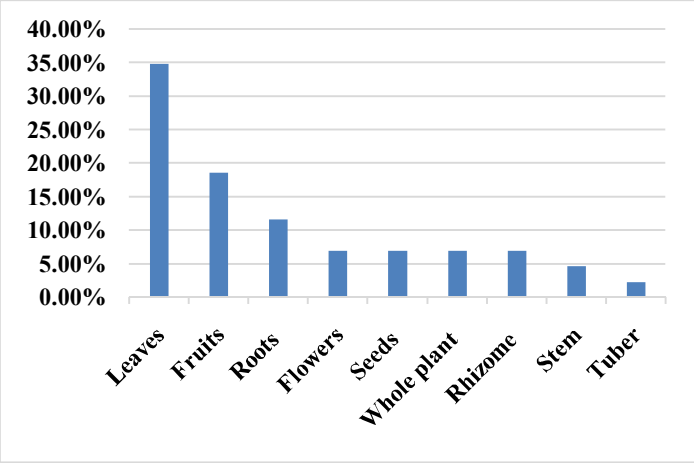

Fig 3 | Percentage of plant parts used

Use Value of Plant Species

Use value was calculated on the basis of informant's citations to estimate the relative importance of medicinal plant species. In the present study, UV ranged from 0.04 to 0.33. *Berberis aristata* reported with highest use value of 0.33 followed by *Pistacia integerrima*, *Viola canescens* (0.3 each), *Acorus calamus*, *Thymus linearis* (0.29 each), *Aloe vera* (0.27), *Centella asiatica* (0.26), *Phyllanthus emblica* (0.24), *Urtica diocia* (0.23), *Coriandrum sativum*, *Tinospora cordifolia* (0.21 each) and 0.2 for *Punicagranatum, Solanum tuberosum, Zanthoxylum armatum*. *Ficus religiosa* reported with lowest use value of 0.04. The plant species with higher UV were used to treat various diseases such as boils, bronchitis, cold cough, mouth ulcer, stomachache, wound, diabetes and dysentery (Table 2).

Informant Consensus Factor (ICF)

To calculate the ICF, all the reported diseases were categorized into 11 different categories (Table 3). The ICF value ranges from 0.75 to 0.91 in the present findings.

Table 3: Disease categories based on ailments record and calculated ICF (Informant Consensus Factor)

Sr. No.	Major categories	Responded by informants	Nur	Nt	ICF
1	**Oral problems**	Toothache, mouth ulcer, scurvy	35	4	0.91
2	**Dermatological Disorders**	Boils, wounds, cuts, eczema, itching, blemishes, burn, allergy, skin problems	77	11	0.86
3	**Reproductive disorders**	Infertility, genital dysfunction, galactagogue, heavy menstrual flow	11	3	0.8
4	**Gastro intestinal disorders**	Constipation, piles, jaundice, dysentery, diarrhea, bloody dysentery, stomachache	56	12	0.8
5	**Respiratory disorders**	Asthma, throat infection, sore throat, nasal bleeding, cold, cough, bronchitis	102	15	0.86
6	**Urological disorders**	Kidney stones, urinary tract infection	9	3	0.75
7	**Inflammation**	Rheumatism, arthritis, joint pain, muscular strain	34	6	0.84
8	**Poisoning**	Wasp bite, snake bite, nettle sting, insect bite	16	3	0.86
9	**Tonic**	Memory enhancer, immunity enhancer, hair tonic	35	4	0.91
10	**General**	Headache, fever	22	5	0.81
11	**Unspecified**	Stress, insomnia, eye problems	13	3	0.83

The highest ICF value was reported for oral problems and tonic (0.91each), followed by dermatological disorder and poisoning (0.87 each), respiratory disorders (0.86), inflammation (0.85), unspecified (0.83), general (0.81), reproductive and gastrointestinal disorders (0.8). Lowest ICF value was reported for urological disorders (0.75). 15 plant species with highest use reports (102)are used to treat respiratory disorders followed by 12 plant species for gastro intestinal disorders (56 use reports), 11 plant species for dermatological disorders (with 77 use reports), and 06 plant species for inflammation (with 34 use reports.) (Table 3).

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CONFLICT OF INTEREST

All authors declare that there is no conflict of interest or any affiliation or involvement in any organization whether it is academic, commercial, financial, personal and professionally relevant to the work under consideration to avoid the potential for bias and accept responsibility for what is said in the manuscript.

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