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RESEARCH ARTICLE

Ethnopharmacological survey of indigenous medicinal plants of Palampur, Himachal Pradesh in north-western Himalaya, India

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Abstract

The ethnopharmacological investigation was done to study the traditional usage of indigenous medicinal plants of Palampur, Himachal Pradesh. Therefore, an extensive ethnopharmacological survey was conducted to document the traditional knowledge of ethnomedicinal plants. Direct interviews of 77 informants were conducted with the help of a questionnaire. Three quantitative factors (use value, factor informant consensus and fidelity level) were used for the analysis of generated data. A total of 102 species, belonging to 90 genera and 30 families were identified and collected with the help of traditional healers and local informants from different locations of the study area. Total 19 medicinal plants species were reported for new or less known ethnomedicinal uses. Also, 3 threatened wild plants species were collected from the study area. The maximum number of species belongs to the family Lamiaceae (7), Fabaceae (7), Asteraceae (6), Moraceae (4 species), Apocyanaceae (4 species) and Euphorbiaceae (3 species). Different plant parts were used by local informants such as leaves, galls, fruits, seeds, latex, stem, root, flowers, bark, and rhizomes. It was also observed that maximum numbers of plant species were used to cure gastro-intestinal disorders (48 species), skin disorders (34 species) and respiratory disorders (25 species). Ethnopharmacological data depict that medicinal plants were extensively used by local people to cure gastrointestinal, dermatological disorders and skeletomuscular disorders. Traditionally used medicinal plants have enormous potential to provide the raw material for the discovery of new bioactive compounds and drugs.

Keywords Ethnopharmacology · Traditional medicine · Palampur · Traditional healers · Medicinal plants

Introduction

Ethnopharmacological studies encompasses a beautiful arc of empirical data practised since antiquity among indigenous population (Pandey and Tripathi 2017). In many developing countries, the traditional system of medicine is used by 80% of indigenous people for their primary healthcare system (Oyebode et al. 2016)**.** Ethno medicines attribute a methodology to use medicinal plant, different diagnostic ways and a combination of two or more herbs together (Kanta et al. 2018). Ethnopharmacological investigations can be used as a useful method to find new polyherbal formulations which can be used to treat many diseases that cannot be treated by standard health practices (Ahmad et al. 2018; Kanta et al. 2018). Modern pharmacopeia manufacture around 25% of herbal drugs and several synthetic drugs using chemical substances isolated from plants (WHO 2002). Medicinal plants have bioactive compounds that can be used for various therapeutic purposes and synthesis of useful drugs (Kumar et al. 2016a, b). The Indigenous communities characterize medicinal plants based on two factors i.e. traditional knowledge and Indigenous practice (Kain et al. 2018). Traditional knowledge is integrated into the practice, customs, and culture of ethnic groups and communities. Indigenous populations have broad natural pharmacopeia's which consist of wild medicinal valuable plant species. During nomadic wandering, Indigenous knowledge and folk medicine was exchanged and expanded within tribal groups, neighbors, friends and foes (Palria and Vashistha 2017).

Kangra district is home to different indigenous tribes such as Gaddis and Gujjars of Himachal Pradesh. Palampur is a

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hilly area which is located in the Kangra district of Himachal Pradesh. It is situated between pine forests and flanked by the Dhauladhar mountain ranges. The present ethnobotanical study was done in different villages of the Palampur region. Palampur region was selected for the current study because of its vast vegetation, plant diversity, geographic range, an array of climatic conditions. The main objective of this study was to explore ethnopharmacological knowledge with the help of local traditional healers regarding the flora of Palampur, Kangra, Himachal Pradesh. The ethnomedicinal data was used to investigate the quantitative indices (Use value, factor informant consensus and fidelity level) in order to explore most popular medicinal species.

Materials and methodology

Study area

The present investigation was conducted in Palampur tehsil, Kangra district of the state Himachal Pradesh (Fig. 1). Palampur is situated in the foothills of the snow-capped Dhauladhar mountain range. Palampur is located between 32° 6′ 35″ N latitude and 76° 32′ 11.92″ E longitude in the north western Himalaya with an altitudinal range varying between 1472 and 2350 m amsl (above mean sea level). Vegetation growth in the study area is mainly semi tropical to temperate.

Ethnopharmacological survey and data collection

Extensive field surveys were conducted in Raudi, Kandi, Sarehr Kari, Bahli, Chopati, Bhadrol, Bhadrol Buhla, Paniali, Gharanu, Ban, Lahr and Bharehr villages of Palampur from August 2019 to December 2020 for the collection of information about ethnomedicinal plants. According to ISE code of ethics (www.ethnobiology.net/ethics.php), each informant profile includes age, sex and education level. The data collected for each plant consists: local name, uses, part used, the method of preparation and categorisation of ailments. The ethno pharmacological information was gathered with the help of a questionnaire and interviews about the traditional uses of plant species as medicine by local knowledgeable people and healers. A total of 77 resource persons were considered for the interview. The consents of the healers and local informants were also taken for the participation in the ethnopharmacological survey. The specimens were collected and assigned a field book number. Specimens were dried, pressed and pasted on herbarium sheets. All the herbarium sheets (102 specimens) were deposited/ submitted to the Department of Botany, University of Delhi and their accession numbers were obtained for each specimen. Flora of Himachal Pradesh (Chowdhery and Wadhwa 1984), Flowers of Himalaya (Polunin and Stainton 2005) and The Plant List (theplantlist.org) were considered for the identification and authentication of the specimen.

Data analysis

The preliminary ethnobotanical data were analyzed with the help of three different quantitative factors viz. use value (UV), factor informant consensus (F_{ic}) and fidelity level (Fl%).

Use value (UV)

The use value was a quantitative tool to determine the relative importance of the species (Phillips et al. 1994),

$$UV = \Sigma U/n$$

where U is the number of plants cited by each informant for a given species and n is the total number of informants. Total citations (ΣU) are the total number of informant cited for a particular plant species used for the treatment of various diseases. Use value (UV) is a widely used index to determine the relative importance of medicinal plants. It combines the frequency with which a species is mentioned with the number of uses mentioned per species, and is usually used to highlight conspicuous species of interest. High Use values depict many use reports for a plant which shows its significance and zero use values indicate its low use reports (Sharma et al. 2012, 2013).

Factor informant consensus (F_{ic})

It was used to test the homogeneity on the use of ethnomedicinal plants in the various disease categories among the informants. F_{ic} was calculated as (Heinrich et al. 1998),

$$Fic = (Nur - Nt)/(Nur - 1)$$

where Nur is the number of use reports for a particular disease category and N_t is the number of species used for a particular disease category (Karthik et al. 2018). Low Fic values indicate that there is no information exchange about the plant usage between the informants or plants were chosen randomly during the survey and a high Fic value (close to 1) shows that the few plant species were frequently used by a large number of the informants (Xavier et al. 2014).

Fidelity level (Fl %)

It is very interesting to know about the most preferred and frequently used species by informants for a particular disease category. Fidelity level (Fl%) was defined as the ratio between the number of informants who independently

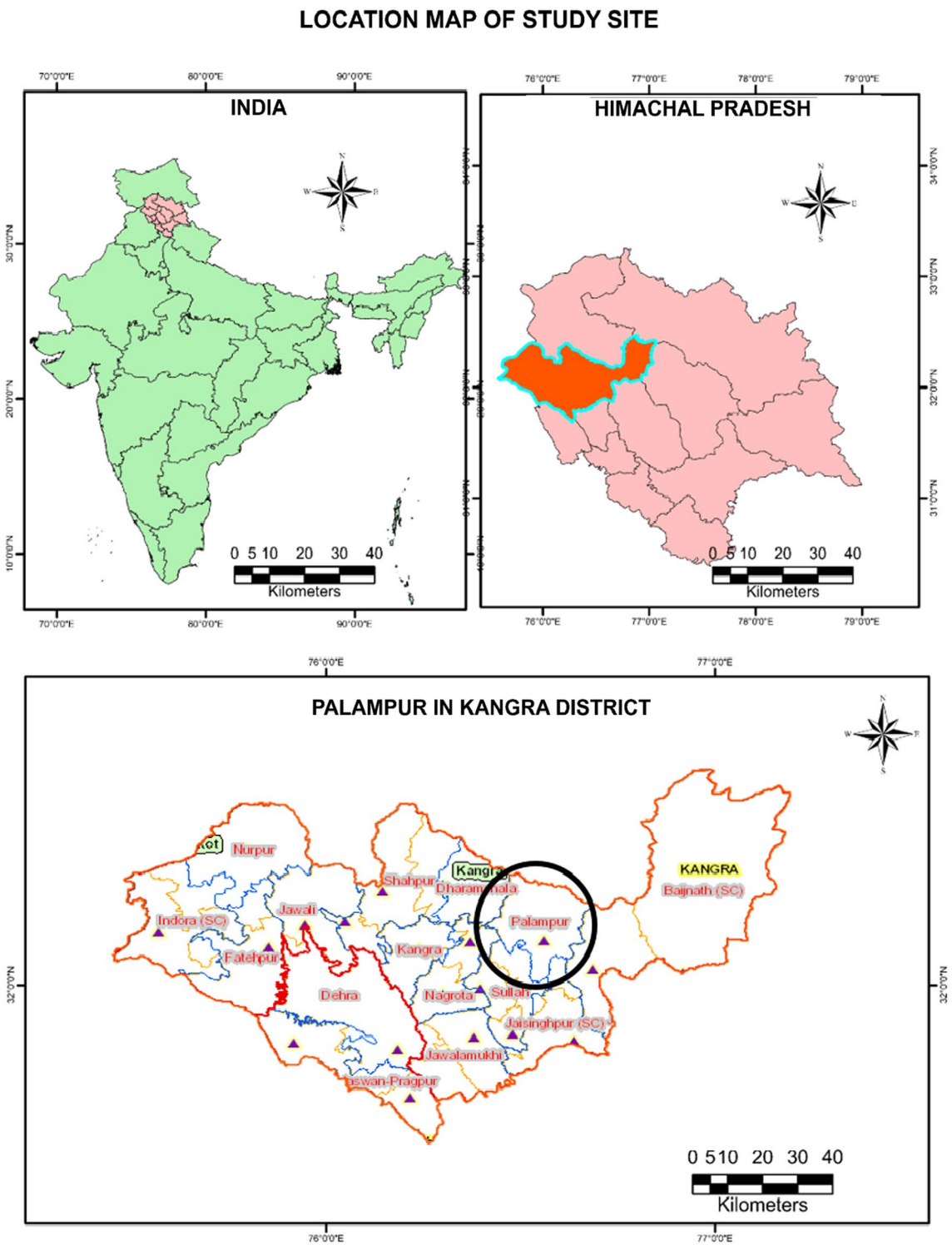

Fig. 1 Map depicting Palampur (study area)

suggested the use of a species for a particular diseases and the total number of informants who mentioned the use of particular plant species in various disorders.

For this purpose, Fidelity level (Fl%) was determined using (Friedman et al. 1986)

$$\text{Fl}\ (\%) = \text{Np}/\text{N} \times 100$$

where Np depicts the use reports cited for a given species for a particular disease category and N is the total number of use reports cited for any given species (Rana et al. 2019). High values (100%) for a particular species report about the plants which are particularly used for a specific disease. Whereas, low values indicate plants having multiple different uses (Musa et al. 2011).

Results

Characteristics of informants

A total of 77 informants were interviewed. Ethnopharmacological data were collected from 55.84% males and 44.16% females belonged to the age group between 60 and 89 years. Most of the informants were educated (Table1).

Floristic characteristics of medicinal plants

A total of 102 plant species of 90 genera and 30 families were documented for their medicinal use in the study area (Table 2). Some plant species such as *Achyranthes aspera* L., *Artemisia vulgaris* Linn., *Ajuga parviflora* Benth., *Asparagus racemosus* Willd, *Bauhinia variegata* L., *Berberis lyceum* Royle,*Cassia occidentalis* L., *Cirsium wallichii* DC., *Leucas cephalotes*(Roth) Spreng., *Prunus cerasoides* D. Don, *Pyrus pashia* Buch. & Ham., *Rhododendron arboreum* Sm., *Rynchostylis retusa* (L.) Blume, *Solanum americanum* Mill. L., *Thalictrum foliosum* D.C., *Viola canescens* Wall. ex Roxb, *Acacia catechu* (L.f.) Willd. and *Vitex negundo* L. are well known for their medicinal properties.

In our survey majority of plants belonging to Fabaceae (7 species), Lamiaceae (7 species), Asteraceae (6 species), Moraceae (4 species), Apocyanaceae (4 species) and Euphorbiaceae (3 species) (Fig. 2). Two species each were contributed by families namely Berberidaceae and Dioscoreaceae. Single species were reported from remaining families. The following genera represented by the highest number of species are *Ficus* (3 species), *Solanum* (3 species), *Ajuga* (2 species), *Bauhinia* (2 species), *Berberis* (2 species), *Curcuma* (2 species), *Dioscorea* (2 species), *Murraya* (2 species), *Ocimum* (2 species), and *Phyllanthus* (2 species). But our finding demonstrates that a combination of multiple herbs or single herbs along with *piper nigrum* and *Trachyspermum ammi* to treat various ailments of human beings. Literature study revealed about the similar ethnopharmacological/ ethnobotanical/ biological activities along with phytochemical constituents of the medicinal plants species reported by researchers are presented in Table 3. Based on extensive literature review, the 19 plant species were lesser known or new uses were reported from the study area.

Use-value of medicinal plants

The most important medicinal plants of the study site were classified on the basis of use-value (UV). Higher to lower use-value (UV) such as *Curcuma longa* (UV = 0.88), *Viola canescens* (UV = 0.68), *Helicteres isora* (UV = *0.64*), *Tinospora cordifolia* (UV = *0.59*), *Rhododendron arboretum* (UV = *0.50*), *Gloriosa superba* (UV = *0.52*), *Pyrus pashia* (UV = *0.48*), and *Terminalia chebula* (UV = *0.45*), *Withania somnifera* (UV = *0.44*), *Eclipta prostrate* (UV = *0.31*), *Ficus benghalensis* (UV = 0.31), *Curcuma zedoaria* (UV = 0.29), *Euphorbia hirta* (UV = 0.28), *Cymbopogon citratus* (UV = *0.24*), *Ficus auriculata* (UV = 0.21),

Table1 Demographic description of the informants

Informants	Number	Percentage (%)
Male	43	55.84
Female	34	44.16
Age groups	Male	Female
60–70	15 (34.88%)	11 (32.35%)
70–80	21 (48.83%)	13 (38.23%)
80–90	7 (16.27%)	10 (29.41%)
Education level	Male	Female
0–5th	17 (39.53%)	19 (55.88%)
5–12th	19 (44.18%)	11 (32.35%)
Above 12th	7 (16.27%)	4 (11.76%)

Table 2 Ethnomedicinal uses of flora of Palampur, Himachal Pradesh, India

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
1.	*Acacia catechu* (L.f.) Willd (14631) Fabaceae	Khair	Leaves	Mouth ulcers (23)	23	0.30	Mouth ulcers: Katha is applied to cure mouth ulcers
2.	*Achyranthes aspera* L (14607) Amaranthaceae	Puthkanda	Whole plant	Kidney stone (7) Snake bite (4)	11	0.14	Kidney stone**:** 20 ml whole plant decoction is consumed in morning and evening Snake bite: Leaves and root paste is applied externally to bitten part
3.	*Aegle marmelos* (L.) Corrêa (14632) Rutaceae	Belpatri	Fruit Pulp	Digestion (6) Appetite (4) Dysentery (2)	12	0.22	Digestion and appetite: Fresh and dry fruit pulp is consumed to improve digestion Dysentery: Fruit pulp is crushed with mango seeds and this mixture is boiled in water to make decoction. This decoction is consumed to cure dysentery
4.	*Ageratum conyzoides* (L.) L (14619) Asteraceae	Neela–Phulnu	Leaves and flowers	Cuts and wounds (3)	3	0.03	Cuts and wounds: Fresh leaves are crushed to paste and it is applied to cuts
5	*Ajuga integrifolia* Buch.-Ham. (14585) Lamiaceae	Neelkanthi	Leaves	Wounds and sores (7) Diabetes (5), Viral Fever (10)	22	0.28	Wounds and sores: Fresh leaves are crushed and mixed with seeds of kali mirch *Piper nigrum.* This paste is applied to the wounds Diabetes: Fresh leaves are crushed and mixed with seeds of kali mirch *Piper nigrum.* This paste is converted in pills and used twice a day Viral Fever: Green leaves are crushed to paste and consumed as pills to cure viral fever

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
6	*Ajuga parviflora* Benth (14558) Lamiaceae	Neelbadi	Leaves	Diabetes (2)	2	0.02	Diabetes: Fresh leaves are crushed and mixed with seeds of kali mirch *Piper nigrum.* This paste is converted in pills and used twice a day
7	*Aleuritopteris bicolor* (Roxb.) Fraser-Jenk. (14554) Pteridiaceae	Chadan	Whole plant	Weakness (2)	2	0.02	Plant powder mixed with cow's ghee is used as an incense to keep off fear in children. Decoction of whole plant is used as tonic to cure weakness problems. It is also used for painting hands
8	*Aloe vera (L.) Burm.f* (14630) Xanthorrhoeaceae	Gwarpatha	Leaves	Skin diseases (63) Cuts and insect bites (7)	70	0.90	Skin diseases: Leaves pulp is used for treatment of various diseases Cuts and insect bites: Leaf pulp is applied externally to the cuts and insects
9	*Artemisia vulgaris* L (14637) Asteraceae	Charamara	Fresh leaf	Fever (4)	4	0.05	Fever: Decoction of fresh leaf is used to cure fever
10	*Asparagus racemosus* Willd (14599) Asparagaceae	Satavar	Roots	Jaundice (2) Female reproductive Disorders (13)	15	0.19	Jaundice: Fresh root are crushed and kept in pot for overnight. This filtered juice is given to patient in early morning Female reproductive system: Decoction of dried root is given to the patient to cure reproductive disorders
11	*Bambusa nutans* Wall. ex Munro (14601) Poaceae	Bamboo	LeavesYoung shoots	Hematemesis (1) Fractures Injuries (7)	8	0.10	Haematemesis: The juice of leaves is used to cure Hematemesis Fractures and injuries: Older and dried stems of bamboo are used as splints in fractures
12	*Bauhinia vahlii* Wight & Arn (14621) Fabaceae	Tore, Tore-dia-tata	Leaves, Seeds	Stomach worms (2)	2	0.02	Stomach worms: Seeds decoction is used to kill worms

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
13	*Bauhinia variegata* L (14552) Fabaceae	Kachnar, Karale	Leaves, Seeds	Dysentery (2) Piles (2)	4	0.05	Dysentery: Dried buds (5–10 g) powder is consumed with curd, twice a day Piles: Dried buds powder is consumed with water for few days
14	*Berberis aristata* DC (14551) Berberidaceae	Kashmal	Whole plant	Jaundice (13) Piles (2) Skin diseases (5)	20	0.26	Jaundice and Piles: Extract of root, Stem and bark is consumed with water twice a day for a week Skin diseases**:** Extract of root, Stem and bark is used to cure skin related diseases Eye infection: New branches are crushed to produce sap, which is used to cure eye infection
15	*Berberis lycium Royle* (14545) Berberidaceae	Billikakanta	Whole plant	Piles (2), Skin diseases (4), Eye infection (2)	8	0.10	Piles: Extract of root, Stem and bark is consumed with water twice a day for a week Skin diseases: Extract of root, Stem and bark is used to cure skin related diseases Eye infection: New branches are crushed to produce sap, which is used to cure eye infection
16	*Boehmeria virgata* (G.Forst.) Guill (14636) Urticaceae	Handa	Fresh leaves	Oral Hygine (3)	3	0.03	Oral hygiene: Fresh leaves are crushed and its paste is used for treatment of oral diseases
17	*Boerhavia diffusa* L (14624) Nyctaginaceae	Punarnava	Leaves and roots	Backache (2), Jaundice (3), Kidney stone (7)	12	0.16	Backache: Roots decoction is consumed in weakness and waist pain Jaundice: Fresh leaves and root are crushed and its sap (10–20 ml) is consumed with sugar (misri) in morning, empty stomach Kidney stone: Root decoction is used to remove stones from kidney

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
18	*Brugmansia Suaveolens* (Humb. & Bonpl. ex Willd.) Bercht. & J. Presl *(14544)* Solanaceae	Dhatura	Flowers, Leaves	Aches (2), Wound rashes and Ulcers (6), Aphrodisiac effects (6)	14	0.18	Aches and Pains: Dried Leaves are applied externally to aching body parts with cloth Wound rashes and Ulcers: Leaf paste is applied externally to wound area Aphrodisiac effects: The flowers and leaves are also commonly used as aphrodisiacs
19	*Capsicum annuum* L *(14578)* Solanaceae	Hari Mirch	Fruit and Leaf	Antirheumatic (2), Digestive disorders (5)	7	0.09	Antirheumatic, Antiseptic, and Digestive disorders: Fruits are consumed in small amount as flavouring agent in food. It has ability to cure antirheumatic, antiseptic, and digestive disorders
20	*Calotropis procera* (Aiton) Dryand *(14642)* Apocyanaceae	Aak	Milky latex	Toothache, (2) Skin diseases (3) Scorpion sting (2)	7	0.09	Toothache: Small amount of latex is used in aching tooth cavity Skin diseases: Fresh leaves are crushed and its paste is applied externally Scorpion sting: Fresh leaves latex is used to reduce swelling and pain
21	*Camellia sinensis* (L.) Kuntze *(14592)* Theaceae	Chai	Leaves	Stimulant and Diuretic (9) Astringent (2)	11	0.14	Stimulant, diuretic and astringent: leaves are used to obtain green tea which act as a stimulant, diuretic and astringent
22	*Cannabis sativa* L *(14629)* Cannabaceae	Bhang	Leaves	Scrorpian and Wasp stings (4), Cuts and wounds (2)	6	0.07	Scrorpian and Wasp stings: Crushed leaves are applied on sting part of skin Cuts and wounds: leaves are crushed and applied to the cuts
23	*Carissa opaca* Stapf ex Haines (14604) Apocyanaceae	Jungli Karonda, Garna	Leaves, Stem and Roots	Skin diseases (5)	5	0.06	Skin diseases: Stem is heated in fire and it will ooze out as a sap. This sap is applied on old skin diseases

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
24	*Cassia occidentalis* L (14553) Fabaceae	Bara-elwu	Seeds, leaves and root	Gall bladder dysfunction (6) Wounds and abscesses (3)	9	0.12	Gall bladder dysfunction: Roasted seeds powder is mixed with mustard oil, citrus juice and salt. This mixture is consumed to cure Gall bladder dysfunction Wounds and abscesses: fresh leaves paste is applied externally to wounds
25	*Cascabela thevetia* (L.) Lippold Apocyanaceae (14608)	Pilakaner	Flowers, leaves, seed and root	Skin diseases (2) and Ulcer (2)	4	0.05	Skin diseases and Ulcer: Root paste is applied externally in both cases
26	*Cedrus deodara* (Roxb. ex D.Don) G.Don (14613) Pinaceae	Devdar	Stem Oil	Skin diseases (2) Rheumatism (3) Paralysis (5)	10	0.12	Skin diseases: Oil is applied externally on infected area of skin for few days Rheumatism and paralysis: Oil is massaged on joints in Rheumatism and its 2–3 drops are consumed before sleeping for few days
27	*Celastrus paniculatus* Willd (14640) Celastraceae	Sankherra, Malkangangani	Leaves and seeds	Arthritis (2) Paralysis (2)	4	0.05	Arthritis and Paralysis: Dry seeds are powdered, mixed with *Linum usitatissimum* (alsi) oil and applied externally
28	*Cirsium Wallichii* DC (14591) Asteraceae	Bhrush	Root	Jaundice (2), Paralysis (3)	5	0.06	Jaundice: Fresh roots are crushed and its sap is collected. Sap (15–20 ml) is mixed with sugar and consumed by patient Paralysis: Fresh roots are crushed and roasted in desi ghee. 3 to 5 g Pills are made from this mixture. These pills are consumed with milk

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
29	*Cissampelos pareira* L (14577) Menispermaceae	Batindu	Leaves, roots	Spermatorrhoea (3), Snake bite (2), Piles (1), Dysentery (2),	8	0.10	Spermatorrhoea: The sap of Fresh leaves is consumed to cure Spermatorrhoea Snake bite: Root is crushed with seeds of kali mirch (*Piper nigrum*). This paste is applied externally to the bite part Piles: Root and leaves are crushed into paste and form pills. These pills are consumed with water twice a day Dysentery: Fresh leaves are crushed into paste and 3 to 5 g of this paste is consumed twice a day to cure dysentery
30	*Citrus limon* (L.) Osbeck (14557) Rutaceae	Nimbu	Leaves	Sore throat, (2), Digestive disorders, (2), Malaria and other fevers,(2), Cuts and wounds, (1), Internal injuries (1)	8	0.10	Sore throat: Fresh Lemon juice is used as a gargle for sore throat Digestive disorders: Fresh Lemon juice is used for Digestive disorders Malaria and other fevers: Good antiperiodic and has been used as a substitute for quinine Cuts and wounds: Leaves paste is applied externally to cuts and wounds Toothbrush: Fresh sticks are used as a toothbrush Internal injuries: Fresh leaves are crushed and warmed in a pot and linseed oil is added to it. It is tied with the help of cloth on the internally injured part of the body

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
31	*Cheilocostus speciosus* (J.Koenig) C.D.Specht (14602) Costaceae	Costus	Rhizomes	Gout and rheumatism (5), Skin diseases (2)	7	0.09	Gout and rheumatism: Fresh and dry rhizome is grounded to paste and roasted in desi ghee. Pill of 3 to 5 g paste is consumed in morning and evening for two weeks Skin diseases: Fresh rhizome is ground to paste with kali mirch (*Piper nigrum*) and this paste is applied externally to skin
32	*Curcuma longa* L (14559) Zingiberaceae	Haldi	Rhizomes	Wound healing(10), cold (12), cough (36), influenza (10)	68	0.88	Wound healing: Boiled with mustard oil and used topically for wound healing Cough and Cold: Rhizome is consumed in crushed form to cure cold and cough
33	*Curcuma zedoaria* (Christm.) Roscoe (14643) Zingiberaceae	Karchura	Rhizomes	Cancer (23)	23	0.29	Antitumour effects: Dry Rhizome is crushed to powder and its decoction is used to control the tumour
34	*Cymbopogon citratus* (DC.) Stapf (14641) Poaceae	Lemon grass	Leaves	Digestive disorders (14), Skin diseases (5)	19	0.24	Digestive disorders: Leaves are boiled as tea and it is consumed to cure digestive disorders Skin diseases: Essential oil is very effective in treatment of ringworm, athlete's foot, scabies and lice
35	*Dendrophthoe falcata* (L.f.) Ettingsh. (14635) Loranthaceae	Vanda	Leaves	Chest diseases (2), Diabetes (3)	5	0.06	Chest diseases: The leaves are cooked in milk to cure chest diseases Antidiabetic: Leaves powder is considered as antidiabetic. It is consumed with water to control sugar in blood

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
36	*Dioscorea bulbifera* L (14611) Dioscoreaceae	Ratalu, Gangalti	Dry tuber	Wound and ulcers (3), Piles (7)	10	0.12	Wound and ulcers: For quick healing power of dry tuber is applied externally Piles: Dry tuber powder is mixed with butter and applied externally
37	*Dioscorea deltoidea* Wall. ex Griseb (14612) Dioscoreaceae	Shingli-mingli	Tuber	Rheumatism (12)	12	0.15	Rheumatism: Tuber paste is applied externally
38	*Diplocyclos palmatus* (L.) C. Jeffrey (14616) Cucurbitaceae	Shivlingi	Seeds	Infertility (27)	27	0.35	Conceiving: Seeds powder is consumed with water after mensuration for 4 days in women
39	*Dodonaea viscosa* (L.) Jacq (14625) Sapindaceae	Maindhdu	Fresh leaves	Internal injuries (7), Cuts and wounds (7)	14	0.18	Internal injuries: Fresh leaves are crushed with leaves of *Vitex negundo* and *Rhyncho-stylis retusa*. This mixture is toasted with Linseed oil and applied on internally injured parts of body Cuts and wounds: Leaves paste is applied externally on the cuts and wounds for healing
40	*Drymaria cordata* (L.) Willd. ex Schult. (14586) Caryophyllaceae	Tropical chickweed,Pithpapra	whole plant	Appetizer and Depurative (17), Chest-complaints and bronchitis (6), Cerebral stimulant (5)	28	0.36	Appetizer and Depurative: Juice of whole plant is used as an appetizer Chest-complaints and bron-chitis: The dried leafs are smoked like a cigarette for treating chest complaints and bronchitis Cerebral stimulant: The decoc-tion of whole plant is used as a cerebral stimulant for children

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
41	*Eclipta prostrata* (L.) L. (14627) Asteraceae	Bhringraj	Whole plant	Skin diseases (28)	28	0.31	Skin diseases: Fresh root paste is applied on ulcers and wounds. Leaves are crushed and mixed with mustard oil to remove dandruff from hair
42	*Euphorbia hirta* L (14595) Euphorbiaceae	Dudhi	Leaves, latex and Stem	Indigestion and Constipation (18) Asthma (4)	22	0.28	Indigestion and Constipation: Aerial part is crushed to make paste and it is consumed in morning and evening Asthma: 5–10 ml, Decoction of aerial part is consumed in morning and evening
43	*Ficus auriculata* Lour (14583) Moraceae	Tremble	Stem bark and Flower	Tonsils (9), Digestive system (7)	16	0.21	Tonsils: Fresh leaves are toasted in desi ghee and these leaves are tide to infected area Digestive system: Ripened Fruits are consumed to improve and remove the impurities of digestive system
44	*Ficus benghalensis* L (14573) Moraceae	Bargad	Milky latex, Roots, Young stem	Spermatorrhoea and seminal weakness (16), Ulcers (8)	24	0.31	Spermatorrhoea and seminal weakness: Milky latex is filled in Batasha (Spongy crisp sugarcake) and consumed in early morning to cure spermatorrhoea and seminal weakness Ulcers: Milky latex is applied to the mouth ulcers

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
45	*Ficus religiosa* L (14618) Moraceae	Peepal	Bark, Fruits and leaves	Leucorrhoea (21), infertility (4)	25	0.34	Leucorrhoea: Dry bark is crushed and mixed with misri (Sugar) and this powder is consumed with milk Conceiving in female: Fruits and leaves (10 g) are grind with shivlingi seeds (*Diplocyclos palmatus*). This mixture is consumed with sugar (mishri). After mensuration, this mixture (3–5 gm) is consumed with milk for 4 consecutive days
46	*Gloriosa superba* L (14644) Liliaceae	Kalihari, Agnishiksha	Roots	Chronic ulcers (17), Snake bites (23)	40	0.52	Chronic ulcers: root paste is applied externally on chronic ulcers Snake bites: Root paste is applied externally on snake bitten portion of the body
47	*Helicteres isora* L. (14589) Sterculiaceae	Marorphali	Flowers, Root and stem bark	Dysentery and stomachache, (49)	49	0.64	Dysentery and stomachache: Fruits are crushed and boiled with sugar and this decoction is used to cure dysentery and stomachache
48	*Hemidesmus indicus* (L.) R. Br. ex Schult (14588) Asclepiadaceae	Anantamul	Roots	Anticancer (22) and antiulcers (4)	26	0.34	Anticancer and Antiulcers: Roots are crushed to powder form and its water decoction is consumed to cure cancer and ulcers
49	*Hibiscus rosa-sinensis* L (14606) Malvaceae	Gurhal	Stem and flower	Diuretic (3), Abortion and antifertility (8)	11	0.14	Diuretic and contraceptive: Hot water extract of dry stems and flower powder is used to cure diuretic Abortion and antifertility: Dried flowers are crushed to powder form and hot water decoction is consumed

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
50	*Holarrhena antidysenterica* (Roth) Wall. ex A.DC. (14556) Apocyanaceae	Inderjau, Kutaja	Stem bark, root bark, Seeds and leaves	Piles and Dysentery (5), Spermatorrhoea and Leucorrhoea (13)	18	0.23	Piles and Dysentery:5 to 10 g of bark powderis used with sugar two times a day Spermatorrhoea and Leucorrhoea: Fresh and dry bark is crushed and kept in water overnight. This 50 ml of cleaned solution is taken with empty stomach
51	*Jasminum officinale* L (14634) Oleaceae	Safed–Chameli	Fresh leaves	Toothache and ulcers (5), Gum infections (2)	7	0.09	Toothache and ulcers: Fresh leaves are chewed in mouth ulcers and toothache Gum infections: Fresh leaves are crushed with kali mirch (*Piper nigrum*) in mouth saliva. It is commonly known as 'Dandiajehar'
52	*Jatropha curcas* L (14550) Euphorbiaceae	Rakatjot	leaves, fruit, seed, stem bark, branches, twigs, latex and root	Ringworm and eczema (6), Ulcers (2)	8	0.10	Ringworm and Eczema: Seed paste is applied externally to control skin diseases Ulcers: Latex is applied to mouth ulcers 2 to 3 times a day
53	*Juglans regia L* (14603) Juglandaceae	Akhrot	Leaves, Bark, and Fruits	Sore throat(3), Gum infection and cavities (6)	9	0.12	Sore throat: Bark decoction is used to cure sore throat Gum infection and cavities: Fresh leaves and bark is used as a toothbrush. This toothbrush is effective in teeth protection
54	*Justicia adhatoda* L (14561) Acanthaceae	Pilibasuti	Leaf	Asthma (6) Cough (3) Jaundice (12)	21	0.27	Asthma and Cough**:** 5–10 g of the fresh leaves juice is used with 3 to 5 g honey to cure asthma and cough Jaundice**:** 10–15 ml Fresh juice of leaves is consumed twice a day

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
55	*Lantana camara* L (14593) Verbenaceae	Raimuniya	Whole plant	Influenza and Cough (2), Haemoptysis and Pulmonary tuberculosis (2), Fevers (1), Skin diseases (2)	7	0.09	Influenza and Cough: Root decoction is used to treat cough and cold Haemoptysis and Pulmonary tuberculosis: A decoction of the dried flowers is used in the treatment of tuberculosis and haemoptysis Fevers and constipation: An infusion of the dried leaves and flowering tops is used for the treatment of fever and constipation Skin diseases: Fresh leaves and stems paste is applied to treat dermatitis and eczema
56	*Leucas cephalotes* (Roth) Spreng (14555) Lamiaceae	Mal-bhedu	Leaves	Cough and Cold (4), digestive disorders (3)	7	0.09	Cough, Cold and digestive disorders: Decoction of fresh and dry leaves is consumed with sugar twice a day for few days
57	*Litchi chinensis* Sonn (14546) Sapindaceae	Litchi	Fruit, seed, root, bark and flowers	Throat ailments (2), Diarrhoea (2)	4	0.05	Throat ailments: Decoctions of the root, bark and flowers are used as a gargle to improve throat infections Diarrhoea: fruit peel is used in the treatment of diarrhoea
58	*Mallotus philippinensis var. reticulatus* (Dunn) F.P. Metcalf (14600) Euphorbiaceae	Kamal	Fruit and leaves	Skin diseases (6) Stomach worm (2)	8	0.10	Skin diseases: Fruit paste is applied externally to pimples, boils and ringworms Stomach worm: Fruit powder is used to kill worms
59	*Mentha arvensis* L (14572) Lamiaceae	Pudina	Leaves	Digestive disorder (17) Vomiting (6)	23	0.29	Stomach problems: Fresh leaves are crushed and consumed to cure stomach disorders such as gastric problem Vomiting: Fresh leaves are crushed and consumed to cure vomiting

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
60	*Morus alba* L (14633) Moraceae	Shehtoot	Leaves, fruits, Root,Bark	Antihelmintic and Purgative (14), Cough and cold (2)	16	0.21	Antihelmintic and Purgative: Bark powder is consumed with water to destroy parasitic worms of intestine Cough and cold: Fresh leaves and fruit juice is consumed to treat cough and cold
61	*Mucuna pruriens* (L.) DC (14575) Fabaceae	Gajar-Bel	Seeds	Seminal weakness and Spermatorrhoea (13), Arthritis (4)	17	0.22	Seminal weakness and Spermatorrhoea: Roasted seeds powder is consumed orally to cure it Arthritis**:** Seeds are cooked as dal and it is consumed to cure arthritis
62	*Murraya koenigii* (L.) Spreng (14549) Rutaceae	Curry patta	Leaves	Digestive problem (6) Cuts and wounds (2) Toothbrush (1) Internal injuries (3)	12	0.15	Digestive problem: Leaves Decoction is consumed to cure stomach ache and gastric problems Cuts and wounds: Leaves paste is applied externally to cuts and wounds Toothbrush: Fresh sticks are used as a toothbrush Internal injuries: Fresh leaves are crushed and warmed in a pot and linseed oil is added to it. It is tied with the help of cloth on the internally injured part of the body
63	*Murraya paniculata* (L.) Jacq (14563) Rutaceae	Dinher and Anghar	Fresh leaves	Diarrhoea and dysentery (8), Joint pain and internal injuries (13)	21	0.27	Diarrhoea and dysentery: Fresh leaves are crushed and 5 to 10 ml juice is consumed twice a day to cure Diarrhoea and dysentery Joint pain and internal injuries: Fresh leaves roasted with Linseed oil (*Linum usitatissimum*) and these leaves are tied with help of cloth on joints and internal part of body

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
64	*Ocimum basilicum* L (14610) Lamiaceae	Bhabhari	Leaves, seeds and roots	Asthma, Cough and cold (18)	18	0.23	Asthma, Cough and cold: Decoction of Leaves, flowers is consumed to cure asthma, cough and cold
65	*Ocimum tenuiflorum* L (14547) Lamiaceae	Kapoor Tulsi	leaves, stem, flower, root, seeds	Cough and cold (13)	13	0.17	Cough and cold: Fresh leaves are crushed and juice given in cough
66	*Oroxylum indicum* (L.) Kurz (14581) Bignoniaceae	Arlu	Leaves,Seeds and bark	Joint pain and Injuries (11), Stomach ache (2),Liver disorders (4)	17	0.22	Joint pain and Injuries: Fresh leaves are warmed in linseed oil and applied to joints Stomach ache: Dry seed powder is consumed with water to cure stomach ache Liver disorders: Bark is crushed and kept for overnight in earthen pot. Then 40 to 50 ml solution is consumed regularly to cure liver dysfunctions
67	*Oxalis corniculata* L (14596) Oxalidaceae	Maroli and Amroli	Leaves	Jaundice (2), Cuts and wounds (2), Bile problems (3), Fever and headache (3), Bronchitis (5)	15	0.19	Jaundice: Fresh leaves are crushed with kali mirch (*Piper nigrum)* and consumed in early morning with empty stomach Cuts and wounds: Fresh leaves paste is applied externally to cuts and wounds Bile problems: Fresh leaves are crushed to make paste and this paste is consumed to cure bile problems Fever and headache: Fresh leaves paste is consumed with (misri) sugar in morning and evening Bronchitis: Fresh leaves are crushed and its sap is poured in nostrils to cure bronchitis

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
68	*Phyllanthus emblica* L (14568) Phyllanthaceae	Amla	Fruits	Hair problem (12),Eyes infection (4),Digestive disorders (3), Piles (5),Jaundice (3)	27	0.35	Hair problem: Fruit juice and paste is applied to the scalp Eyes infection: Dry fruits are crushed and mixed with (*Terminalia bellirica*) bahera and Harad (*Terminalia chebula*).This mixrure is soaked overnight and its filtrate is used to cure infection Digestive disorders: Fruit powder, candy, pickle is used to cure gastric problems, acidity, bile and digestive disorder Piles: Dry fruit powder mixed with (*Terminalia bellirica*) bahera and Harad (*Terminalia chebula*) to cure piles problem Jaundice: Fruit juice and it powder is consumed with misri (Sugar) to cure jaundice
69	*Phyllanthus niruri* L (14609) Phyllanthaceae	Choti-aamble, Bhuniaamla	Seeds	Digestive disorders (7), Cold and fever (4)	11	0.14	Digestive disorders: Seeds decoction is consumed to cure various gastric troubles and aches Cold and fever: Seeds decoction is used to cure fever and cold

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
70	*Pinus roxburghii* Sarg (14614) Pinaceae	Chir	Seeds	Eye infections (8)	8	0.10	Eye infections: Dry seeds crushed with almond seeds and it is applied over a cotton plug. This cotton plugs are placed in earthen pot having melted cow butter and it is enlightened with fire. This earthen pot is covered with brass and kept in dark for 3 to 4 h. Then carbon is collected from this brass plate and mixed with butter. Final mixture is known as 'kajal' and applied to the eyes of small children
71	*Pistacia chinensis subsp. Integerrima* (J. L. Stewart ex Brandis) Rech. f (14615) Anacardiaceae	Kakarsinghi	Galls, resin and bark	Asthma, and Cough (11), Arthritis (13)	24	0.31	Asthma and Cough: Gall ash is mixed with honey and consumed orally Arthritis: 3 to 5 g of ash of gall is consumed daily
72	*Plantago lanceolata* L (14571) *Plantaginaceae*	Isabgol	Leaves	Skin Diseases (13), Diarrhoea (4)	17	0.22	Skin Diseases: Leaves are crushed to paste in cow urine. This paste is mixed with butter and applied to skin Diarrhoea: Seeds are soaked in water and given orally twice a day for 2 to 3 days
73	*Plumbago zeylanica* L (14565) Plumbaginaceae	Chitrak	Root, stem and leaves	Toothache (9), Arthritis (3), Skin diseases (3)	15	0.19	Toothache: root paste is applied on aching tooth Arthritis: Dry root paste is mixed with seeds of kali mirch (*Piper nigrum*) and applied on aching part of body Skin diseases: Root paste is applied externally to cure skin diseases

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
74	*Prinsepia utilis* Royle (14623) Rosaceae	Bhekhal, Baklain	Leaves and seeds	Cough and Fever (7),Joint pain (3), rheumatism (3)	13	0.16	Cough and fever: Decoction of fresh young leaves and apical bud is consumed twice a day Joint pain and rheumatism: Seeds oil is massaged in joint pain and rheumatism. Oil is also consumed by tribal people in winter season
75	*Prunus cerasoides* Buch.-Ham. ex D.Don (14579) Rosaceae	Paddam	Seeds and bark	Internal Injuries (26)	26	0.34	Internal Injuries: Seeds and bark are crushed with Methi (*Trigonella foenum*), Ajwain (*Trachyspermum ammi*) and roasted in Linseed oil. It is applied to the injured part with help of cloth
76	*Pueraria tuberosa* (Willd.) DC (14569) Fabaceae	Salor	Tubers	Weakness (8)	8	0.10	Weakness: Fresh tubers are consumed as vegetable to remove general weakness
77	*Punica granatum* L (14567) Punicaceae	Daru, Daran	Seeds, fruit rind	Bile problem and indigestion (7), Cough, Vomiting (12)	19	0.25	Bile problem and indigestion: Dried seeds are crushed with Pudina (*Mentha spicata*) and consumed for 3 to 5 days to cure Bile problem and indigestion Cough: Fruit rind is dried and crushed. It is consumed with water twice a day for a week Vomiting: Dry and fresh seeds are crushed with Pudina (*Mentha spicata*) and consumed for 2–3 times in a single day
78	*Pyrus pashia* Buch.-Ham. ex D.Don (14620) Rosaceae	Kainth	Fruits,Stem	Mouth ulcers (35), Boils (2)	37	0.48	Mouth ulcers: Unripe fruits are chewed to cure mouth ulcers Boils: Twigs are brunt to obtain sap. This sap is applied on boils

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
79	*Quercus oblongata* D.Don (14598) Fagaceae	Ban	Leaves, Bark and Kernels	Dysentery (6), Rheumatism (13)	19	0.25	Dysentery: Crushed fresh leaves and kernels powder is consumed to cure dysentery Rheumatism: Decoction of bark is consumed orally by adding milk and sugar. It is consumed twice a day for a week
80	*Catunaregam spinosa* (Thunb.) Tirveng (14594) Rubiaceae	Madanphal, Rada	Fresh leaves and roots	Arthritis (8), Pneumonia (13)	21	0.27	Arthritis: Crushed roots are boiled in water. This decoction is used twice a day to cure Arthritis Pneumonia: Fresh leaves of *Randia dumetorum* and *Adhatoda vasaca* are crushed together to obtain a paste. This paste is toasted and applied on the chest of children
81	*Rhododendron arboreum* Sm (14548) Ericaceae	Burans	Flower	Nose bleeding (34), Diarrhoea (5)	39	0.50	Nose bleeding: Paste of reproductive part of flowers except petals is applied to cure nose bleeding Diarrhoea: Petal paste is used for cooling in summer and it is also used to make chutney
82	*Rubus ellipticus* Smith (14626) Rosaceae	Akhe, Pile Akhe	Fruits and Roots	Blood purifier (18) ,Boils (9)	27	0.35	Blood purifier: Fresh fruits are consumed to purify the blood Boils: Fresh roots are grinded into cow urine with 2 to 3 seeds of Kali mirch (*Piper nigrum*). This paste is applied externally to the infected area
83	*Rumex nepalensis* Spreng (14562) Polygonaceae	Janglee Palak	Leaves, Roots	Boils (7), Constipation (2)	9	0.12	Boils: Roots are grind in cow urine with seeds of kali mirch (*Piper nigrum*) and applied on boils Constipation: Fresh leaves are used a vegetable to cure constipation problem

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
84	*Rhynchostylis retusa* (L.) Blume (14639) Orchidaceae	Bhangru	Leaves	Internal injuries (19), Earache (7)	26	0.34	Internal injuries: Fresh plant leaves are crushed and heated for 2 or 3 min. It is applied to the injured part with bandage Earache: Fresh leaves are heated to obtain its sap, and then 2 or 3 drops of its sap is poured in ear
85	*Senna tora* (L.) Roxb. (14587) Fabaceae	Elu, Elwan	Seeds	Gall bladder dysfunctions (4), Piles (2)	6	0.07	Gall bladder dysfunctions: Roasted seeds powder is mixed with mustard oil, citrus juice and salt. This mixture is consumed to cure Gall bladder dysfunction Piles: Roasted seeds powder is consumed with water in morning and evening to cure piles
86	*Solanum aculeatissimum* Jacq (14566) Solanaceae	Ban-bindi, Kandiari	Whole plant	Toothache (5), Whooping Cough (2), Joint pain and Injuries (2)	9	0.11	Toothache: Dry seeds decoction is used to kill tooth worms and Fruit paste is applied on the aching tooth Whooping Cough: Entire plant is brunt and its ash is mixed with honey and black pepper (*Piper nigrum*). This solution used as a pill to cure whooping cough Joint pain and Injuries: Ripened fruits are fried in linseed oil and applied externally to joints pain injuries

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
87	*Solanum americanum* Mill. L (14622) Solanaceae	Makoi	Root	Fever and diarrhoea (3), Jaundice (2), Headache (6)	11	0.14	Fever and diarrhoea: Root decoction is consumed in morning and evening during fever Jaundice: fresh leaves are grounded to paste. This paste is consumed in form of pills in morning and evening Headache: Fresh leaves and fruit paste is applied on head to cure headache
88	*Solanum virginianum* L (14576) Solanaceae	Kateli, Kanthkari	Dry seeds and leaves	Asthma and cough (4), Liver problem and fever (7)	11	0.14	Asthma and cough: Dry seeds and leaves are crushed and brunt on coal. Its smoke is inhaled by patient Liver problem and fever: Dry seeds and leaves are boiled in hot water. This decoction is consumed in morning and evening
89	*Syzygium cumini* L. skeels (14617) Myrtaceae	Jamun	Bark and seeds powder	Mouth problems (2), Diabetes (4)	6	0.07	Mouth problems: Bark of plant is burn in fire and ash is applied in mouth to cure mouth problems Diabetes: Seeds powder is consumed with water twice a day to cure diabetes
90	*Tagetes minuta* L (14560) Asteraceae	Jungleegenda	Whole plant	Gastritis, indigestion and internal worms (21) Haemorrhoids and skin infections (9)	30	0.39	Gastritis, indigestion and internal worms: Whole plant is dried and grinded to powder form. This powder is consumed with water to cure gastric problems Haemorrhoids and skin infections: Fresh leaves are crushed to make paste and it is applied externally to cure skin diseases

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
91	*Terminalia chebula* Retzius (14570) Combretaceae	Harad	Fruits,roots, bark, wood and leaves	Asthma and Cough (4), Piles and Constipation (31)	35	0.45	Asthma and Cough: Roasted fruit rind is chewed for instant relief Piles: Dry rind is mixed with sugar for consumption and used twice a day for 20 days Constipation: Powder of dry rind is consumed with warm water
92	*Thalictrum foliolosum* DC (14638) Ranunculaceae	Gurvini, Mamira and Pillijari	Root	Boils (5), Toothache and mouth ulcers (2)	7	0.09	Boils: fresh roots are grind with 2–3 seeds of kali mirch (*Piper nigrum*) and this paste is applied on boils Toothache and mouth ulcers: Dry root powder is used for toothache and ulcers
93	*Tinospora cordifolia* (Willd.) Miers (14628) Menispermaceae	Giloe, Amrita	Stem	Gastric problems (11), Blood purifier (9), Fever (21), Diabetes (3), Arthritis (2)	46	0.59	Gastric problems: Stem is boiled in tea and milk. It will reduce gastric effect of tea and milk Blood purifier: Stem powder is consumed with honey twice a day. It will purify the blood Fever: Stem powder is boiled with leaves of tulsi (*Ocimum sanctum*) and consumed twice a day Diabetes: Dry stem is also used to control diabetes Arthritis: Stem is crushed and soaked in water overnight and in early morning its filtered sap is consumed to cure arthritis
94	*Trachyspermum roxburghianum* (DC.) H. Wolff (14597) Apiaceae	Ban-ajwain	Seed,Leaves, Root and Fruits	Carminative and Cardiotonic (9)	9	0.11	Carminative and Cardiotonic: Fruits and seeds are used as prickles and vegetables. It is used as a spice in Indian vegetables

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
95	*Tridax procumbens* (L.) L (14590) Asteraceae	Chote-Lumb	Leaf	Cuts, wounds (7), Urinary infections (16)	23	0.29	Cuts and wounds: Leaves paste is applied externally to cure cuts and wounds Urinary infections: 30 to 50 ml Crushed leaves juice is consumed twice a day for five to ten days
96	*Urtica dioica* L (14574) Urticaceae	Bichu-butti	Root, stem	Boils (11), Arthritis (3)	14	0.18	Boils: Root is grinded with kali mirch (*Piper nigrum*) seeds in cow urine. It is applied to the boils Arthritis: Fresh branches having stings are touched to the aching and swollen part of body parts
97	*Verbascum thapsus* L (14582) Scrophulariaceae	Ban-tambhakhu	Leaves, Root and seeds	Piles (2), Respiratory Problems (5), Chicken pox (7)	14	0.18	Piles: Dry roots are grounded to water and roasted in ghee. This mixture is consumed in empty stomach for two weeks Respiratory Problems: Dry and fresh leaves are boiled in 200 ml of water. It is consumed for a week Chicken pox: Seeds are brunt on red charcoal and its fumes are consumed to cure chickenpox
98	*Viola canescens* Wall (14564) Violaceae	Banaksha	Flowers and leaves	Cough, Cold and fever (53)	53	0.68	Cough, Cold and fever: Dry flowers and leaves are boiled in water and decoction is given to the patient in fever. Also, 2–3 seeds of kali mirch (*Piper nigrum*) is added while boiling

Table 2 (continued)

S. no.	Plants name (voucher no.) and family	Local name	Part(s) used	Diseases treated (no. of informants)	Total citations (ΣU)	Use value (UV)	Mode of usage
99	*Vitex negundo* L (14605) Lamiaceae	Nirgundi	Whole plant	Fever (6), Internal injuries and fracture (13)	19	0.24	Fever: Decoction is prepared by using Leaves of *Vitex negundo* and leaves of *Justicia adhatoda* in boiling water Internal injuries and fracture: Fresh leaves are crushed with *Murraya koenigii* and *Justicia adhatoda* leaves. This paste is applied to the injured and fractured part of body
100	*Withania somnifera* (L.) Dunal (14645) Solanaceae	Ashvagandha	Flowers	Aphrodisiac tonic (24), Constipation (4), Arthritis and rheumatism (6)	34	0.44	Aphrodisiac tonic: Dry roots are crushed in powder form is consumed (1–2 g) with milk in night as aphrodisiac tonic Constipation: Dry root powder is consumed with hot milk to cure Constipation Arthritis and rheumatism: dry root powder is consumed with milk every day to cure arthritis and rheumatism
101	*Woodfordia fruticosa* (L.) Kurz (14580) Lythraceae	Dhataki	Flowers	Fever (7), Liver Disorder (3), Dysentery (2)	12	0.15	Fever: Dry flower powder is consumed to cure to Fever Liver Disorder: Fresh flower are crushed and consumed to cure liver disorder Dysentery: Dry flower powder is consumed with honey to cure dysentery
102	*Zingiber officinale* Roscoe (14584) Zingiberaceae	Adrak	Rhizomes	Cough and cold (33)	33	0.09	Cough and cold: Roasted rhizome chewed and its juice mixed with honey for cough and cold respectively

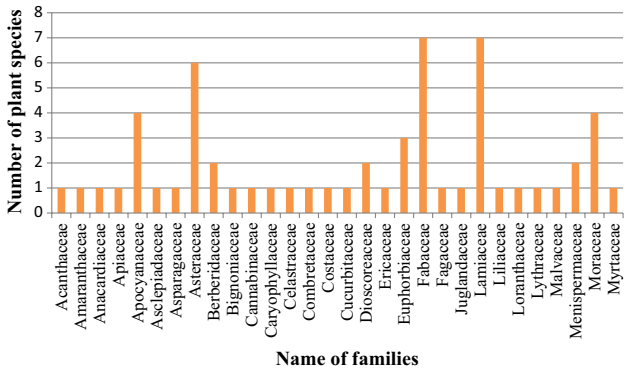

Fig. 2 Representation of the families and number of plants studied at study sites

Dodonaea viscosa (UV = *0.18*), *Dioscorea deltoidea* (UV = 0.15), *Tagetes minuta* (UV = *0.39*), *Drymaria cordata* (UV = 0.36), *Diplocyclos palmatus* (UV = 0.35) and *Ficus religiosa* (UV = 0.34) were observed. Leaves were the most frequently used plant part among different plant parts, followed by roots, seeds, whole plants, fruits, bark, flowers, stem, rhizomes and tuber (Fig. 3). Methods of preparations of crude drugs depend on the nature of diseases. Various methods such as decoction, juice extraction, grinding, dried powder and poultice were used for single and polyherbal formulations.

Factor informant consensus

The categorization of diseases was done into 18 categories (Table 4). The maximum number of species were used to cure gastrointestinal disorders (48), followed by dermatological disorders (34), respiratory (25), skelto muscular (14), liver (13), inflammation (11), reproductive (11), fever (10), physical pain (10), poisoning (6), circulatory (5), urological (5), diabetes (5), oral hygiene (4), ophthalmological (3), cancer (2), ringworms and antihelmintic (2), and cerebral disorders (1). Based on our survey, informant agreed on the curing of cerebral (F_{ic} = 1), circulatory (Fic = 0.94), ringworms and antihelmintic (Fic = 0.94), cancer (Fic = 0.93), reproductive (F_{ic} = 0.93), skelto muscular (F_{ic} = 0.92), respiratory (F_{ic} = 0.92), urological (F_{ic} = 0.90), poisoning (F_{ic} = 0.88), gastrointestinal (F_{ic} = 0.88), dermatological (F_{ic} = 0.87), inflammation (Fic = 0.84), ophthalmological (Fic = 0.84), physical pain (F_{ic} = 0.80), liver (F_{ic} = 0.80), fever (F_{ic} = 0.78), oral hygiene (F_{ic} = 0.72) and diabetes (F_{ic} = 0.68).

Fidelity level

Fidelity percentage varies from 100 to 50% i.e. *Eclipta alba* (100%), *Aloe vera* (100%), *Carissa opaca* (100%) *Ageratum conyzoides* (100%), *Urtica dioica* (78.57%), *Plantago lanceolata* (76.47%), *Rumex nepalensis* (77.77%), *Mallotus philippinensis* (75%), *Dodonaea viscosa* (50%), *Verbascum thapsus* (50%), and *Thevetia peruviana* (50%) is used to treat dermatological disorders. *Acacia catechu* (100%), *Helicterus isora* (100%), *Mentha arvensis* (100%), *Pyrus pashia* (94.59%), *Terminalia chebula* (88.5%), *Euphorbia hirta* (81.81%), *Tagetes minuta* (70%), *Phyllanthus niruri* (63.13%), used for the gastro intestinal disorders. The fidelity level (Fl) is used to determine the most preferred plant species used by local informants for treating various diseases. The total 21 species were observed with (100%) fidelity level. The gastrointestinal (four species) and respiratory disorders (four species) had the 100% fidelity level. Several other important species *Curcuma zedoaria* and *Hemidesmus indicus* used for cancer; *Drymaria cordata* for cerebral disorders; *Rhododendron arboreum, Rubus ellipticus* and *Trachyspermum roxburghianum* for circulatory disorders; *Ajuga integrifolia, Ajuga parviflora. Dendrophthoe falcata,* and *Syzygium cumini* used for diabetes; *Prinsepia utilis, Artemisia vulgaris, Tinospora cordifolia* and *Woodfordia fruticosa* used for fever; *Pistacia integerrima, Quercus leucotrichophora, Cedrus deodara, Costus speciosus, Dioscorea deltoidea* and *Ficus auriculata* used for inflammation; *Cassia occidentalis, Solanum virginianum, Berberis aristata, Cassia tora* and *Justicia adhatoda* used for liver problems; *Pinus roxburghii* used for Ophthalmological; *Boehmeria virgata* and *Juglans regia* for oral hygiene; *Solanum americanum,,Jasminum officinale, Plumbago zeylanica, Solanum aculeatissimum,* and *Pueraria tuberosa* used for physical pain; *Gloriosa superba and Cannabis sativa* used to prevent poisoning; *Ficus benghalensis, Ficus religiosa,Withania somnifera, Brugmansia suaveolens, Asparagus racemosus, Diplocyclos palmatus, Holarrhena antidysenterica,* and *Hibiscus rosa-sinensis* used for reproductive disorders; *Viola canescens, Randia dumetorum, Curcuma longa, Leucas cephalotes, Ocimum basilicum*, *Zingiber officinale* and *Ocimum tenuiflorum* used for respiratory disorders; *Rynchostylis retusa, Vitex negundo*, *Dodonaea viscosa*, *Oroxylum indicum* used for skelto muscular disorders; *Tridax procumbens, Achyranthes aspera, Boerhavia diffusa* and *Camellia sinensis* used for urological disorders; *Jatropha curcas* and *Morus alba* used for ring worms and antihelmintic (Table 5). The maximum number of plant species used to cure gastrointestinal disorders followed by dermatological, respiratory and skelto muscular disorders (Fig. 4). It was found that the frequency of gastrointestinal, dermatological, respiratory and skelto muscular diseases is frequently found in the study area. Ethnopharmacological and ethnobotanical knowledge are transuding down these days among the indigenous population.

Table 3 Similar ethnobotanical/ethnopharmacological uses/biological activities reported for the target plants with their chemical constituents

Plant name	Ethnobotanical/ethnopharmacological uses/biological activities	Chemical constituents
Acacia catechu (L.f.) Willd	Anti-inflammatory, and Chemoprotective (Stohs and Bagchi 2015) Antihyperglycemic and antinociceptive activity (Rahmatullah et al. 2013)	Catechin and epicatechin (Stohs and Bagchi 2015)
Achyranthes aspera L	Antiperiodic, antiasthmatic, hepatoprotective, anti-allergic, pneumonia (Srivastav et al. 2011)	Saponins, oleonolic acid, (Srivastav et al. 2011)
Aegle marmelos (L.) Corrêa	Diarrhea, dysentery, hepatoprotective, anti-diabetic, cardioprotective and radioprotective effects (Baliga et al. 2011)	Carotenoids, coumarins, flavonoids and terpenoids (Baliga et al. 2011)
Ageratum conyzoides (L.) L	Arthrosis, antiasthmatic, antispasmodic, haemostatic effects, leprosy (Kamboj and Saluja 2008)	Chromenes, benzofurans, sterols and terpenoids (Kamboj and Saluja 2008)
Ajuga integrifolia Buch.-Ham	Malaria, inflammatory diseases, Antidiabetic (Alene et al. 2020)	Alkaloids, steroidal compounds, phenolic compounds, flavonoids, saponins, tannins and anthraquinones (Alene et al. 2020)
Ajuga parviflora Benth	Diabetes, malaria, fever, asthma, jaundice, arthritis, cancer, antiviral (Yousaf et al. 2018)	Tannins, alkaloids, polyphenols, quinines and dions, aminophenols, steroids, flavonoids and terpenoids (Yousaf et al. 2018)
Aloe vera (L.) Burm.f	Antimicrobial, anti inflammatory, aphrodisiac, anti-helmenthic (Sahu et al. 2013)	Vitamins, minerals, enzyme, amino acids (Sahu et al. 2013)
Artemisia vulgaris L	Antispasmodic and bronchodilator (Khan and Gilani 2009)	alkaloids, coumarins, flavonoids, saponins, sterols, tannins and terpenes (Khan and Gilani 2009)
Asparagus racemosus Willd	Diarrhoea and dysentery, immunostimulant, anti-dyspepsia and antitussive effects (Bopana and Saxena 2007)	Saponins, quercetin, Rutin, diosgenin (Bopana and Saxena 2007)
Bambusa nutans Wall. ex Munro	Anti-inflammatory, anti-helmintic, anti-diabetic and anti-ulcer (Nirmala et al. 2018)	Phenols, vitamin C & E and mineral elements (Nirmala et al. 2018)
Bauhinia vahlii Wight & Arn	Diarrhea and dysentery (Sowndhararajan and Kang 2013)	Phenol (Sowndhararajan and Kang 2013)
Bauhinia variegata L Fabaceae	Antitumour, antimicrobial, antiinflammatory, antigoitrogenic, hepatoprotective and haemagglutination (Mali et al. n.d.)	Sterols, glycosides, flavanone (Mali et al. n.d.)
#Berberis aristata DC	Anti-pyretic, anti-microbial, anti-hepatotoxic, anti-hyperglycaemic, anti-cancer and anti-lipidemic (Potdar et al. 2012)	Karachine, aromoline, oxyberberine, oxyacanthine, berbamine, and berberine chloride (Potdar et al. 2012)
Berberis lycium Royle	Antidiabetic, antihyperlipidemic, hepatoprotective, anticoccidial, pesticidal, antimutagenic and wound healing (Shabbir 2012)	Alkaloids, cardioactive glycosides, saponins, tannins, anthocyanins, β carotein, phytic acid and phytate phosphorous (Shabbir 2012)
**Boehmeria virgata* (G.Forst.) Guill	Anticancer (Wardihan et al. 2013)	Boehmeriasin A and B (Wardihan et al. 2013)
Boerhavia diffusa L	Jaundice and cancer (Mishra et al. 2014)	Rotenoids, flavonoids, xanthones, purine nucleoside, lignans, and steroids (Mishra et al. 2014)
Brugmansia Suaveolens (Humb. & Bonpl. ex Willd.) Bercht. & J. Presl	Hallucinatory, analgesic, aphrodisiac, nematicide, rheumatism, asthma, and inflammation (Petricevich et al. 2020)	Alkaloids, coumarins, flavonoids, steroids, and hydrocarbons (Petricevich et al. 2020)
Capsicum annuum L	Anti-inflammatory, analgesic, stomachic, hypoglycemic (Pandey et al. 2012)	Thiamine, red carotenoids, capsanthin and capsorubin (Pandey et al. 2012)
Calotropis procera (Aiton) Dryand	Asthma, leprosy, eczema, elephantiasis, vertigo, baldness, toothache, rheumatoid and paralysis (Meena et al. 2011)	Cardenolide, proceragenin, calotropin, and calotropagenin, calotropenyl acetate, and uzarigenin, and terpenol ester (Meena et al. 2011)
Camellia sinensis (L.) Kuntze	Anticancer, Cardiovascular and Antiaging (Mahmood et al. 2010)	Catechins, Quercetin, myricetin and kaempferol (Mahmood et al. 2010)

Table 3 (continued)

Plant name	Ethnobotanical/ethnopharmacological uses/biological activities	Chemical constituents
Cannabis sativa L	Inflammation, pain, colitis, sleep disorders, neurological, healing oils, psychoactive effects (Bonini et al. 2018)	Cannabinoids, cannabinoids, tetrahydrocannabinol (Bonini et al. 2018)
Carissa opaca Stapf ex Haines	Cytotoxic, antitumor and anticancer (Sahreen et al. 2013)	Isoquercetin, myricetin and apigenin (Sahreen et al. 2013)
Cascabela thevetia (L.) Lippold	Antifungal properties (Gata-Gonçalves et al. 2003) Antioxidants and inflammatory (Rahman et al. 2017)	Pulegone, linoleic acid and palmitic acid (Gata-Gonçalves et al. 2003)
Cassia occidentalis L	Antidiabetic, anti-inflammatory, anticancerous, antimutagenic and hepatoprotective activity (Yadav et al. 2010)	Anthraquinones, anthrones, apigenin, aurantiobtusin, campesterol, cassiollin, chryso-obtusin, chrysophanic acid, chrysarobin, chrysophanol, chrysoeriol (Yadav et al. 2010)
**Catunaregam spinosa* (Thunb.) Tirveng	Abortiffcient activity, diarrhoea and dysentery (Khan et al. 2017a, b)	D-mannitol, 1-keto-3αhydroxy Oleanane, saponins, scopoletin, iridiodal and glycosides phenol, alkaloids (Khan et al. 2017a, b)
**Senna tora* (L.) Roxb	Antihepatotoxic and anti mutagenic (Fathalla et al. 2019)	Chrysophenol, emodin, rhein (Fathalla et al. 2019)
Cedrus deodara (Roxb. ex D.Don) G.Don	Anti-inflammatory, analgesic, anti-hyperglycemia, antispasmodic, insecticidal, anti-apoptotic, anti-cancer, immmunomodulatory, molluscidal, anxiolytic and anticonvulsant properties (Chaudhary et al. 2011)	Matairesinol, dibenzylbutyrolactol, berating, isopimpillin, lignans 1, 4 diaryl butane, benzofuranoid, isohemacholone, (Chaudhary et al. 2011)
Celastrus paniculatus Willd	Nervine tonic, rejuvenator, anti-depressant, rheumatism, gout and paralysis (Arora and Pandey-Rai 2012)	Celastrine and paniculatin, palmitic, stearic, oleic, linoleic, and linolenic (Arora and Pandey-Rai 2012)
**Aleuritopteris bicolor* (Roxb.) Fraser-Jenk	Antibacterial, anti-inflammatory (Singh et al. 2020)	Phenolic compounds, glycosides, flavonoids and alkaloids (Singh et al. 2020)
**Cirsium Wallichii* DC	Antimicrobial (Ajaib et al. 2016)	Flavonoids (Ajaib et al. 2016)
Cissampelos pareira L	Antitumour, ulcers, migraine, Antinociceptive and antiarthritic, Anti-inflammatory, Antifertility (Katekhaye et al. 2010)	Cissampareine, Cissamine, cycleanine, Tetrandrine (Katekhaye et al. 2010)
Citrus limon (L.) Osbeck	Analgesic, antianaemic, antiemetic, antiesclerotic, antipyretic, antiseptic (Arias and Ramón-Laca 2005)	Caffeine, theobromine, theophylline, paraxanthine, limonene, canfen, citral, coumarins (Arias and Ramón-Laca 2005)
Cheilocostus speciosus (J.Koenig) C.D.Specht	Diuretic activity (Dubey Subodh et al. 2010) Insecticidal activity, antidiabetic properties (Benelli et al. 2018)	Camphene, zerumbone and α-humulene (Benelli et al. 2018)
Curcuma longa L	Antiinflammatory, anticarcinogenic, antimutagenic, anticoagulant, antifertility, antidiabetic, antifibrotic, antivenom, antiulcer, hypotensive and hypocholesteremic activities (Vigyan Kendra et al. 2018)	Curcumin (diferuloylmethane), Anthocyanins (Vigyan Kendra et al. 2018)
Curcuma zedoaria (Christm.) Roscoe	Diarrhoea, cancer, flatulence,dyspepsia, rubefacient, diuretic (Lobo et al. 2009)	Curcumin, arabin, sesquiterpenes (Lobo et al. 2009)
Cymbopogon citratus (DC.) Stapf	Anti-amoebic, antidiarrheal, antifilarial, anti-inflammatory, antimalarial, antimutagenicity, hypoglycemic and neurobehaviorial (Shah et al. 2011)	Terpenes, ketones, aldehyde, esters, Citral α, Citral β, Nerol Geraniol, Terpinolene, Geranyl acetate, Myrecene and Terpinol Methylheptenone (Shah et al. 2011)
Dendrophthoe falcata (L.f.) Ettingsh	Anticancer, aphrodisiac, astringent, narcotic, pulmonary tuberculosis, asthma, menstrual disorders (Dashora et al. 2011)	Flavonoids, phytosterols, tannins, phytosterols, (Dashora et al. 2011)
Dioscorea bulbifera L	Ulcers, sores, dysentery, diabetes and cancer (Ghosh et al. 2015)	Diosbulbin, Bafoudiosbulbin, Diosbulbiside (Ghosh et al. 2015)

Table 3 (continued)

Plant name	Ethnobotanical/ethnopharmacological uses/biological activities	Chemical constituents
# *Dioscorea deltoidea* Wall. ex Griseb	Neurodegenerative, cardiovascular disorders, hypercholesterolemia, menopausal symptoms, Antidiabetic (Nazir et al. 2020)	Diosgenin (Nazir et al. 2020)
Diplocyclos palmatus (L.) C. Jeffrey	Aphrodisiac, tonic, Constipation, Stomach problem, Diarrhoea, Malaria, fever (Patel 2018)	Punicic acid (Patel 2018)
Dodonaea viscosa (L.) Jacq	Antidiabetic,insecticidal, antifertility, wound, anti-inflammatory, analgesic, anti-ulcer, antispasmodic, anti-diarrheal (Al-Snafi 2017)	Steroids, phenolics, saponins, tannins, gums, mucillages (Al-Snafi 2017)
Drymaria cordata (L.) Willd. ex Schult	Analgesic activity, antitussive activity, anxiolytic activity, antipyretic activity, antinociceptive activity (Nono et al. 2014)	Stigmasterol, triterpenoids, (Nono et al. 2014)
Eclipta prostrata (L.) L	Hemorrhagic diseases, skin diseases, respiratory disorders, coronary heart disease, vitiligo, snake bite (Feng et al. 2019)	Cardiac glycosides, coumestans, polyacetylene, steroids, saponins, phytosterol, triterpenes (Feng et al. 2019)
Euphorbia hirta L	Female disorders, respiratory ailments, dysentery, jaundice, pimples, gonorrhea (Kumar et al. 2010)	Triterpenes, phytosterols, tannins, polyphenols, and flavonoids (Kumar et al. 2010)
Ficus auriculata Lour	Diarrhea and dysentery (Gaire et al. 2011)	Alkaloids, saponins, glycosides, phytosterols, resins, phenols, tannins, diterpenes (Gaire et al. 2011)
Ficus benghalensis L	Dysentery, diarrhea, diabetes, leucorrhoea, menorrhagia, nervous disorders (Praseetha 2015)	Sterols, flavanoids, phenol, tannins, and saponins triterpenoids, gums (Praseetha 2015)
Ficus religiosa L	Antidiabetic, antiviral, hypolipidemic, antiasthmatic, antitumor, antiulcer, antihelmintic, apoptosis, hypotensive (Singh et al. 2011)	Phytosterols, amino acids, furanocoumarins (Singh et al. 2011)
Gloriosa superba L	Arthritis, gout, rheumatism, ulcers, bleeding piles, skin diseases, leprosy, impotency, snakebites (Jana and Shekhawat 2011)	Colchicine, colchicoside superbine, gloriosine, lumicolchicine (Jana and Shekhawat 2011)
Helicteres isora L	Hypolipidaemic, anticancer activity, antinociceptive activity, hepatoprotective activity, anti-diarrheal activity and (Kumar and Singh 2014)	Saponins, phlobotannis, rosmarinic acid, phenolic compounds and tannins and amino acid (Kumar and Singh 2014)
Hemidesmus indicus (L.) R. Br. ex Schult	Anticancer, antipyretic, analgesic, antidiabetic, hepatoprotective, cardioprotective and neuroprotective (Das and Singh Bisht 2013)	Vanillin, isovanillin, lupeol (Nandy et al. 2020)
Hibiscus rosa-sinensis L	Hypotensive, anti-pyritic, anti-inflammatory, anti-cancer, anti-diabetic, abortifacient activities (Missoum 2018)	Flavonoids, tannins, terpenoids, saponins, and alkaloids (Missoum 2018)
Holarrhena antidysenterica (Roth) Wall. ex A.DC	Analgesic, anti-diarrhoeal, anti-inflammatory anti-malarial, anti-diabetic, anti-urolithic, anti-mutagenic, CNS-stimulating, anti-haemorrhoidal activities (Sinha et al. 2013)	Coumarins, saponins and ergostenol (Sinha et al. 2013)
**Jasminum officinale* L	Hepatitis (Zhao et al. 2009)	Secoiridoid glycosides, oleuropein (Zhao et al. 2009)
Jatropha curcas L	Skin, antidiabetic, anticoagulant, hepatoprotective, analgesic and abortifacient effects (Abdelgadir and Van Staden 2013)	Diterpeniods, sesquiterpenoids, coumarins and (Abdelgadir and Van Staden 2013)
Juglans regia L	Antidiabetic, hypolipidemic, antihypertensive activities (Delaviz et al. 2017)	Quercetin, galactoside, caffeic acid, and paracomaric acid (Delaviz et al. 2017)
Justicia adhatoda L	Antitussive, abortifacient, cardiovascular protection, anticholinesterase, anti-inflammatory (Dhankhar et al. 2011)	Quinazoline alkaloids (Dhankhar et al. 2011)

Table 3 (continued)

Plant name	Ethnobotanical/ethnopharmacological uses/biological activities	Chemical constituents
Lantana camara L	Antipyretic, larvicidal, insecticidal, healing and anti-hyperglycemic (Ghisalberti 2000)	Mono- and sesquiterpenes, Triterpenes, flavonoids, lantadene A and icterogenin (Ghisalberti 2000)
Leucas cephalotes (Roth) Spreng	Diaphoretic, fever and liver disorder (Priyank et al. 2011)	Flavanoids, phenol, phytosterol and tannins, (Priyank et al. 2011)
Litchi chinensis Sonn	Hypoglycemic, anticancer, anti-platelet, anti-tussive, analgesic, antipyretic and diuretic (Ibrahim and Mohamed 2015)	Flavonoids, sterols, triterpenens, phenolics (Ibrahim and Mohamed 2015)
Mallotus philippinensis var. reticulatus (Dunn) F.P. Metcalf	Antiviral, cytotoxicity, immunoregulatory (Gangwar et al. 2014)	Coumarins, isocoumarins,, bergenin, mallotophilippinens, rottlerin, and isorottlerin (Gangwar et al. 2014)
Mentha arvensis L	Antimicrobial, cytotoxic and analgesic activities (Biswas et al. 2014)	Quercetin, menthoside, and isorhoifolin, eugenol and thymol, monoterpenes, viridiflorol (Biswas et al. 2014)
Morus alba L	Antidiabetic, antimutagenic, anticancer, anxiolytic, anthelmintic, antistress, immunomodulatory, nephroprotective, hepatoprotective (Jambheshwar et al. 2013)	Carotene, vitamin b1, folic acid, folinic acid, quercetin, tannins, flavonoids and saponins (Jambheshwar et al. 2013)
Mucuna pruriens (L.) DC	Antidiabetic, aphrodisiac, antineoplastic, antiepileptic, antimicrobial activities (Kavitha and Thangamani 2014)	Mucunadine, mucunine, Lecithin prurienidine, prurienine (Kavitha and Thangamani 2014)
Murraya koenigii (L.) Spreng	Anti diabetic and cholesterol reducing property, antimicrobial activity, antiulcer activity, antioxidative property, cytotoxic activity, anti diarrhea activity (Singh et al. 2014)	Carotene, nicotinic acid and vitamin C, glycosides, carbazole alkaloids, koenigin and resin (Singh et al. 2014)
Murraya paniculata (L.) Jacq	Antinociceptive, antioxidant, anti-diabetic, antimicrobial, analgesic activities (Sayar et al. 2014)	Coumarins, alkaloids, phenols, terpenoids and flavonoids (Sayar et al. 2014)
Ocimum basilicum L	Vasorelaxant and anti-platelet aggregation, cardiotonic, abdominal pain reliever and anti-diarrhoeal agent (Amrani et al. 2009)	Linalool, monoterpenes, polyphenols, flavonoids, (Hussain et al. 2008)
Ocimum tenuiflorum L	Anti-fertility, anticancer, antidiabetic, antimicrobial, cardioprotective, analgesic, antispasmodic and adaptogenic (Pattanayak et al. 2010)	Eugenol, euginal,, urosolic acid (Pattanayak et al. 2010)
Oroxylum indicum (L.) Kurz	Antidiabetic, hepato-protective, anti-carcinogenic, immunomodulatory, nephro-protective, cardioprotective (Ahad et al. 2012)	Chrysin, oroxylin-A, scutellarin, baicalein, ellagic acid (Ahad et al. 2012)
Oxalis corniculata L	Anti-inflammatory, anxiolytic, anticonvulsant, antifungal, antiulcer, antinociceptive, anticancer, antidiabetic, hepatoprotective, abortificient (Srikanth and Swetha 2012)	β-sitosterol, betulin, 4-hydroxybenzoic acid, ethyl gallate, methoxyflavones, and apigenin (Srikanth and Swetha 2012)
Phyllanthus emblica L	Anti-inflammatory, analgesic and antipyretic, adaptogenic, hepatoprotective, antitumor and antiulcerogenic activities (Luo et al. 2011)	Phosphatides, essential oils, phosphatides, essential oils, tannins (Luo et al. 2011)
Phyllanthus niruri L	Antimicrobial, anticancer, antinflammatory, antiplasmodial, antiviral, diuretic and hepatoprotective (Kaur et al. 2017)	Rutin, Quercetin, Quercitrin, astragalin (Kaur et al. 2017)
Pinus roxburghii Sarg	Hepatoprotective activity, Analgesic and anti-inflammatory activity, Anticonvulsant activity (Kaushik et al. 2013)	α-pinene, abietic acid, quercetin and xanthone. Resin acids and flavonoid (Kaushik et al. 2013)
Pistacia chinensis subsp. Integerrima (J. L. Stewart ex Brandis) Rech. f	Alzheimer, diabetes, convulsions, cancer, asthma, diabetes, diarrhea and immunomodulatory, analgesic and anti-inflammatory (Ahmad et al. 2020)	Pistagremic acid, triterpenes, phenolic, phytosterols, tannins and oligosaccharides (Ahmad et al. 2020)

Table 3 (continued)

Plant name	Ethnobotanical/ethnopharmacological uses/biological activities	Chemical constituents
Plantago lanceolata L	Anti-inflammatory and wound healing (Gonçalves and Romano 2016)	Iridoid glucosides and phenylethanoid glycosides (Gonçalves and Romano 2016)
Plumbago zeylanica L	Anti-fungal, anti-tumor, disease of heart, rheumatic pains, liver diseases, fever, diabetes, and kidney disease (Mandavkar and Jalalpure 2011)	Plumbagin, zeylinone, isozeylinone, naphthoquinones, sitosterol, lupeol, (Mandavkar and Jalalpure 2011)
**Prinsepia utilis*Royle	Antiosteoporotic activities (Gupta et al. 2015)	Hydrocyanic acids, fatty oils, prinsepiol, and triterpenoids(Guan et al. 2014)
**Prunus cerasoides* Buch.-Ham. ex D.Don	Swelling, stomach troubles, asthma, and nausea/ vomiting (Kim et al. 2020)	Naringenin, prunetin, sakuranetin, gentisic acid, (Kim et al. 2020)
Pueraria tuberosa (Willd.) DC	Spermatogenic, immune booster, aphrodisiac, anti-inflammatory, cardiotonic and brain tonic (Maji et al. 2014)	Puerarin, genistein, daidzein, tuberosin (Maji et al. 2014)
*Punica granatum*L	Anti-inflammatory Activity, Healing Activity, Anti-diabetic Activity, Anti cancer Activity (Arun and Singh 2012)	Ellagic acid, gallic acid; caffeic acid; catechin, EGCG, quercetin, Ellagitannins, including punicalin and punicalagin (Arun and Singh 2012)
**Pyrus pashia* Buch.-Ham. ex D.Don	Gastrointestinal, Respiratory and Cardiovascular Ailments (Janbaz et al. 2015)	Lupeol, β-sitosterol, β-sitosterol—β-D-glucoside, arbutinphlorhizin, pectin and amygdalin (Janbaz et al. 2015)
**Quercus oblongata* D.Don	Hepatoprotective activity (Singh and Bisht 2018)	Triterpenoids, flavonoids, and tannins (Taib et al. 2020)
Rhododendron arboreum Sm	Diarrhoea and blood dysentery (Kiruba et al. 2011)	Hyperoside, ursolic acid and epifriedelinol, xanthoprotein and coumarin. (Kiruba et al. 2011)
**Rubus ellipticus* Smith	Antitumor and Wound Healing, skin diseases (George et al. 2015)	Triterpenoid, Saponins, rubusides (Li et al. 2009)
Rumex nepalensis Spreng	Anti-inflammatory, central nervous system depressant, genotoxic, wound healing and skeletal muscle relaxant activity (Shaikh et al. 2018)	Triterpenoids, stilbene glycosides, tannic acid, saponins, resveratrol, sterols, quercetin (Shaikh et al. 2018)
**Rhynchostylis retusa* (L.) Blume	Antibacterial and antifungal potential, paralysis (Rohani et al. 2018)	Alkaloids, glycosides, flavonoids, saponins, tannins, terpenoids, steroids, quinine and coumarin (Rohani et al. 2018)
**Solanum aculeatissimum* Jacq Solanaceae	Protease inhibitor (Meenu Krishnan and Murugan 2015)	Saponin (Ikenaga et al. 1995)
Solanum americanum Mill. L Solanaceae	Hepatoprotective, anti-tumor, cytostatic, anti-convulsant, anti-ulcerogenic and anti-inflammatory effects (Atanu et al. 2011)	Nigrumins, solanine, (Atanu et al. 2011)
**Solanum virginianum* L	Antimicrobial, insecticidal, and antiradical activity (Hl et al. 2017)	Alkaloids, phenolics, flavonoids, sterols, saponins, glycosides, fatty acids, tannins, and amino acids (Hl et al. 2017)
Syzygium cumini L. skeels	Antidiabetic (Ayyanar and Subash-Babu 2012)	Anthocyanins, glucoside, ellagic acid, isoquercetin, kaemferol, alkaloid, jambosine, and glycoside jambolin or antimellin and myrecetin (Ayyanar and Subash-Babu 2012)
**Tagetes minuta* L	Larvicidal activity (Kyarimpa et al. 2014)	Trans-ocimene, I-verbenone, limonene, tegetone and 2-pinen-4-one (Kyarimpa et al. 2014)
Terminalia chebula Retzius	Antidiabetic, hepatoprotective, anti-inflammatory, antimutagenic, antiproliferative, radioprotective, cardioprotective, antiarthritic, anticaries, (Bag et al. 2013)	Gallic acid, chebulic acid, punicalagin, chebulanin, corilagin, neochebulinic, ellagic acid, chebulegic acid, chebulinic acids (Bag et al. 2013)

Table 3 (continued)

Plant name	Ethnobotanical/ethnopharmacological uses/biological activities	Chemical constituents
**Thalictrum foliolosum* DC	Antifungal pathogens (Kumar et al. 2020) (Pandey et al. 2018) Hepatoprotective Activity (Marslin and Prakash 2020)	Berberine, columbamine, jatrorrhizine, oxyberberine, thalifendine, palmatine, (Kumar et al. 2020)
Tinospora cordifolia (Willd.) Miers	Diabetes, liver damage, cancer (Panchabhai et al. 2008) (Choudhary et al. 2013)	Alkaloids, glycosides, steroids, diterpenoid lactones, sesquiterpenoid, aliphatic compound (Choudhary et al. 2013)
Trachyspermum roxburghianum (DC.) H. Wolff	Antioxidant and antibacterial activities, anti-malarial, anti-inflammatory and anticancer (Peerakam et al. 2014)	Sabinene and α-terpinolene, bytylphthalide (Peerakam et al. 2014) cyclohexenone, roxydienone (Wisetsai et al. 2018)
Tridax procumbens (L.) L	Anti-diabetic (Bhagwat et al. 2008) anti-anemic, anti-inflammatory and anesthetic (Beck et al. 2018)	Anthraquinones, anthrones, flavonoids, and steroids flavonoids, alkaloids, tannins, carotenoids and saponins (Beck et al. 2018)
Urtica dioica L	Hypertension, central nervous system, cardiovascular system, anti-inflammatory, antifungal (Dhouibi et al. 2020)	Flavonoids (Dhouibi et al. 2020), polyphenol carboxilic acids, caffeoylmalic acid, caffeic acid and ferulic acid, sterols (β-sitosterol), coumarins lectines (isolectines, Urtica dioica Agglutinin) (Nencu et al. 2012)
**Verbascum thapsus* L	Anticarcinogenic, antimicrobial (Mahdavi et al. 2019), ANTHELMINTIC (Ali et al. 2012)	Flavonoids, saponins, tannins, terpenoids, glycosides, carbohydrates, proteins, fats and fixed oils (Ali et al. 2012)
**Viola canescens* Wall	Anti-malarial activity (Verma et al. 2011) Hepatoprotective effect (Khan et al. 2017a, b)	polyphenols and flavonoids, beside saponins, triterpenes and alkaloids (Khan et al. 2017a, b)
**Vitex negundo* L	Anti-inflammatory (Tiwari and Tripathi 2007)	Polyphenolic compounds, terpenoids, glycosidic iridoids and alkaloids (Tiwari and Tripathi 2007)
Withania somnifera (L.) Dunal	Anti-inflammatory, antitumor, antistress, immunomodulatory, hemopoetic, and rejuvenating properties (Singh et al. 2000)	Steroidal lactones (withanolides, withaferins), saponins, alkaloids (Singh et al. 2000)
Woodfordia fruticosa (L.) Kurz	Anti-inflammatory and Analgesic Properties (Baravalia et al. 2012) Hepatoprotective (Baravalia et al. 2012)	Tannins,, flavonoids, anthraquinone glycosides, and polyphenols (Das et al. 2007)
Zingiber officinale Roscoe	Anticancer, anti-inflammatory, anti-apoptotic, anti-hyperglycemic, anti-hyperlipidemic and anti-emetic actions (Naveed et al. 2011)	Sesquiterpenoids, zingiberene (Naveed et al. 2011)

*Plants with new or lesser known ethnopharmacogical uses reported in the present study

#Threatened wild plants of Himachal Pradesh, India (Status assessed for Himachal Pradesh 2 Criteria 3% of Global Population, n.d.)

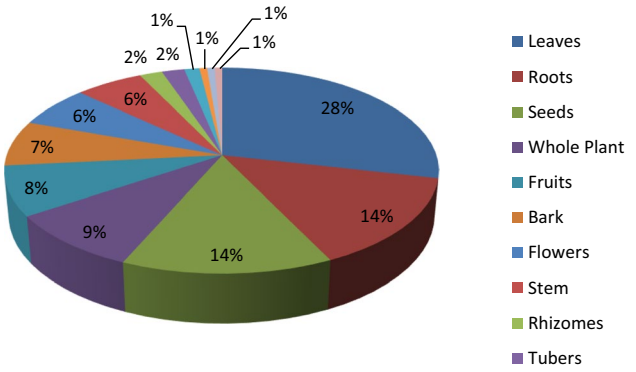

Fig. 3 Representation of the number of plants and their parts used for treating various ailments

Medicinal uses of plants against various disorders

Many scientific reports or claims indicate the possible use of medicinal plants in various diseases. Aqueous extracts of *Acacia catechu* heartwood having catechin and epicatechin were used for anti-inflammatory and chemoprotective (Stohs and Bagchi 2015), antihyperglycemic and antinociceptive activity (Rahmatullah et al. 2013). The aqueous root extract of *Ajuga integrifolia* (Alene et al. 2020) and *Leucas cephalotes* (Priyank et al. 2011) was used against inflammatory diseases and diabetic disorders. *Ajuga parviflora* methanol extract (Yousaf et al. 2018) and rhizome part of *Curcuma longa* (Vigyan Kendra et al. 2018) were used for diabetes, malaria, fever, asthma, jaundice, arthritis, cancer and antiviral. *Artemisia vulgaris* crude extract exhibits a combination of anticholinergic and Ca^{2+} antagonist mechanisms, which provides the pharmacological basis for hyperactive gut and airways disorders, diarrhea, abdominal colic, and asthma disorders (Khan and Gilani 2009). *Asparagus racemosus* root powder extract was known for its phytoestrogenic activities. It was effective against diarrhea, dysentery, and dyspepsia (Bopana and Saxena 2007). Leaves and root decoction of *Berberis aristata* were used for various disorders i.e. anti-pyretic, anti-microbial, anti-hepatotoxic, anti-hyperglycaemic, anti-cancer and anti-lipidemic (Potdar et al. 2012). Dried bark and root powder of *Berberis lycium* were used for diabetes, hyperlipidemic, hepatoprotective, antimutagenic and wound healing (Shabbir 2012). *Boehmeria virgata* (Wardihan et al. 2013), ethanolic and aqueous extracts of the *Dendrophthoe falcata* (Dashora et al. 2011) and *Boerhavia diffusa* (Mishra et al. 2014) extracts were used for different cancer cell lines. The aqueous and ethanolic extracts of *Brugmansia suaveolens* (Petricevich et al. 2020) and *Cissampelos pareira* (Katekhaye et al. 2010) exhibit antinociceptive and nematocidal activities. *Dioscorea bulbifera* (Ghosh et al. 2015) and *Dioscorea deltoidea* (Nazir et al. 2020) have exhibited anti-oxidant, antiinflammatory, antibacterial, antidiabetic and anticancer activities. The aqueous, methanol and petroleum extract of root tubers and leaves of *Gloriosa superba* shows arthritis, gout,

Table 4 Disease category and their factor informant consensus (Fic)

S. no.	Disease category	No. of plant species	Use citations	Fic
1	Cancer	2	45	0.93
2	Cerebral disorders	1	5	1
3	Circulatory disorders (anemia, blood purifier, blood thinner, high blood pressure)	5	71	0.94
4	Dermatological disorders (boils, burns, Cuts and wounds)	34	273	0.87
5	Diabetes	5	17	0.68
6	Fever	10	43	0.78
7	Gastro intestinal disorders (appetizer, bloating, cholera, constipation, indigestion, diarrhea, dysentry, oralulcers, piles)	48	410	0.88
8	Inflammation (rheumatoid, arthritis, tonsillitis)	11	66	0.84
9	Liver, spleen and gall bladder complaints (hepatitis, jaundice)	13	63	0.80
10	Ophthalmological (eye infection, eye sight)	3	14	0.84
11	Oral hygiene (Teeth and gum infection, Mouth)	4	12	0.72
12	Physical pain (Weakness, body pain, headache, joint pain, toothache)	10	46	0.80
13	Poisoning (scorpion sting, snakebite)	6	45	0.88
14	Reproductive disorders (impotency, leucorrhea, spermatorrhoea menstrual pain, uterine haemorrhage)	11	148	0.93
15	Respiratory disorders (asthma, cold, cough, influenza, pneumonia, whooping cough, throat ailments)	25	306	0.92
16	Ring worms and Antihelmintic	2	20	0.94
17	Skelto muscular (arthritis, bone fracture, injuries)	14	171	0.92
18	Urological (diuretic, kidney stones)	5	42	0.90

Table 5 Fidelity level (Fl%) of some important plant species for various diseases

S. no.	Disease category	Important medicinal plants	Fl (%)
1	Cancer	*Curcuma zedoaria*	100
		Hemidesmus indicus	84.6
2	Cerebral disorders	*Drymaria cordata*	17.85
3	Circulatory disorders (anemia, blood purifier, blood thinner, high blood pressure)	*Rhododendron arboreum*	87.17
		Rubus ellipticus	66.66
		Trachyspermum roxburghianum	100
4	Dermatological disorders (boils, Cuts and wounds)	*Verbascum thapsus*	50
		Thevetia peruviana	50
		Plantago lanceolata	76.47
		Carissa opaca	100
		Ageratum conyzoides	100
		Urtica dioica	78.57
		Rumex nepalensis	77.77
		Mallotus philippinensis	75
		Berberis lyceum	50
		Eclipta alba	100
		Aloe vera	100
		Dodonaea viscosa	50
		Thalictrum foliosum	71.42
5	Diabetes	*Ajuga integrifolia*	22.27
		Ajuga parviflora	100
		Dendrophthoe falcate	60
		Syzygium cumini	66.66
6	Fever	*Prinsepia utilis*	53.84
		Artemisia vulgaris	100
		Tinospora cordifolia	45.65
		Woodfordia fruticosa	58.33
7	Gastro intestinal (appetizer, constipation, indigestion, diarrhea, dysentry, oralulcers, piles)	*Acacia catechu*	100
		Helicterus isora	100
		Tagetes minuta	70
		Terminalia chebula	88.5
		Mentha arvensis	100
		Phyllanthus niruri	63.63
		Pyrus pashia	94.59
		Dioscorea bulbifera	70
		Euphorbia hirta	81.81
8	Inflammation (rheumatoid, arthritis, tonsillitis)	*Pistacia integerrima*	54.16
		Quercus leucotrichophora	68.42
		Cedrus deodara	80
		Costus speciosus	71.42
		Dioscorea deltoidea	100
		Ficus auriculata	56.25
9	Liver, spleen and gall bladder complaints (hepatitis, jaundice)	*Cassia occidentalis*	66.66
		Solanum virginianum	63.63
		Berberis aristata	65
		Justicia adhatoda	57.14
		Cassia tora	66.66
10	Ophthalmological (eye infection, eye sight)	*Pinus roxburghii*	100
11	Oral hygiene (Teeth, Mouth)	*Boehmeria virgata*	100
		Juglans regia	66.66

Table 5 (continued)

S. no.	Disease category	Important medicinal plants	FI (%)
12	Physical pain (Weakness, body pain, headache, joint pain, toothache)	*Solanum americanum*	54.54
		Jasminum officinale	71.42
		Plumbago zeylanica	60
		Solanum aculeatissimum	55.55
		Pueraria tuberosa	100
13	Poisoning (scorpion sting, snakebite)	*Gloriosa superba*	57.5
		Cannabis sativa	66.66
14	Reproductive disorders (impotency, leucorrhea, spermatorrhoea menstrual pain, uterine haemorrhage)	*Ficus benghalensis*	66.66
		Ficus religiosa	100
		Withania somnifera	70.58
		Brugmansia suaveolens	37.5
		Asparagus racemosus	86.66
		Diplocyclos palmatus	100
		Holarrhena antidysenterica	72.22
		Hibiscus rosa-sinensis	72.72
15	Respiratory disorders (asthma, cold, cough, influenza, pneumonia, whooping cough, throat ailments)	*Viola canescens*	100
		Randia dumetorum	61.90
		Curcuma longa	85.29
		Leucas cephalotes	57.14
		Ocimum basilicum	100
		Ocimum tenuiflorum	100
		Zingiber officinale	100
16	Ring worms and Antihelmintic	*Jatropha curcas*	75
		Morus alba	87.16
17	Skelto muscular (arthritis, bone fracture, injuries) disorder	*Rynchostylis retusa*	73.06
		Vitex negundo	68.42
		Dodonaea viscosa	50
		Oroxylum indicum	
18	Urological (diuretic, kidney stones)	*Tridax procumbens*	69.56
		Achyranthes aspera	63.63
		Boerhavia diffusa	58.33
		Camellia sinensis	81.81

rheumatism, ulcers, bleeding piles, skin diseases, leprosy, impotency, snakebites (Jana and Shekhawat 2011). Fruits and leaves extract of *Helicteres isora* show hypolipidaemic, anticancer activity, antinociceptive activity, hepatoprotective activity and anti-diarrheal activity (Kumar and Singh 2014). The root extract of *Hemidesmus indicus* was used for antitumor potential (Das and Singh Bisht 2013).). Seeds extract of *Holarrhena antidysenterica* in different solvents was used against anti-malarial, anti-diabetic, anti-oxidant, anti-urolithic, anti-mutagenic, CNS-stimulating, angiotensin-converting-enzyme inhibitory and acetylcholinesterase inhibitory activity. Similarly, various studies revealed about detailed analysis of the medicinal uses of plants for various disorders reported by researchers are presented in Table 3.

Discussion

The local informants and traditional healers of Palampur had a diverse knowledge about ethnomedicinal plants. They were using 102 plant species belonging to 90 genera and 30 families, to cure 18 categories of diseases. Total 19 medicinal plants species (*Solanum aculeatissimum, Rhynchostylis retusa, Vitex negundo, Thalictrum foliolosum, Viola canescens, Verbascum Thapsus, Tagetes minuta, Solanum virginianum, Rubus ellipticus, Quercus oblongata, Pyrus pashia, Prunus cerasoides*, *Prinsepia utilis, Jasminum officinale, Cirsium Wallichii, Aleuritopteris bicolor, Senna tora* and *Boehmeria virgata*) having new or less known ethnomedicinal uses. Also, 3 threatened wild plants species (*Berberis aristata*, *Dioscorea deltoidea* and *Oroxylum indicum*)

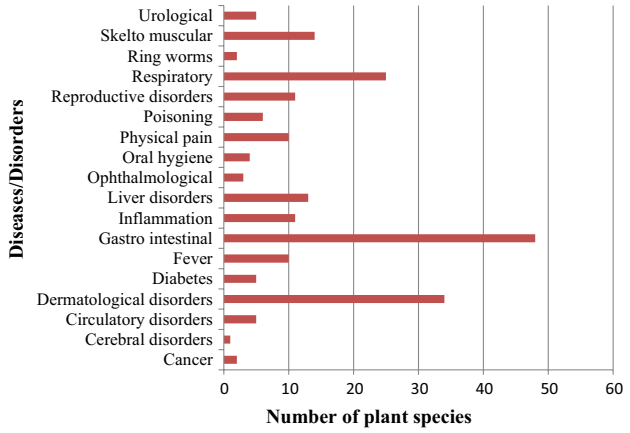

Fig. 4 Frequency of plant species used for the treatment of various diseases

were collected from the study area. The older generation had greater knowledge of ethnomedicinal plant species than the younger generation. Herbs were most frequently used because of their higher availability in the study area. Also, herbs were easy to access and use for the treatment of more than one disease in comparison to shrubs and trees. Traditional healers and local informants were frequently using *Dodonaea viscosa, Solanum virginianum*, *Curcuma zedoaria, Viola canescens, Helicterus isora, Verbascum Thapsus, Solanum aculeatissimum, Randia dumetorum, Pyrus pashia* and *Prinsepia utilis* to treat more than one disorder. Among them leaves were most frequently used plant parts for the treatment of diseases followed by whole plant and other parts. Dominance of families Fabaceae (7 species), Lamiaceae (7 species), Asteraceae (6 species), Moraceae (4 species), Apocyanaceae (4 species) were observed. This dominance could be result of their availability, distribution and abundance (Mahalik et al. 2015). There are many reports about the use of medicinal plants of lamiaceae and Asteraceae family (Bennett and Prance 2000). Various methods were used for the preparation of medicines ingredients such as a paste, fresh plants parts juice, decoction, and fresh and dried plants part powder (Samant et al. 2007). In the study area, traditional healers tend to prepare medicine by use combination of different plants species for curing diseases. Seeds and bark of *Prunus cerasoides* were crushed with methi (*Trigonella foenum*), ajwain (*Tachyspermum ammi*) and roasted in Linseed oil. It was used to internal injuries. Roots of *Urtica dioica* is ground with kali mirch (*Piper nigrum*) seeds in cow urine and it is used to cure boils. Our ethnobotanical survey revealed the use of single plant species in more than one disorder. *Mucuna pruriens* seeds were used to cure seminal weakness, spermatorrhoea and arthritis. *Mallotus philippinensis* fruits were used to cure skin and stomach disorders and applied in paste or powdered form. Reproductive parts of *Rhododendron arboreum* flowers were used to cure nose bleeding and diarrhea disorders. Use value is an important tool for the identification of important medicinal plants. Medicinal plants with higher use values i.e. *Curcuma longa* (UV = 0.88), *Viola canescens* (UV = 0.68), *Helicteres isora* (UV = *0.64*), *Tinospora cordifolia* (UV = *0.59*), *Rhododendron arboretum* (UV = *0.50*), *Gloriosa superba* (UV = *0.52*), *Pyrus pashia* (UV = *0.48*), and *Terminalia chebula* (UV = *0.45*).

The consensus among the informants (Fic) on the use of ethnomedicinal plants was observed from high to low for curing of cerebral, circulatory, ringworms and antihelmintic, cancer, reproductive, skelto muscular, respiratory, urological, poisoning, gastrointestinal, dermatological, inflammation, ophthalmological, physical pain, liver, fever, oral hygiene and diabetes. The maximum number of species were used to cure gastrointestinal disorders, followed by dermatological disorders, respiratory, skelto muscular, liver, inflammation, reproductive, fever, physical pain, poisoning, circulatory, urological, diabetes, oral hygiene, ophthalmological, cancer, ringworms and antihelmintic, and cerebral disorders. The fidelity level (Fl) is used to indicate the most preferred plant species used by local inhabitants for treating certain diseases. Fidelity level (Fl) with 100% value for a species indicates that the all of its use reports mentioned the same method for a particular disease category. Twenty one plant species had 100% fidelity level. The gastrointestinal and respiratory disorders had the maximum eight species (four in each category) with100% fidelity level.

In the present study, Fresh leaves of *Vitex negundo* were crushed with *Murraya koenigii* and *Justicia adhatoda* leaves to cure fever, Internal injuries and fracture, while in previous studies it was reported to use against inflammation (Tiwari and Tripathi 2007). Fresh roots of *Thalictrum foliolosum* was used to cure boils, toothache and mouth ulcers, its earlier reports shows activity as hepatoprotective (Marslin and Prakash 2020). Dry flowers and leaves of *Viola canescens* were boiled in water to cure cough, cold and fever. It has been reported as anti-malarial and hepatoprotective (Khan et al. 2017a, b) in its previous reports. *Tagetes minuta* was used in the study area against gastrointestinal disorsers but it was cited as antilarvicidal (Kyarimpa et al. 2014). Smoke of dry seeds and leaves of *Solanum virginianum* was used against asthma and cough, while it was earlier used as antimicrobial, insecticidal and antiradical. *Solanum aculeatissimum* plant ash was mixed with honey and black pepper (*Piper nigrum*) to cure whooping Cough. It has been used as protease inhibitor (Meenu Krishnan and Murugan 2015) in earlier reports. Fresh leaves of *Dodonaea viscosa* are crushed with leaves of *Vitex negundo* and *Rhynchostylis retusa*. This mixture is toasted with Linseed oil and applied on internally injured parts of body. Whereas *Rhynchostylis retusa* reported for antibacterial, antifungal, and paralysis

(Rohani et al. 2018). *Rubus ellipticus* was reported for its antitumor and wound healing activities (George et al. 2015), whereas it has been used as blood purifier and boil activities. *Catunaregam spinosa* was known for abortiffcient activity, diarrhoea and dysentery activities, whereas it was used by people of Palampur people for arthritis and pneumonia. *Quercus oblongata* was cited for hepatoprotective activity whereas it was used for dysentery and rheumatism. Unripe fruits of *Pyrus pashia* were chewed to cure mouth ulcers, whereas it has been reported for gastrointestinal, respiratory and cardiovascular Ailments. Seeds and bark of *Prunus cerasoides* were crushed with Methi (*Trigonella foenum*), Ajwain (*Trachyspermum ammi*) and roasted in Linseed oil. It is applied to the injured part with help of cloth. *Prunus cerasoides* has been reported for swelling, stomach troubles, asthma, and nausea/ vomiting. Decoction of fresh young leaves and apical bud of *Prinsepia utilis* was used to cure cough and fever, joint pain and rheumatism, while its previous reports for antiosteoporotic activities. Fresh leaves of *Jasminum officinale* are crushed with kali mirch (*Piper nigrum*) in mouth saliva to cure mouth and gum infections. *Jasminum officinale* has been widely used for hepatitis (Zhao et al. 2009). Fresh roots of *Cirsium Wallichii* were and used for jaundice and paralysis, while it has been reported as antimicrobial. Decoction of whole plant of *Aleuritopteris bicolor* was used to cure weakness problems. In previous studies it has been reported as antibacterial and anti-inflammatory. *Senna tora* has been widely used for gall bladder dysfunctions and piles problem, while it has been reported as antimicrobial, antihepatotoxic and anti-mutagenic. Fresh leaves of *Boehmeria virgata* are crushed and its paste is used for the treatment of oral diseases while it has been reported as anticancer (Wardihan et al. 2013). Ayurveda has highlighted the concept of polyherbalism. Polyherbalism was used to achieve more therapeutic potential. Polyherbalism efficacy is based on active phytoconstituents of multiple herbs. A combination of multiple herbs in a ratio would give better results than a single herb (Parasuraman et al. 2014). Polyherbalism also reduces toxicity. The present survey provide a data of 3 rare endangered species providing clear sign to develop strategies from excessive human explotation. The indigenous culture of treating ailments has emerged with passage of time and experience (Khan et al. 2010). Ethnopharmacological approach and modern tools such as green synthesized nanoparticles will be beneficial for human civilization (Kain and Kumar 2020). Ethnomedicines require access, proper identification, better clinical evaluation and validation by formulating the drug products (Suryavanshi et al. 2019; Mikawlrawng and Kumar 2014). So, ethnomedicine is a necessary tool to conserve the floristic diversity and indigenous culture.

Conclusion

Ethnopharmalogical data depict that medicinal plants were extensively used by local people to cure gastrointestinal, dermatological disorders and skeletomuscular disorders. Our results also signify these three category disorders were widely spread in the study area. This study concluded that old village people prefer the use of traditional medicine in comparison to the younger generation. Western medicine was accessible in the study area, even though the treatment of the simple diseases such as fever, headache, cold, cough, poison bites and skin treatment traditional medicines were considered. Poor people were dependent on traditional knowledge for their primary healthcare. Traditional knowledge is based on the selection of the best medicinal species to cure ailments. Ethnomedicinal knowledge is lost in the selection of the best species for the treatment of ailment. This selection also results in overexploitation of the best species. Himalayan endemics populations of medicinal plants are declining due to various anthropogenic activities. Medicinal plants require conservation efforts and their wise use. Ethnopharmalogical exploration and new phytochemical studies of these species help in the discovery of new bioactive compounds. Plantation of medicinally valuable plants in the forests/community lands is an essential requirement for conservation and sustainable development. In recent times, the relevance of ethnopharmacology is increasing day by day. In the future, Ethnopharmacology acts as a bridge between sustainable development and biodiversity conservation. Medicinal plants drugs formulations are the symbols of purity and safety when compared with the synthetic drugs.

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Declarations

Ethical statement This article contains questionnaire based survey research through verbal communication between authors and informants. The consent of each informant was taken before conducting interview. This article does not contain any studies involving animals performed by any of the authors.

Conflict of interest Atul Arya has no conflict of interest. Suresh Kumar has no conflict of interest. Rajinder Paul has no conflict of interest. Amrita Suryavanshi has no conflict of interest. Dolly Kain has no conflict of interest. Rudra Narayan Sahoo has no conflict of interest.

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