



Ethnobotanical Study of Medicinal Plants in Kepilasgadhi Rural Municipality of Khotang District, Nepal

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Ethnobotany is a field that study traditional use of plants by local communities. In Nepal, approximately 80% of the population, particularly in rural areas, relies on traditional medicine due to their effectiveness and cultural significance.

Objectives: This study aims to investigate the ethnomedicinal knowledge in Kepilasgadhi Rural Municipality, Khotang, Nepal, documenting medicinal plants used by local communities, identify diseases treated, plant parts used and application method, evaluate the Use Value (UV), Fidelity Level (FL), Informant Consensus Factor (ICF) and Relative Frequency of Citation (RFC) as well as threats, and conservation practices to these medicinal plants.

Methods: Primary data were gathered through reconnaissance surveys, key informant interviews, structured questionnaires, focus group discussions, and field observations. Secondary data included previous research, journals, books, and reports.

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Results: A total of 102 medicinal plants across 93 genera and 57 families were documented. Herbs were the most common life form (52.94%), with roots being the most used part (21.31%). Oral administration was predominant (72.54%), with inhalation being least common. Gastrointestinal disorders were most treated (54 plants), followed by skin issues. A total of 10 species showed highest FL of 100% for specific ailments. ICF values ranged from 0.11 to 0.75, with urologic disorders showing the highest consensus. Paris polyphylla had the highest RFC (0.98), while Cheilocostus speciosus had the lowest (0.02). The findings highlight significant UV for plants like *Curcuma domestica* L (1.83), indicating their high importance in treating ailments and frequent use as a traditional medicine. Despite a rich ethnomedicinal heritage unsustainable harvesting, forest fires, deforestation, illegal collection have threatened these resources. Conservation efforts include cultivating high-demand species, reforestation, and selective harvesting.

Conclusion: Although Kepilasgadhi is rich in medicinal plants and traditional knowledge, declining youth interest threatens their preservation. Urgent initiatives are needed to educate younger generations about these practices.

Keywords: Medicinal plants; ethnobotany; traditional medicine; informant consensus factor; use value.

1. INTRODUCTION

John W. Harshberger first introduced the term "ethnobotany" in 1896 to refer to the study of plants used by primitive and indigenous people. It explores the relationship between humans and plants, documenting traditional knowledge on how different ethnic groups or communities utilize local plant resources. Since the dawn of human civilization, people have relied on plants for various needs, including food, fodder, medicine, and fiber. Over time, through experience and experimentation, they discovered numerous properties and uses of plants, particularly their medicinal benefits [1,2]. Approximately 80% of the global population, especially in the rural areas of developing and under developed countries, relies on traditional medicine as their main source of healthcare [3,4] due to their effectiveness, the lack of modern medical options, and deeply rooted cultural preferences [5-8]. Recent years have seen a decline in traditional medicinal practices due to decreased interest among the younger generation, urban migration, mass deforestation, changing life style, and traditional healers shifting to other jobs [9]. It is estimated that between 35,000 and 70,000 plant species are utilized in traditional medicine around the world [10] and more than 50% of modern pharmaceutical drugs have origins rooted in traditional ethnomedicine [11,12]. According to study conducted by Fabricant and Farnsworth [13] 122 compounds derived from 94 plant species are used in medicine worldwide.

Nepal is a diverse nation with multiple ethnic groups, languages, and religions, reflecting varieties of culture and tradition [14]. With over 142 caste/ethnic groups and 129 spoken

languages [15]. the ethnic communities possess extensive traditional knowledge about the use of plants and plant parts. This indigenous knowledge has been passed down through generations, highlighting a long-standing tradition of utilizing plant resources [16]. The traditional knowledge held by indigenous communities is crucial for the development of herbal remedies and the extraction of bioactive compounds, which could potentially result in the discovery of new drugs [13,17]. Although the use of medicinal plants in Nepal dates back to ancient times, the earliest documented evidence of their medicinal use is found in the Rig-Veda, written between 4500 and 1600 BC, which is considered one of the oldest repositories of human knowledge on plant-based medicine [18,19]. Out of approximately 29 million inhabitants in Nepal, over 80% living in rural areas, who have limited access to government healthcare facilities and face high costs and unavailability of allopathic medicine, rely on traditional remedies as a primary or complementary treatment for illnesses [20]. In Nepal a total of 6,653 species of angiospermic plants were documented, with 1,792 to 2,331 of them identified as potential medicinal and aromatic plants [18]. With varied topography and microclimate within the small geographical area, Nepal harbors a rich diversity of medicinal and aromatic plants [21,22,23].

The traditional use of plants for medicinal purposes in Nepal is gaining popularity because these remedies are often free of side effects, readily accessible, affordable, and sometimes the only healthcare option available for those in need [16]. Numerous studies have demonstrated that medicinal plants have been traditionally used to treat a wide range of ailments, including fever, digestive issues, skeletal and muscular

disorders, jaundice, blood purification, asthma, bone spurs, hemorrhoids, pneumonia, snake bites, dehydration, fatigue, liver disorders, tonsillitis, rheumatism, constipation, toothaches, high blood pressure, hemorrhage, skin diseases, and more [20,21,22,24-30]. Medicinal plants are used not only for treating human ailments but also for addressing various diseases in animals [26]. Some medicinal plants are also used for religious or ritual purposes [30] due to their significant spiritual/religious value, particularly in Hinduism. For example, *Ocimum sanctum* (Tulsi) is regarded as one of the most sacred plants in Hindu culture. It is believed to attract positive energy, bring blessings, and strengthen one's connection to God.

In Nepal, ethnobotanical research began with Banerji's 1955 publication on medicinal and food plants. Until then, various studies have been conducted across various region of the country [23,28,31-34] but, Kepilasgadhi Rural Municipality in Khotang District remains largely unexplored despite its significance for medicinal plant diversity. No scientific research has yet been conducted in this area. Given these considerations, the present study aims to document ethnomedicinal knowledge among people of Kepilasgadhi Rural Municipality. The main objective of the study are:

1. To investigate the medicinal plants utilized by the people of Kepilasgadhi Rural Municipality.
2. To identify the diseases treated by these medicinal plants.
3. To assess the plant parts/products used and their methods of application.
4. To evaluate the Use Value (UV), Informant Consensus Factor (ICF), Fidelity Level (FL) and Relative Frequency of Citation (RFC) of medicinal plants in Kepilasgadhi Rural Municipality.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in Kepilasgadhi Rural Municipality, located in the Khotang district of Nepal (Fig. 1), positioned at 27.33° N latitude and 86.83° E longitude. Kepilasgadhi Rural Municipality cover an area of 191.28 km² and is consists of 664 households with the population of 15,288 individuals, comprising 7,323 men and 7,965 women [15]. The region experiences a maximum temperature of 21.75°C, a minimum temperature of 10.59°C, and an average annual rainfall of 263.29 mm.

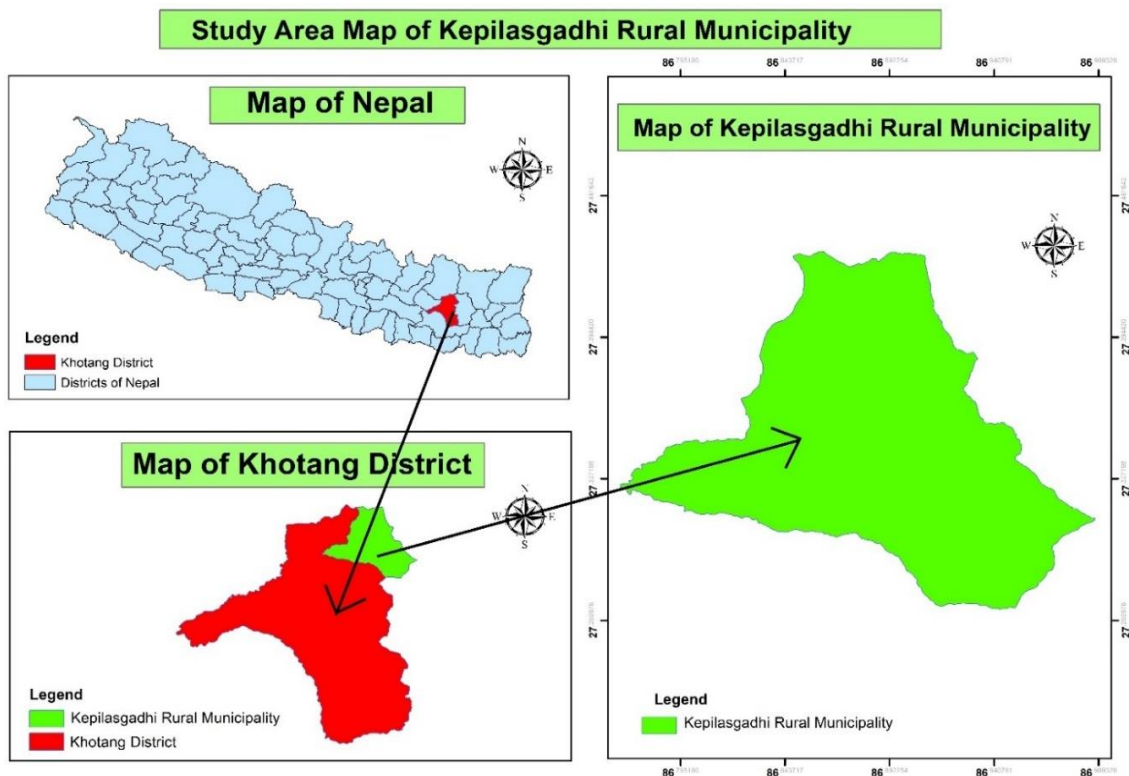


Fig. 1. Map of the study area

The Rai community is the predominant ethnic group in Kepilasgadhi Rural Municipality, with a population of 9,654, speaking the Sampang language. Other ethnic groups residing in the rural municipality include Chhetri, Tamang, Kami, Damai/Dholi, Sherpa, Gurung, Newar, Koiri/Kushwaha, Hill Brahmin, Nachhiring, Gharti/Bhujel, Sunuwar, Sanyasi/Dashnami, Limbu, Sarki.

2.2 Data Collection

2.2.1 Primary data collection

Primary data were systematically gathered using various methods, including a reconnaissance survey, key informant interviews, a structured questionnaire survey, Focus group discussions, and field observations.

2.2.1.1 Reconnaissance survey

A reconnaissance survey was conducted in Kepilasgadhi Rural Municipality, through field visits and discussions with local leaders. This survey aimed to develop an initial understanding of the respondents' socio-economic status and healthcare needs. During this phase, permission to conduct the study was obtained by clearly communicating the study's objectives to the local authorities and community members.

2.2.1.2 Key informant interviews (KII)

A total of 20 key informants were purposively selected for in-depth interviews. This group included 10 traditional healers (Lama, Baidhyas, and local practitioners), 2 traders, 2 officials of Division forest office, Khotang, and 6 individuals representing the Community Forest User Groups (CFUG), model farmers, and teachers. The interviews focused on gathering detailed information about the local medicinal flora, including trees, shrubs, and herbs used in traditional medicine.

2.2.1.3 Questionnaire survey

To ensure a representative and diverse sample, stratified random sampling approach was employed. The Household were first divided into distinct strata based on key characteristics, including ethnicity, caste, and economic class. From these strata, a total of 100 households were randomly selected, representing 15% of the total households in the study area. One individual from each selected household was interviewed. This method ensured that the sample accurately

reflected the population's diversity and provided robust data for analyzing the research objectives.

2.2.1.4 Field observation

Field observations were conducted in various settings, including forests, fallow lands, and farmyards, with the assistance of local experts identify and authenticate the plant species. Specimens of accessible medicinal plants were collected, and photographed for future reference.

2.2.1.5 Focus group discussions (FGDs)

Three Focus group discussions were conducted, involving 9-12 participants each. Two discussions were held with the dominant Chhetri and Rai communities separately, and one with a mixed group comprising individuals from different ethnic backgrounds, traditional healers, and local experts. These discussions provided insights into the ethno-medicinal knowledge of bio-resources, including the effectiveness and trade of medicinal plants, the threats they face, and the conservation practices implemented.

2.2.2 Secondary data collection

Secondary data were sourced from previous research studies, academic journals, books, websites, and reports from relevant agencies, both published and unpublished. This comprehensive literature review provided a deeper understanding, interpretation, and analysis of the research context and findings.

2.3 Data Analysis

To systematically analyze the ethnomedicinal data collected, statistical software such as SPSS and Microsoft Excel were employed. The analysis focused on quantifying the significance of various medicinal plant species and assessing the consensus among informants regarding their use. The following indices were calculated to evaluate the ethnobotanical knowledge: Use Value (UV), Fidelity Level (FL%), Informant Consensus Factor (ICF) and Relative Frequency of Citation (RFC).

2.3.1 Use value (UV)

The Use Value (UV) index was calculated to determine the relative importance of each plant species based on the number of use reports provided by indigenous informants. This index reflects the significance of each species within

the local medicinal practices. The UV was calculated using the formula [8].

$$UV = U/n$$

Where 'U' represents the total number of use of particular species reported by all respondents, and 'n' represents the total number of informants questioned for that particular plant species. The Use Value (UV) of a plant increases with the number of use provided by informants, indicating that the plant is of greater significance within the community. Conversely, a lower UV suggests less frequent use or recognition of the plant [35].

2.3.2 Fidelity level (FL%)

The Fidelity Level (FL%) was employed to identify the most preferred plant species for treating specific ailments. Fidelity level quantifies the percentage of informants who endorse the use of a particular plant species for a specific health condition. The FL was calculated using the formula [36].

$$FL (\%) = (N_p / N) * 100$$

Where 'N_p' represents the number of informants reporting the use of the plant for a specific illness, while 'N' denotes the total number of informants reporting the use of the plant for any health condition. A high Fidelity Level (FL) value indicates that the plant species is frequently used by informants for treating a specific ailment category within the study area [37].

2.3.3 Informant consensus factor (ICF)

The Informant Consensus Factor (ICF) was calculated to assess the degree of agreement among informants regarding the use of plants for specific ailment categories. The ICF was calculated using the formula [38,39]

$$ICF = N_{ur} - N_t / (N_{ur} - 1)$$

Where 'N_{ur}' indicates number of use citations in each category, and 'N_t' indicates the number of species used. The ICF value ranges from 0 to 1, with higher values indicating greater agreement among informants, suggesting a higher potential for the identified species to be effective in treating the ailments [38,40]. High ICF values suggest that certain species are widely recognized within the community for their medicinal properties, making them prime species for further cultural and pharmacological research [41].

2.3.4 Relative frequency of citation (RFC)

The Relative Frequency of Citation (RFC) indicates the local significance of each species that was determined using the formula [35].

$$RFC = FC/N$$

where 'FC' represents the number of informants who reported the use of the species, and 'N' is the total number of informants who participated in the survey.

3. RESULTS

3.1 Availability and Diversity of Used Medicinal Plants

In the Kepilasgadhi Rural Municipality, a total of 102 medicinal plant species, representing 93 genera and 57 families, have been documented (Fig. 2). The species composition includes 54 herbaceous plants, 22 tree species, 16 climbers, and 10 shrubs. Among these, the family Rosaceae is the most prevalent, with 7 species, followed by Poaceae with 6 species. Several families, including Ranunculaceae, Cucurbitaceae, Ericaceae, and Asteraceae, each contribute 5 species to the medicinal flora. Additionally, Lauraceae, Moraceae, and Zingiberaceae are each represented by 3 species. Families such as Saxifragaceae, Polygonaceae, Rutaceae, Orchidaceae, Liliaceae, Vitaceae, Urticaceae, Rubiaceae, Lamiaceae, Apiaceae, Piperaceae, Apocynaceae, and Fabaceae are each represented by 2 species. The remaining 34 families are represented by a single species each, highlighting the diverse botanical resources utilized within this ethnic community.

3.2 Ethnomedicinal Uses of Plants in Kepilasgadhi Rural Municipality and Their Use Value

Table 1 given shows the list of ethnomedicinal plants used by the people Kepilasgadhi Rural Municipality and their their Use Value.

3.3 Life Form of Medicinal Plants

Medicinal plants in the study area predominantly consist of herbs, which account for 52.94% (54 species) of the total documented flora. Trees represent 21.56% (22 species) of the medicinal plants, while climbers and shrubs constitute 15.68% (16 species) and 9.80% (10 species) respectively.

3.4 Parts Used

Various parts of medicinal plants have been utilized to treat different ailments through a range of application methods (Fig. 4). The root was the most frequently used part, accounting for 21.31% (26 species), followed by leaves at 18.86% (23 species). Whole plants were employed in 15.57% (19 species) of cases, while fruits were used in 12.30% (15 species). Stems and bark each contributed 7.4% (9 species), with rhizomes and seeds at 6.6% (8 species) and 4.1% (5 species) respectively. Latex and flowers were the least utilized, at 3.3% (4 species) each.

3.5 Mode of Administration

The mode of administration of medicinal plants varied according to the species (Fig. 5). Approximately 72.54% (74 species) are administered orally, either in raw form, as juice, or as a decoction. A smaller proportion, 7.84% (8 species), are used both orally and topically. Topical application alone accounts for 18.62% (19 species). Inhalation is the least common method, employed for only 0.98% (1 species). These varied methods highlight the versatility and depth of traditional medicinal application practices in the study area.

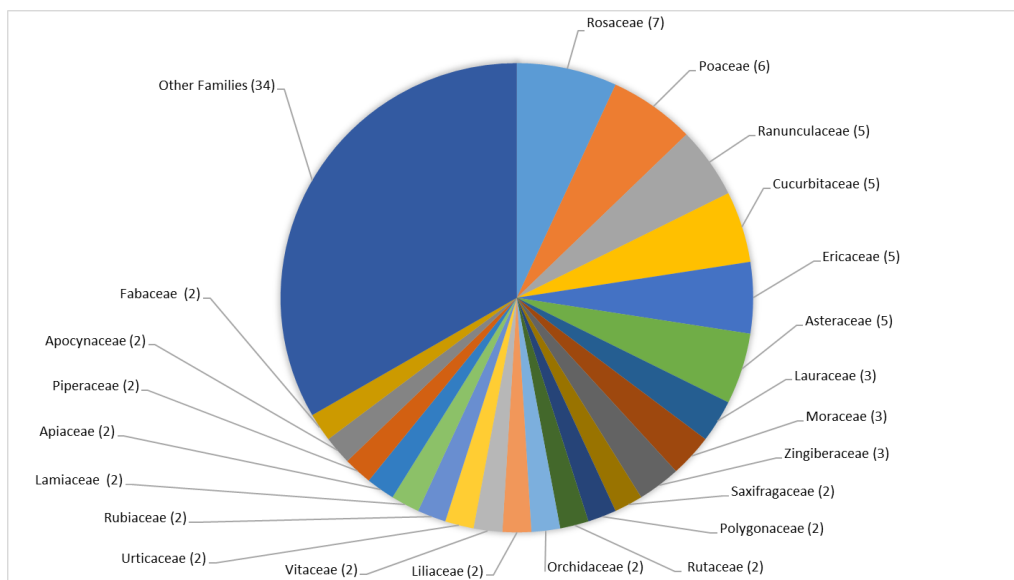


Fig. 2. Plant families of medicinal plants

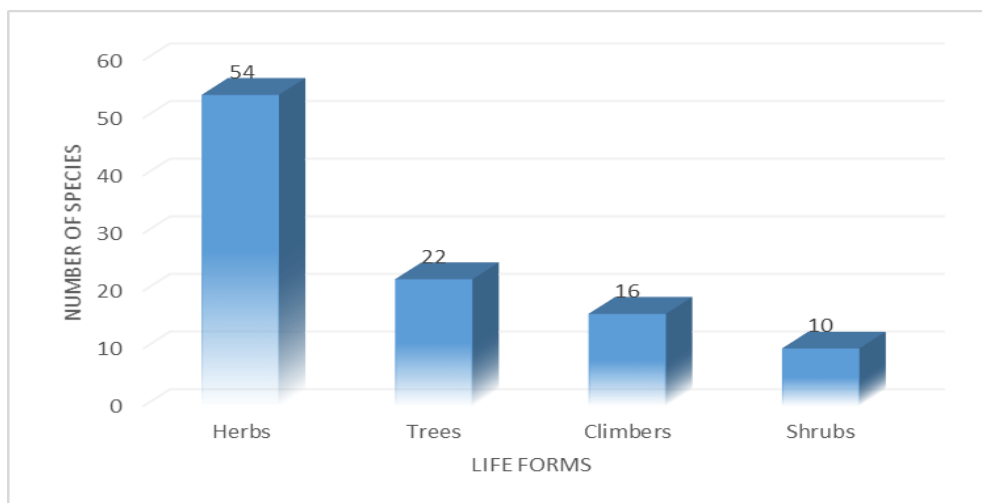


Fig. 3. Life form of medicinal plant

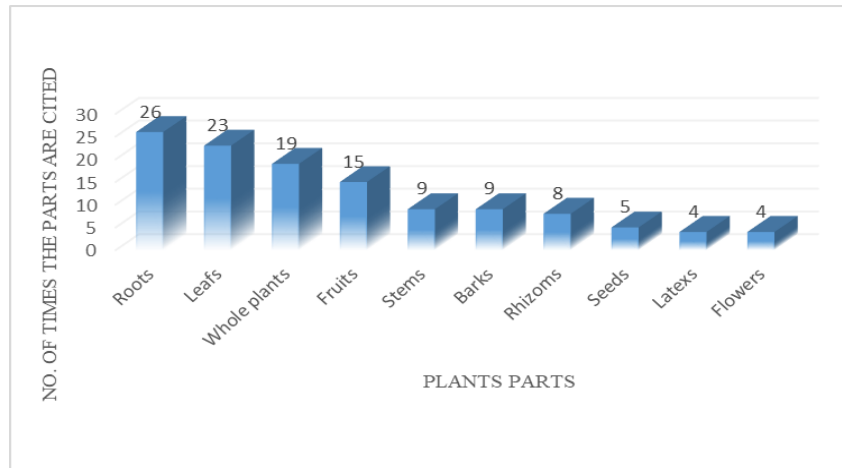


Fig. 4. Parts used in medicinal plants

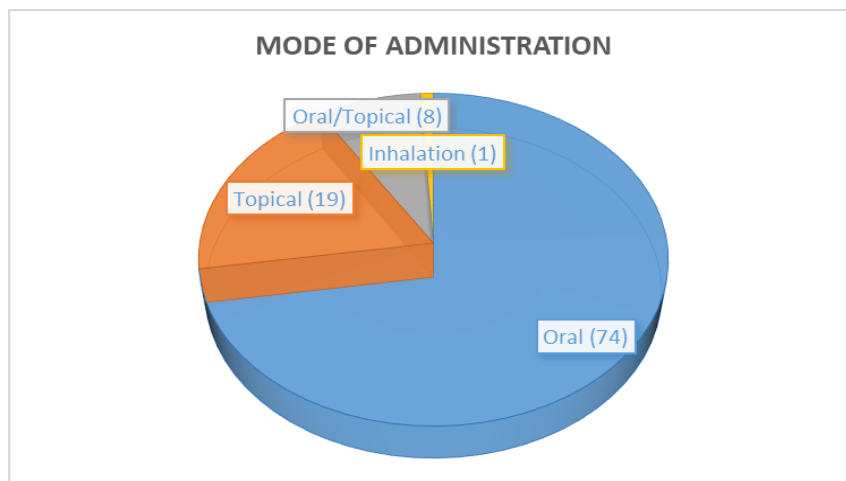


Fig. 5. Mode of administration

3.6 Number of Plants Treating a Disease

The gastrointestinal disorders are the most treated category with 54 plants cited. Skin-related issues (cuts, wounds, burns) and headaches/fevers also have high citation counts which is 21 and 22 plants respectively. Other conditions like Common cold and Cough (15 plants) and respiratory issues (11 plants) have moderate representation, while categories like urologic disorders and general health with 2 plants each have minimal citations.

3.7 Fidelity Level Calculation

The study identifies several plant species with high Fidelity Levels (FL), indicating a strong preference by the local community for treating specific ailments (Table 2). Notably, *Aconitum bisma* and *Swertia chirayita* achieve an FL of 100% for treating fever and typhoid, while *Cissus*

quadrangularis also reaches 100% for bone fractures. In gastrointestinal disorders, *Zanthoxylum acanthopodium* shows a perfect FL for gastric issues, and *Ageratina adenophora* reaches 100% for treating cuts. In contrast, *Cissus adnata* has the lowest FL at 30.8% for treating eye cataracts, indicating less selection among informants regarding its use for this condition.

3.8 Informants Consensus Factor (ICF)

The Informant Consensus Factor (ICF) is found to range between 0.11 to 0.75. Urologic disorders have the highest ICF value of 0.75, based on 5 use reports for 2 species, followed by Gastrointestinal disorders with an ICF of 0.51, derived from 109 use reports for 54 species. In contrast, the category of snake bites exhibits the lowest ICF value of 0.11, with 10 use reports spread across nine plant species.

Table 1. Ethnomedicinal uses of plants and their Use Value (UV)

| SN | Local name | Scientific name | Family | Parts used | Management | Life form | Distribution | Diseased treated | Method of preparation | Mode of application | Previous use reports | Use value (UV) |
|----|-------------|---|----------------|--------------|------------|-----------|--------------|--|----------------------------------|---------------------|--|----------------|
| 1 | Pakhanbed | <i>Bergenia ciliata</i> (Haw.) Sternb. | Saxifragaceae | Root | W | H | A | Body pain/ bone fracture/ pregnancy problems/ diarrhea/ dysentery | Powder/ decoction | O | wound, diabetes, piles, tumor, urinary problems, hearth, and respiratory disease [2,28,42,43] | 1.33 |
| 2 | Padamchal | <i>Rheum acuminatum</i> Hook. f. & Thomson ex Hook | Polygonaceae | Root | W | H | A | Body pain/ gastritis/ Indigestion/ bone fracture | Decoction | O | Treatment of arthritis, rheumatism, blood purification, fever reduction, blood purification, constipation [18,19,44] | 1.75 |
| 3 | Satuwa | <i>Paris polyphylla</i> Sm. | Melanthiaceae | Whole plants | W/C | H | R | Gastritis/vomit/bur/ fever/headache/ cut/stomach infection/sore throat/snakebite | Paste | T/O | Gastritis, Stomach swelling, wounds, skin infections, reduce fever, snake bites [45,46,47] | 1.23 |
| 4 | Bethlauri | <i>Cheilocostus speciosus</i> (J. Konig)C. Specht | Costaceae | Stem/ root | W | H | R | Jaundice/burning urination | Juice extraction | O | | 0.75 |
| 5 | Sil timur | <i>Lindera neesiana</i> | Lauraceae | Fruit | W | T | A | Common cold/cough/snake bite/indigestion/ sore throat | Decoction | O | | 1.07 |
| 6 | Boke timur | <i>Zanthoxylum acanthopodium</i> DC. | Rutaceae | Fruit | W | T | A | Gastritis/fever/ toothache | Decoction/ 1-2 pieces eaten raw | O | Gastritis, Leech bite, toothaches, oral discomfort, indigestion, stomach pain [45,48,49] | 0.92 |
| 7 | Sarpagandha | <i>Rauvolfia serpentina</i> (L.) Benth. Ex Kurz (RKM78-S17) | Apocynaceae | Root/ leaf | W /C | S | R | Body pain/uric acid/ herpes zoster | Powder | O | Reduce blood pressure, dysentery, labor pain, removal of opacities of the cornea [16,45] | 1.09 |
| 8 | Jatamansi | <i>Nardostachys grandiflora</i> | Caprifoliaceae | Root | W | H | R | Diarrhea/ dysentery/ anti-poison | Juice extraction | O | insomnia, hysteria, convulsions [29] | 0.81 |
| 9 | Bikhuma | <i>Aconitum bisma</i> | Ranunculaceae | Root/ leaf | W | H | R | Headache/fever/ Common cold/ snakebite/ low pressure | Direct chewing/ Juice extraction | O | tonsillitis, sore throat, gastritis and debility, anti-inflammatory [50,51] | 1.05 |
| 10 | Saktigumba | <i>Pleione praecox</i> L. | Orchidaceae | Pseudo bulb | W | H | R | Body pain/ Ligament sprain/ bone fracture/ cut/wound | Powder mixed with milk/paste | O/ T | | 0.8 |
| 11 | Golkakri | <i>Coccinia grandis</i> (L.) Voigt | Cucurbitaceae | Root/ fruit | W | CL | R | Cut/wounds/ Body pain/ dysentery | Paste/ Direct chewing | O/ T | leprosy, jaundice, diabetes, tongue sores, Indigestion, [52,53] | 1.21 |
| 12 | Indreni | <i>Trichosanthes pida</i> Lour | Cucurbitaceae | Seed | W | CL | R | Cut/wounds | Oil extraction | T | Abscess, tonsillitis [27] | 1.33 |

| SN | Local name | Scientific name | Family | Parts used | Management | Life form | Distribution | Diseased treated | Method of preparation | Mode of application | Previous use reports | Use value (UV) |
|----|---------------------------|---|-------------------|--------------|------------|-----------|--------------|--|--|---------------------|---|----------------|
| 13 | Khiraula | <i>Polygonatum cirrhifolium</i> L. | Liliaceae | Root | W | H | A | Cut/wound/diarrhea/mensuration problem | Powder/Paste/juice extraction | O | | 1.08 |
| 14 | Ban karela | <i>Herpetospermum pedunculatum</i> (Ser.) C.B. Clarke | Cucurbitaceae | Seed | W | H | R | Cut/wounds | Oil extraction | T | Treatment of high blood pressure, joint pain, constipation [30] | 0.86 |
| 15 | Ban lasun | <i>Allium carolinianum</i> L. | Amaryllidaceae | Bulb | W | H | R | Stone/stomach disorder/headache | Powder/paste | O | Altitudinal sickness, high blood pressure, indigestion, colds, coughs, and bronchitis [26,54] | 1.46 |
| 16 | Ban mula | <i>Potentilla fulgens</i> Wall. ex Hook | Rosaceae | Root/bulb | W | H | R | Stone/body pain/sore throat/stomach pain/high pressure | Decoction/dried pieces are chewed directly | O | Regulate blood sugar levels, manage diabetes, dysentery, and stomach ulcers [55,56] | 1.29 |
| 17 | Bojho | <i>Acorus calamus</i> L. | Araceae | Rhizome | W | H | R | Common cold/allergy/sore throat | Dried/fresh roots chewed directly/infusion | O | cut, common cold, vomiting, sore throat, fever, Scabies, reduce mental stress, high blood pressure, asthma [26,48,57,58,59] | 1.43 |
| 18 | Nagbeli | <i>Lycopodium clavatum</i> L. | Lycopodeceae | Whole plants | W | CL | A | Allergy/fever/headache | Paste/juice extraction | T/O | burns, headache [26] | 1.08 |
| 19 | Nangre/nas jhar | <i>Hemiphragma heterophyllum</i> L. | Scrophulariaceae | Whole plants | W | H | A | Cut/wounds | Paste | O | | 1 |
| 20 | Pinase jhar/tinpate | <i>Clematis b Buchananiana</i> DC. | Ranunculaceae | Whole plants | W | CL | A | Sinusitis/allergy/Nasal bleeding/vitiligo | Juice extraction/paste | O/T | | 0.64 |
| 21 | Haadjora | <i>Cissus quadrangularis</i> L. | Vitaceae | Whole plants | W | H | R | Bone fracture/bone disease/cuts/wounds | Decoction/paste | T | menstrual disorders, wound healing, bone disorders [60] | 0.9 |
| 22 | Laligurans | <i>Rhododendron arboretum</i> Sm. | Ericaceae | Flower/leaf | W | T | A | Allergy/throat obstruction/gastritis/fertility increase in women | Leaf/flowers mixed with Tea/honey | O | cuts, cure from having fish bone into neck, jaundice, tonsillitis, diarrhea [26,27,61,62] | 0.77 |
| 23 | Chimal | <i>Rhododendron campanulatum</i> L. | Ericaceae | Flower | W | T | A | Body ache/throat pain | Direct Chewing | O | | 0.77 |
| 24 | Loth salla/dhyangre salla | <i>Taxus wallichiana</i> Zucc. | Taxaceae | Whole | W/C | T | A | Diabetes/cancer/Urine infection/Womb problems/cold/ cough/fever | Paste/juice extraction/powder | O | treat digestive, respiratory, nervous and skeletal systems, cough, fever, pain [20,63] | 1.13 |
| 25 | Pani amala | <i>Nephrolepis auriculata</i> (L.) Trimen | Nephrolepiadaceae | Root/bulb | W | H | A | Diabetes/stomach problems/infestation worms | Direct chewing | O | diabetes, stomach problems, diuretic [54,64] | 1.73 |
| 26 | Bot amala | <i>Phyllanthus emblica</i> L. | Euphorbiaceae | Bark/seed | W/C | T | R | Sore throat/tonsils/blood purify | Powder/Direct Chewing | O | | 1.46 |
| 27 | Sisnu | <i>Urtica hyperborean</i> | Urticaceae | Leaf/ | W | H | A | Blood pressure/ | Powder/ | O | Diuretic and appetizer [64,65] | 1.4 |

| SN | Local name | Scientific name | Family | Parts used | Management | Life form | Distribution | Diseased treated | Method of preparation | Mode of application | Previous use reports | Use value (UV) |
|----|----------------------|--|---------------|-----------------|------------|-----------|--------------|--|-----------------------|---------------------|--|----------------|
| | | <i>L.</i> | | stem | | | | Chest problems/ cuts/wounds/ eye disorder | paste | | | |
| 28 | Allo/bhagre sisnu | <i>Girardinia diversifolia</i> | Urticaceae | Root | W | H | A | Swollen body parts | Paste | T | Galactogogue, diabetes, high pressure, fever, asthma, toothache, paralysis, uterine bleeding, rheumatism[31,40,41] | 0.02 |
| 29 | Charpate jhar | <i>Oldenlandia lineata(Roxb.) Kuntze</i> | Rubiaceae | Leaf | W | H | A | Cut/wounds | Paste | T | | 1.09 |
| 30 | Dhade bikh | <i>Aconitum ferox.</i> | Ranunculaceae | Root | W | H | A | Cancer | Paste/ powder | T | | 0.02 |
| 31 | Lajjawoti jhar | <i>Mimosa pudica L.</i> | Leguminaceae | Whole plants | W | H | R | Jaundice | Paste | O | dysentery, regulate menstrual cycles, inflammations, treat burning sensation, asthma, fatigue and blood diseases [66,67] | 0.02 |
| 32 | Ukhu | <i>Saccharum officinarum L.</i> | Poaceae | Stem | C | H | A | Jaundice | Juice extraction | O | Jaundice, stomach disorders, ,seminal weakness, liver health, energy boost [28,30] | 0.04 |
| 33 | Titepati | <i>Artemisia indica Willd.</i> | Asteraceae | Leaf | W | S | A | Indigestion/fever/ cut/scabies/body pain | Juice extraction | O | cut and smallpox, high blood pressure, muscular swelling [26,68,69] | 1.5 |
| 34 | Dhasingre/ maxino | <i>Gaultheria fragrantissima Wall.</i> | Ericaceae | leaves/ seed | W | S | A | Bone fracture/Body pain/cold/cough | Oil extraction | T | back pain, headaches, fever, skin diseases, sore throats, tooth ache [70,71] | 1.07 |
| 35 | Kurillo | <i>Asparagus racemosus Willd</i> | Asparagaceae | Root/ shoot | W | H | A | Immunity power/skin disease/diarrhea/ lactation in women | Powder/ decoction | O | feed to cattle increase, alleviate menstrual cramps, reduce the fatigue, support fertility [14,26,28] | 1.25 |
| 36 | Bantarul | <i>Dioscorea pentaphylla L.</i> | Dioscoreaceae | Bulb/ tuber | W | CL | A | Backbone pain | Infusion | O | skin infections, stomach pain, constipation problems [72] | 0.04 |
| 37 | Sugandhawal | <i>Valeriana jatamansi Jones.</i> | Valerianaceae | Root | W/C | H | A | Nerves problems | Powder | O | Cuts and wounds, Fever, Tonsillitis, indigestion, abdominal pain [27,73,74] | 1 |
| 38 | Dhupi salla | <i>Cryptomeria japonica</i> | Cupressaceae | leaves | W | T | R | Unconsciousness/ vomiting | Paste | O | liver disease, anti-inflammatory [75] | 1.5 |
| 39 | Sikre/lokta | <i>Daphne bholua</i> | Thymileoaceae | leaves | W/C | S | A | Anti-poison | Paste | T | Fever, Treatment of intestinal disorders, sinusitis, coughs and bronchitis [28,31] | 0.36 |
| 40 | Pudina | <i>Mentha spicata L.</i> | Lamiaceae | Whole plant | W | H | A | Indigestion, diarrhea/stomach pain | Paste | O | Stomach pain, relaxant, haemorrhage, influenza, Intestinal parasites [76,55,56] | 0.10 |
| 41 | Jarelo | <i>Cissus adnata</i> | Vitaceae | Whole plants | W | H | A | Eye infection | Paste | T | | 0.02 |
| 42 | Jhar Mauro | <i>Oxalis corniculata</i> | Oxalidaceae | Whole plants | W | H | A | Snakebite/ eye infection | Paste | T | | 0.16 |

| SN | Local name | Scientific name | Family | Parts used | Management | Life form | Distribution | Diseased treated | Method of preparation | Mode of application | Previous use reports | Use value (UV) |
|----|---------------------------|---|----------------|--------------|------------|-----------|--------------|---|--------------------------------------|---------------------|---|----------------|
| 43 | Dubo | <i>Cynodon dactylon</i> (L.) Pers | Poaceae | Whole plant | W | H | A | Cut/wounds/ Blood pressure/ typhoid/fever | Juice extraction/ paste | O | bleeding, piles, paste applied in fracture [65,77] | 1.5 |
| 44 | Khaniyu | <i>Ficus semicordata</i> Buch-Ham. ex Sm. | Moraceae | Latex | W | T | R | Boils/ulcers | Infusion | T | | 0.16 |
| 45 | Chiraito | <i>Swertia Chirayita</i> (Roxb. ex Fleming) Karsten | Gentianaceae | Whole plant | W/C | H | A | Headache/fever/ blood pressure/ common cold | Juice extraction/ plant mix with tea | O | Bronchitis [27] | 1.5 |
| 46 | Pahele | <i>Cuscuta reflexa</i> Roxb. | Convolvulaceae | Whole plants | W | CL | R | Bone fracture/ jaundice | Juice/oil extraction | O / T | Jaundice, regulate blood sugar levels, anti-inflammatory, Fever [44,61,78] | 1.43 |
| 47 | Sikari lahara | <i>Periploca calophylla</i> | Apocynaceae | Whole plants | W | CL | R | Bone fracture/ Ligament sprain/ body aches | Paste | O | | 0.76 |
| 48 | Budo okhati/ thulo okhati | <i>Astilbe rivularis</i> Buch-Ham. ex D. Don, | Saxifragaceae | Root/ stem | W /C | H | A | Tonsils/body aches/pneumonia/ Pregnancy problems/fracture | Decoction/ powder | O | diarrhoea, dysentery, headache [79] | 1.09 |
| 49 | Sungure kada | <i>Cirsium verutum</i> (D.Don) Spreng. | Asteraceae | Root/ latex | W | H | A | Eye pain/Measles/ appendix | Taken raw/juice extraction | O | Body pain, Fever, indigestion, rheumatism, cough, asthma, bronchitis [80,81,82] | 1.04 |
| 50 | Hade kaphal | <i>Myrica esculenta</i> Buch-Ham. ex D.Don. | Myricaceae | Bark/ fruit | W | T | A | Dysentery/ fracture | Decoction/ paste | O/ T | eye pain and measles, fever, abdominal pain [83,84,85] | 0.95 |
| 51 | Bhainsi kada | <i>Clematis connate</i> DC. | Ranunculaceae | Bark | W | CL | A | Sprain/fracture | Powder | O | Muscular swelling and sprain, sinusitis [27] | 0.76 |
| 52 | Mel | <i>Pyrus pashia</i> Buch-Ham.ex.Don. | Rosaceae | Fruit | C | T | A | Diarrhea/ dysentery | Decoction/ Juice extraction | O | | 0.92 |
| 53 | Nase jhar | <i>Plantago lagopus</i> L. | Plantaginaceae | Leaf | W | H | A | Fever/cough/ common cold/stomach problem | Juice extraction | O | eye infections, sore throat, anemia, diarrhea, gastrointestinal disorder [86,87,88] | 1.02 |
| 54 | Dabuke jhar | <i>Centella asiatica</i> | Apiaceae | Leaf | W | H | A | Jaundice/ pressure | Direct chewing | O | Hepatic pain, insomnia [56] | 0.24 |
| 55 | Ainselu | <i>Rubus ellipticus</i> Sm. | Rosaceae | Root/ bud | W | S | A | Tonsils/fever, diarrhea/sore throat/cough | Powder/ Juice extraction | O | Dysuria, Pneumonia, Tonsillitis [21,27,80,89] | 0.47 |
| 56 | Bhuin ainselu | <i>Fragaria daltoniana</i> J. Gay | Rosaceae | Stem | W | H | A | Cut/wounds | Paste | T | | 0.16 |
| 57 | Angeri | <i>Lyonia ovalifolia</i> L. | Ericaceae | Leaf | W | T | A | Allergy | paste | O | Skin diseases treatment [26] | 0.02 |
| 58 | Jhyau | <i>Permelia nepalensis</i> | Parmeliaceae | Whole plants | W | H | A | Skin burn/piles | paste | T | | 0.82 |
| 59 | Chabo | <i>Piper mullesua</i> Buch-Ham.ex D.Don | Piperaceae | Leaf | W | CL | A | Painkiller/tonsils | Direct chewing | O | antidepressant, anti-inflammatory, anti-oxidant [90] | 0.84 |

| SN | Local name | Scientific name | Family | Parts used | Management | Life form | Distribution | Diseased treated | Method of preparation | Mode of application | Previous use reports | Use value (UV) |
|----|----------------|--|-----------------|-------------|------------|-----------|--------------|---|--------------------------------|---------------------|--|----------------|
| 60 | Hande okhar | <i>Juglans Regia L.</i> | Juglandaceae | Bark/ root | W/C | T | A | Toothache/gum problems | Taken raw | O | Diabetes, Kidney ailment, liver ailment [55,76] | 0.65 |
| 61 | Pipla | <i>Piper longum L.</i> | Piperaceae | Fruit | W | Cl | A | Immunity power/ fever/sore throat | powder | O | chronic bronchitis, asthma, constipation, diarrhea, cholera, chronic malaria [91,92] | 1.5 |
| 62 | Aduwa | <i>Zingiber officinale Rosc.</i> | Zingiberaceae | Rhizome | C | H | A | Common cold/fever Sore throat/tonsils/ asthma | Juice extraction/ mix with tea | O | Diarrhoea, sinusitis, cold and cough, goiter [24,30,93] | 0.36 |
| 63 | Besar | <i>Curcuma domestica L.</i> | Zingiberaceae | Rhizome | C | H | A | Body pain/ Fever/sore throat/ common cold/ jaundice | Infusion/ powder | O | cough, Skin disease Treatment, Common cold, Fungal infection [26,27] | 1.83 |
| 64 | Lasun | <i>Allium sativum L.</i> | Alliaceae | Leaf/ bulb | C | H | A | Cancer/heart disease/gastritis | Decoction/ Bulb are fried | O | Malaria, high blood pressure, spider & snake bites [31,55,56,94] | 0.65 |
| 65 | Balu | <i>Pieris formosa(Wall.) D.Don</i> | Ericaceae | Leaf/ root | W | T | A | Allergy/headache | Paste | T | | 0.64 |
| 66 | Tejpaat | <i>Cinnamomum tamala L.</i> | Lauraceae | Leaf/ bark | W/C | T | A | Corona/ stomach ache | Decoction/ Infusion | O | diarrhea, nausea and vomiting, colic, diarrhoea, dysentery or cough [95,96] | 1.09 |
| 67 | Thado unneu | <i>Dryopteris cochleata (Don) C.Chr.</i> | Dryopteridaceae | Rhizome | W | H | A | Mental disorder | Infusion | I | | 0.06 |
| 68 | Dauthe niuro | <i>Diplazium maximum(D.Don)C. Chr.</i> | Athyriaceae | Bud | W | H | A | Osteopenia/ joint pain | Direct chewing | O | stomach problem, smallpox, asthma, diarrhea, rheumatism, dysentery, fever, wounds, high blood pressure [26,97,98,99] | 0.1 |
| 69 | Kukur daine | <i>Smilax ovalifolia L.</i> | Smilacaceae | Root/ fruit | W | CL | A | Joint pain/ dysentery/gastritis | Juice extraction/ paste | O | | 0.33 |
| 70 | Naspati | <i>Pyrus communis</i> | Rosaceae | Fruits | C | T | A | Diarrhea/ indigestion/nausea/ vomiting | Juice extraction | O | Weight loose, skin whitening, fight against diabetes, Cholesterol Lowering, Macular Degeneration [100] | 1.5 |
| 71 | Kagati | <i>Citrus aurantiifolia (Cristm.) Swingle*</i> | Rutaceae | Fruit | C | S | A | Headache/fever/ blood pressure/ common cold | Juice extraction | O | Diarrhea, stomach ache, headache treat nausea and resuscitate fainting individuals [101,102,103] | 0.06 |
| 72 | Sugandhakokila | <i>Cinnamomum glaucescens L.</i> | Lauraceae | Seed | C | S | R | Anti-inflammatory/ toothache | Oil extraction | T | toothache, wound, joints pain treatment [30,31] | 0.01 |
| 73 | Bamboo | <i>Bambusa vulgaris</i> | Poaceae | Shoots | W/C | S | A | Good digestion/ boosting immunity | Cooking | O | malaria, diabetes, reduce fats, dysentery, diarrhea, pile and epilepsy [104,105,106] | 0.95 |
| 74 | sunakhari | <i>Dendrobium amoenum</i> | Orchidaceae | Flower | W | H | A | Immunity power | Juice extraction | O | treat wounds, skin disease, reduce fever, nourish stomach [107,108,109] | 0.95 |
| 75 | Jai phul | <i>Jasminum sp.</i> | Oleaceae | Bud/ leaf | C | CL | R | Sore throat/ stomach problem | Raw leaves/bud | O | | 0.92 |

| SN | Local name | Scientific name | Family | Parts used | Management | Life form | Distribution | Diseased treated | Method of preparation | Mode of application | Previous use reports | Use value (UV) |
|----|--------------|---|----------------|--------------------------|------------|-----------|--------------|--|-----------------------|---------------------|--|----------------|
| 76 | Tite karela | <i>Momordica charantia</i> | Cucurbitaceae | Fruit | C | CL | A | Blood pressure/ diabetes | chewing Cooking | O | | 0.92 |
| 77 | Mewa | <i>Carica papaya</i> L. | Caricaceae | Latex/ root/ fruit | C | H | A | Indigestion/ kidney stone | Juice extraction | O | maintain blood pressure, used as vegetable or pickle, anemia, urinary discharges, asthma, ulcers, bronchitis [30,110, 111] | 0.1 |
| 78 | Majito | <i>Rubia manjith Roxb. ex Fleming</i> | Rubiaceae | Root | W | CL | A | Fever/chest pain | Powder/ paste | O | constipation, toothache, increase in urine output, intestinal parasites [112,113] | 0.16 |
| 79 | Halhale | <i>Rumex nepalensis Spreng.</i> | Polygonaceae | Root | W/C | H | A | Cut/wounds/ ring worm | paste | O | | 0.84 |
| 80 | Dudhe lahara | <i>Ficus hederacea</i> Roxb. | Moraceae | Whole plants | W | CL | R | Body pain/ Bone fracture/ diabetes | Juice extraction | O | | 0.86 |
| 81 | Banmara | <i>Ageratina adenophora</i> (Spreng.) King & H. Rob | Asteraceae | Leaf | W | H | A | Cut/wounds | Paste/ powder | T | Treatment of cuts and wounds, arthritis, rheumatism, indigestion, diarrhea, fever reduction [57,61,114] | 1.45 |
| 82 | Haadchur | <i>Viscum album</i> L. | Loranthaceae | Whole plants | W | T | R | Bone fracture/ body pain/ irregular mensuration | Juice extraction | O | | 0.33 |
| 83 | Makai | <i>Zea mays</i> L.* (RKM61-G1) | Poaceae | fruits | C | H | A | diabetes | decoction | O | given to buffaloes to stimulate milk production, stomach pain, dermatitis, diuretic, kidney ailment [30,56] | 0.02 |
| 84 | Bhutkesh | <i>Selinum wallichianum</i> (DC.) Raizada & Saxena | Apiaceae | Root | W | H | R | Stomach ache/ common cold/ blood pressure | powder | O | Cold, fatigue, nervousness [27,115] | 0.65 |
| 85 | Bishjara | <i>Aconitum ferox</i> L. | Ranunculaceae | Root | W | H | A | Snakebite/diarrhea/ Dysentery/ headache/cough/ cold | Powder/ paste | O | antibacterial, diuretic [116] | 1.09 |
| 86 | Bukki phul | <i>Anaphalis contorta</i> | Asteraceae | Whole | W | H | R | Cold/cough/ gastritis | decoction | O | | 0.36 |
| 87 | Ghiukumari | <i>Aloe vera</i> (L.) Burm f. | Liliaceae | Leaf juice | C | H | R | Burn/uric acid/ piles/constipation/ gastritis | Juice extraction | O/T | burn treatments, Treat constipation, diabetes, dermatitis [117,118,119] | 1.46 |
| 88 | Jarigo | <i>Phytolacca americana</i> Roxb. | Phytolaccaceae | Root/ stem/ leaf | W | H | R | Stomach problems | Cooking | O | Anorexia, Stomach pain, hepatic pain [30,56] | 1.13 |
| 89 | Gogan | <i>Sauraria nepalensis</i> Roxb. | Saurariceae | Bark | W | T | A | Fever | Juice extraction | O | | 0.05 |
| 90 | Gande jhar | <i>Ageratum conyzoides</i> L. | Asteraceae | Leaf | W | H | A | Cut/wound | Paste | O | pneumonia, gynecological diseases, skin disease, wound healing, diarrhea, headaches [120-123] | 0.04 |

| SN | Local name | Scientific name | Family | Parts used | Management | Life form | Distribution | Diseased treated | Method of preparation | Mode of application | Previous use reports | Use value (UV) |
|-----|------------|--|---------------|--------------|------------|-----------|--------------|---|-------------------------------------|---------------------|--|----------------|
| 91 | Alainchi | <i>Amomum subulatum</i> Roxb. | Zingiberaceae | Fruit | C | H | A | Nausea/ indigestion | Extract in powder form/Mix with Tea | O | indigestion, reduce stomach cramps, reduce pain and swelling, dental health, stress relief [124,125] | 0.33 |
| 92 | Tulsi | <i>Ocimum tenuiflorum</i> L. | Lamiaceae | Whole Plants | C | H | R | Vomiting/joint pain/urinary diseases/ toothache | Juice extraction/ powder | O | gastric problems, Blood pressure control, respiratory diseases, typhoid [24,30] | 1.55 |
| 93 | Rato akhle | <i>Achyranthes aspera</i> L. | Amaranthaceae | Root/ stem | W | H | A | Bleeding/dog bite/snake bite | Paste | T | | 0.77 |
| 94 | Koiralo | <i>Bauhinia variegata</i> (L.) Benth. | Fabaceae | Bark/ flower | W | T | A | Dysentery/diabetes/con stipitation/ diarrhea/ indigestion | Juice extraction | O | diarrhoea, dysentery, piles, gastritis, toothache, goiter [30,42,126] | 0.06 |
| 95 | Kalo siris | <i>Albizia lebbek</i> (L.) Benth. | Fabaceae | Bark | W | T | A | snake bite/scorpion sting/diarrhea | Juice extraction | O | Gingivitis, fish killing [27,55] | 1 .5 |
| 96 | Chutro | <i>Berberis aristata</i> DC. | Berberidaceae | Bark/ leaf | W | S | A | Skin disease/ jaundice/piles | paste/juice extraction | O/T | kill intestinal worms, jaundice, treat fever, blood purification, toothache [26,27,30,31] | 1.4 |
| 97 | Paiyu | <i>Prunus cerasoides</i> D.Don. | Rosaceae | latex | W | T | A | Jaundice | Juice extraction | O | | 0.06 |
| 98 | Kodo | <i>Eleusine coracana</i> (L.) Gaerth. | Poaceae | seed | C | S | A | Diarrhea | Fermentation | O | Gingivitis [27] | 0.14 |
| 99 | Siru | <i>Imperata cylindrica</i> (L.) P.Beauv. | Poaceae | root | W | H | A | Worms/fever/ diarrhea | Juice extraction | O | anti-helminthic, indigestion, boils, diarrhea, dysentery, fever [54,64,65] | 0.04 |
| 100 | Farsi | <i>Cucurbita moschanta</i> Duchesne ex Poir. | Cucurbitaceae | Leaf | C | CL | A | Wounds cut | Paste | T | Anti-parasite, diabetes, tumor, cholesterol, inflammation [56,127,128] | 0.33 |
| 101 | Kimbu | <i>Morus alba</i> L. | Moraceae | Leaf/ fruit | W/C | T | R | Blood clotting/ diabetes | Juice extraction | O | asthma, cough, bronchitis, constipation, wound healing, diabetes, burning sensation [129,130,131] | 0.1 |
| 102 | Aaru | <i>Prunus persica</i> Siebold & Zucc. 1845 | Rosaceae | Fruit/ Barks | C | T | A | Wounds/ stomach ache | Juice extraction | O | diabetes, obesity, hypertension, inflammation, cardiovascular diseases [132,133] | 0.22 |

W= Wild O= Oral T= Tree A= Abundant
 C= Cultivated T= Topical CL= Climbers R= Rare
 H= Herbs I= Inhalation S= Shrubs

Table 2. Fidelity level (FL) of medicinal plants of the study area

| Disease Category | Diseases Treated | Total Species | Diseases for Fidelity Level Calculation | Species Fidelity Level Calculation | Np | N | Fidelity Level (FL) (%) |
|---------------------------------|--|---------------|---|------------------------------------|----|----|-------------------------|
| Headache and Fever | Headache, Fever, Typhoid | 20 | Fever | <i>Paris polyphylla</i> | 86 | 98 | 87.8 |
| | | | | <i>Aconitum bisma</i> | 76 | 76 | 100 |
| | | | | <i>Swertia chirayita</i> | 82 | 82 | 100 |
| Skeletal Problems | Bone fracture, Ligament Sprain, Body pain | 18 | Bone fracture | <i>Bergenia ciliata</i> | 56 | 68 | 82.4 |
| | | | | <i>Cissus quadrangularis</i> | 42 | 42 | 100 |
| | | | Ligament sprain | <i>Periploca calophylla</i> | 24 | 46 | 52.2 |
| | | | | <i>Pleione praecox</i> | 38 | 59 | 64.4 |
| Gastrointestinal Disorders | Gastric, Constipation, Dysentery, Diarrhea, Jaundice | 54 | Gastric | <i>Paris polyphylla</i> | 79 | 86 | 91.9 |
| | | | | <i>Zanthoxylum acanthopodium</i> | 87 | 87 | 100 |
| | | | Constipation | <i>Aloe vera</i> | 28 | 53 | 52.8 |
| | | | | <i>Bauhinia variegata</i> | 7 | 13 | 53.8 |
| | | | Dysentery | <i>Pyrus pashia</i> | 32 | 45 | 71.1 |
| Skin Problems | Cuts, Wounds, and Burns | 21 | Cuts | <i>Ageratina adenophora</i> | 46 | 46 | 100 |
| | | | | <i>Rumex nepalensis</i> | 4 | 9 | 44.4 |
| | | | Burns | <i>Permelia nepalensis</i> | 8 | 11 | 72.7 |
| Common cold and Cough | Common cold, cough, and tonsillitis | 15 | Cough & cold | <i>Lindera neesiana</i> | 19 | 19 | 100 |
| | | | | <i>Zingiber officinale</i> | 64 | 64 | 100 |
| Dermatological Disorders | Scabies, Skin Allergy, Vitiligo | 9 | Skin allergy | <i>Acorus calamus</i> | 11 | 19 | 57.9 |
| | | | Vitiligo | <i>Clematis buchananiana</i> | 3 | 8 | 37.5 |
| Snake Bite | Snake Bite | 9 | Snake bite | <i>Aconitum bisma</i> | 67 | 67 | 100 |
| | | | | <i>Lindera neesiana</i> | 36 | 42 | 85.7 |
| Respiratory Diseases | Sore throat, Asthma | 11 | Asthma | <i>Zingiber officinale</i> | 12 | 15 | 80 |
| Odontological Disorders | Toothache, blood in gums | 3 | Toothache | <i>Cinnamomum glaucescens</i> | 16 | 23 | 69.7 |
| Cardio Vascular Diseases | Heart diseases, High/Low blood pressure | 8 | Blood pressure | <i>Momordica charantia</i> | 18 | 27 | 66.6 |
| | | | | <i>Swertia chirayita</i> | 88 | 92 | 95.7 |
| Ophthalmic Diseases | Eye disease, eye cataracts, poor eyesight | 4 | Eye cataract | <i>Cissus adnata</i> | 4 | 13 | 30.8 |
| Mental Disorders (Neurological) | Epilepsy, nervous problem | 3 | Nerves problem | <i>Valeriana jatamansi</i> | 12 | 14 | 85.7 |
| | Unconsciousness | | | | | | |
| Metabolic Disorder | Diabetes | 7 | Diabetes | <i>Taxus wallichiana</i> | 21 | 32 | 65.6 |
| Gynecological Disorders | Pregnancy problems, mensuration problem | 7 | Pregnancy problems | <i>Rhododendron arboretum</i> | 38 | 38 | 100 |
| Immunity Boosters | Overall Immune system | 4 | Not specific | <i>Piper longum</i> | 17 | 19 | 89.5 |
| Urologic Disorders | Burning urination | 2 | Burning urination | <i>Cheilocostus speciosus</i> | 2 | 2 | 100 |
| General | Kidney stone, uric acid | 3 | Uric acid | <i>Rauvolfia serpentina</i> | 31 | 34 | 91.2 |

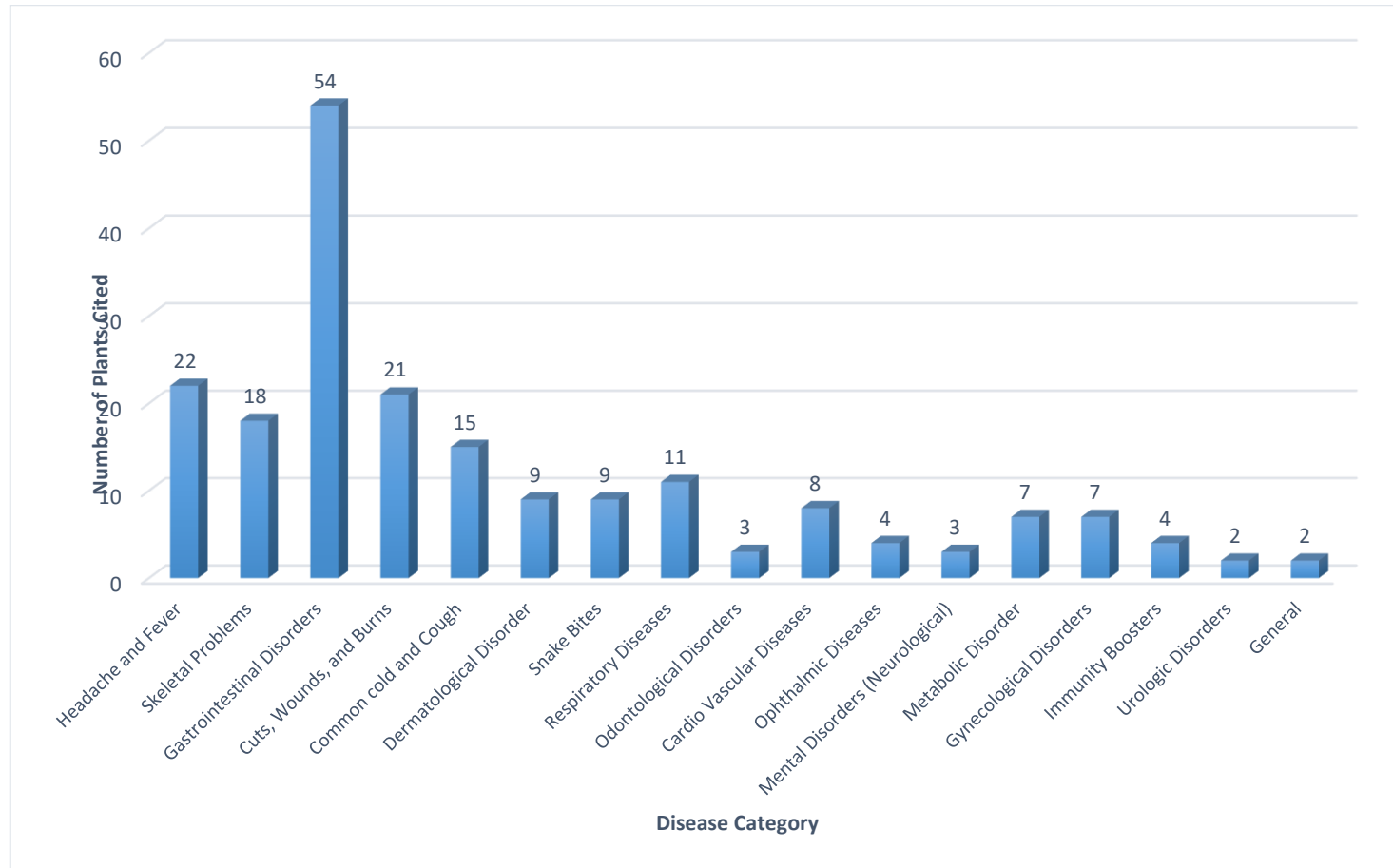


Fig. 6. Number of plants treating a disease

Table 3. ICF values for medicinal plants used to cure a variety of ailments

| Disease Category | No. of species (Mt) | Use reports (Mur) | Informants Factor (ICF) | Consensus |
|----------------------------|---------------------|-------------------|-------------------------|-----------|
| Headache and Fever | 20 | 26 | 0.24 | |
| Skeletal Problems | 18 | 21 | 0.15 | |
| Gastrointestinal Disorders | 54 | 109 | 0.51 | |
| Skin Problems | 21 | 30 | 0.31 | |
| Common cold and Cough | 15 | 22 | 0.33 | |
| Dermatological Disorders | 9 | 12 | 0.27 | |
| Snake Bite | 9 | 10 | 0.11 | |
| Respiratory Diseases | 11 | 17 | 0.38 | |
| Odontological Disorders | 3 | 5 | 0.5 | |
| Cardio Vascular Diseases | 8 | 10 | 0.22 | |
| Ophthalmic Diseases | 4 | 5 | 0.25 | |
| Mental Disorders | 3 | 4 | 0.33 | |
| Metabolic Disorder | 7 | 9 | 0.25 | |
| Gynecological Disorders | 7 | 11 | 0.40 | |
| Immunity Boosters | 4 | 5 | 0.25 | |
| Urologic Disorders | 2 | 5 | 0.75 | |
| General | 3 | 5 | 0.5 | |

Table 4. Relative frequency citation (RFC) of the medicinal plants

| Plant Species | FC | N | RFC |
|----------------------------------|----|-----|------|
| <i>Paris polyphylla</i> | 98 | 100 | 0.98 |
| <i>Aconitum bisma</i> | 76 | 100 | 0.76 |
| <i>Swertia chirayita</i> | 82 | 100 | 0.82 |
| <i>Bergenia ciliata</i> | 68 | 100 | 0.68 |
| <i>Cissus quadrangularis</i> | 42 | 100 | 0.42 |
| <i>Periploca calophylla</i> | 46 | 100 | 0.46 |
| <i>Pleione praecox</i> | 59 | 100 | 0.59 |
| <i>Paris polyphylla</i> | 86 | 100 | 0.86 |
| <i>Zanthoxylum acanthopodium</i> | 87 | 100 | 0.87 |
| <i>Aloe vera</i> | 53 | 100 | 0.53 |
| <i>Bauhinia variegata</i> | 13 | 100 | 0.13 |
| <i>Pyrus pashia</i> | 45 | 100 | 0.45 |
| <i>Ageratina adenophora</i> | 46 | 100 | 0.46 |
| <i>Rumex nepalensis</i> | 9 | 100 | 0.09 |
| <i>Permelia nepalensis</i> | 11 | 100 | 0.11 |
| <i>Lindera neesiana</i> | 19 | 100 | 0.19 |
| <i>Zingiber officinale</i> | 64 | 100 | 0.64 |
| <i>Acorus calamus</i> | 19 | 100 | 0.19 |
| <i>Clematis buchananiana</i> | 8 | 100 | 0.08 |
| <i>Aconitum bisma</i> | 67 | 100 | 0.67 |
| <i>Lindera neesiana</i> | 42 | 100 | 0.42 |
| <i>Zingiber officinale</i> | 15 | 100 | 0.15 |
| <i>Cinnamomum glaucescens</i> | 23 | 100 | 0.23 |
| <i>Momordica charantia</i> | 27 | 100 | 0.27 |
| <i>Swertia chirayita</i> | 92 | 100 | 0.92 |
| <i>Cissus adnata</i> | 13 | 100 | 0.13 |
| <i>Valeriana jatamansi</i> | 14 | 100 | 0.14 |
| <i>Taxus wallichiana</i> | 32 | 100 | 0.32 |
| <i>Rhododendron arboretum</i> | 38 | 100 | 0.38 |
| <i>Piper longum</i> | 19 | 100 | 0.19 |
| <i>Cheilocostus speciosus</i> | 2 | 100 | 0.02 |
| <i>Rauvolfia serpentina</i> | 34 | 100 | 0.34 |

3.9 Relative Frequency Citation (RFC)

Paris polyphylla has the greatest Relative Frequency of Citation (RFC) with a value of 0.98, indicating that the informants are widely aware of and utilize it. On the other hand, *Cheilocostus*

speciosus has the lowest RFC (0.02), indicating that it is not often cited and probably has little importance in the community. This contrast highlights the differences in the relative importance of the various plant species within the study area.

4. DISCUSSION

4.1 Diversity of Medicinal Plants and their Uses

This study identified a total of 102 plant species across 57 families, similar to the findings of Bhattarai & Khadka [2] in Ilam, where 102 species from 94 genera and 64 families were reported to treat 56 human ailments. Bhattarai (2018) [134] documented 30 species from 24 families and 29 genera within the Thami community in Ilam. In this study, the Rosaceae family has the highest representation by 7 species, followed by Poaceae with 6 species, aligning with the study by Karki et al. [135] in Dolakha District, where Rosaceae had 3 species. Additionally, 5 species each were found in the Ranunculaceae, Cucurbitaceae, Ericaceae, and Asteraceae families, while the Lauraceae, Moraceae, and Zingiberaceae families each had 3 species. Other families, including Saxifragaceae, Polygonaceae, Rutaceae, Orchidaceae, Liliaceae, Vitaceae, Urticaceae, Rubiaceae, Lamiaceae, Apiaceae, Piperaceae, Apocynaceae, and Fabaceae, were each represented by 2 species. These findings are inconsistent with a study in the Gulmi District [74] where the Labiatae family had the highest representation with 8 species, followed by Leguminosae and Poaceae with 7 species each, and various other families with fewer species.

The current study revealed 17 different disease categories treated with medicinal plants, including a large number of species (54) used for gastrointestinal disorders, 21 for cuts, wounds, and burns, and approximately 20 for fever and headaches. The emphasis on gastrointestinal treatment is consistent with previous research, however the number of species varies. For instance, a study by Bhattarai & Khadka [2] found 26 species for gastrointestinal difficulties, 17 for headaches and fever, and a more precise breakdown for other conditions like respiratory problems, dermatological issues, and snake stings. Another study by Acharya & Acharya [16] diversifies the categories, identifying 36 species for gastrointestinal difficulties, 23 for Ear, Nose, and Throat (ENT) and ophthalmological concerns, and varied numbers for other conditions such as dermatological and genitourinary problems. The number of species employed for specific conditions varies throughout studies, which could be due to geographical variances in plant availability, traditional knowledge, and cultural practices.

While gastrointestinal difficulties are always the most addressed, the distribution of plant use for other ailments shows a broader application of ethnomedicinal knowledge that is adapt to local health requirements and circumstances.

4.2 Life Form, Plant Parts used, and Mode of Administration

The people in the study area primarily harvest herbaceous plants (52.94%) for remedy preparation. These could be due to ease of collecting, storing, transporting, and extracting active components from compared to other life forms [32]. This finding is consistent with studies conducted in various parts of Nepal [82,136,137]. The preference for herbaceous plants may also be due to their effectiveness and the relative ease of harvesting, transporting, and preparing remedies [14,136]. Additionally, researches has shown that herbs often contain higher concentrations of secondary metabolites with therapeutic potential [138,139].

In the study area, the most frequently utilized plant parts are the root (21.31%), followed by leaves (18.86%). This pattern is consistent with other studies [2,140,141,142,143] where underground parts like roots and rhizomes were heavily harvested. The preference for underground parts, such as roots, rhizomes, tubers, and bulbs, is often due to their higher concentration of bioactive compounds, as suggested by Srithi et al. [144]. However, the study conducted by Bhat et al. [145], revealed that leaves were the most commonly used part (32%), followed by roots (24%) and the whole plant (13%). Study by Ahmad et al. [1] in Pakistan also showed that leaves were mostly harvested plants in that study area. The consistent use of various plant parts across different areas demonstrates a common understanding of their therapeutic significance, while variances in utilization reflect each area's unique ecological and cultural environment.

Oral administration was the most common method of treatment, accounting for 72.54%, which suggests a higher prevalence of internal ailments in Kepilasgadhi Rural Municipality. However, careful attention to dosing is crucial for oral administration, as improper dosages can lead to severe internal complications. Similar findings have been reported in studies from Ethiopia [146,147] and Nepal [18,33] where oral application was the primary method of administration.

4.3 Fidelity Level (FL) and Informant Consensus Factor (ICF)

The study identified a total of 17 disease categories, with Informant Consensus Factor (ICF) values ranging from 0.11 to 0.75, and an average ICF of 0.33. This average is closely aligned with the findings of Yaseen et al. [37] who reported an average ICF value of 0.38. The highest ICF value in our study was 0.75 for urologic disorders, which contrast to the significantly higher ICFs reported by Ragupathy et al. [148] who found an ICF of 0.92 for jaundice, indicating strong consensus among informants for that ailment. In comparison, Uprety et al. [33] reported ICF values as high as 1.00 for ophthalmological problems, toothache, and kidney issues, reflecting very strong agreement among informants for these conditions. Rokaya et al. [18], however, reported generally lower ICF values, such as an ICF of 0.40 for gastrointestinal ailments, which is notably lower than the 0.51 found in our study for the same category. The variations in ICF values across these studies may be attributed to the cultural and geographical diversity of the informant groups, and the extent of medicinal plant knowledge within the communities studied.

In this study, a high Fidelity Level (FL) of 100% was observed for ten plant species used to treat specific ailments. These include *Aconitum bisma* and *Swertia chirayita* for fever, *Cissus quadrangularis* for bone fractures, *Zanthoxylum acanthopodium* for gastric disorders, *Ageratina adenophora* for cuts, *Lindera neesiana* and *Zingiber officinale* for cold and cough, *Aconitum bisma* for snake bites, *Cheilocostus speciosus* for burning urination, and *Rhododendron arboretum* for pregnancy problems. This high FL reflects a strong traditional reliance on these plants within our study area. Similarly, the study by Tumoro & Maryo [149] also identified seven plant species with 100% FL. The high level of FL indicates that these plants have a long history of use in traditional medicine to treat certain diseases and are therefore expected to be trusted greatly by people in the community [4]. In contrast, *Cissus adnata* had the lowest FL of 30.8% for eye cataracts in our study, suggesting either less consensus or a wider variation in its use within the community, whereas Yaseen et al. [37] reported lowest FL values of 50% for *Moringa oleifera* and *Sonchus asper* for specific ailments. *Moringa oleifera* was noted for a range of conditions, including eye disorders and gastric

problems, while *Sonchus asper* was used for male sexual disorders and jaundice.

4.4 Use Value (UV) and Relative Frequency Citation (RFC)

The study reveals that RFC values for the plant species ranged from 0.02 to 0.98, with *Paris polyphylla* having the highest RFC value of 0.98, followed by *Swertia chirayita* (0.92) and *Zanthoxylum acanthopodium* (0.87). The high RFC values for these species can be attributed to their widespread distribution, easy availability, and traditional use in treating numerous diseases [150]. These high citation levels indicate that these species are not only well-known but also highly trusted and widely used within the community. Species of plants with high RFC values should be prioritized for pharmacological, phytochemical, and other biological research in order to confirm and validate their medicinal properties [151]. Conversely, plants like *Cheilocostus speciosus* (0.02), *Clematis buchananiana* (0.08), and *Rumex nepalensis* (0.09) exhibit much lower RFC values, suggesting that they are either less recognized or less frequently used for medicinal purposes. In a similar study by Faruque et al. [152], RFC values ranged from 0.02 to 0.25, with the highest RFC recorded for *Rauvolfia serpentina* (0.25) and the lowest for *Scoparia dulcis* (0.20) indicating that the ailments treated by these plants may be less common or there is less consensus on their effectiveness in the area.

The range of Use Values (UV) from 0.01 to 1.83 reflects the diversity in the importance and frequency of use of various medicinal plants. Plants with higher Use Values, such as *Curcuma domestica* L with a UV of 1.83, are frequently utilized and highly valued for treating multiple ailments, including body pain, fever, sore throat, common cold, and jaundice. This indicates that they are integral to local medicinal practices and are often employed in traditional remedies. In contrast, plants with lower Use Values, like *Cinnamomum glaucescens* (UV of 0.01), are cited less frequently and may play a less significant role in local medicinal practices.

4.5 Medicinal Plant Trade, Threats, and Conservation Practices

This area presents significant trade opportunities for medicinal and aromatic plants (MAPs), with several high-value species with good market

value available, such as *Paris polyphylla*, *Swertia chiraita*, *Lindera neesiana*, *Berberis aristata*, *Astilbe rivularis*, *Piper longum*, *Bergenia ciliata*, and *Aconitum bisma*. Among these, *Paris polyphylla* and *Swertia chiraita* are in particularly high demand according to local traders. Many of the traders also cultivate and harvest these medicinal plants themselves. However, the sustainability of these resources is under threat due to unsustainable harvesting practices, animal grazing, forest fires, deforestation, illegal collection, and the impact of the COVID-19 pandemic. During the pandemic, widespread unemployment in the village led many to turn to the irregular collection and sale of MAPs, contributing to the decline of these resources in the forest. Similar threats have been documented in other studies, such as Chaudhary (1998) [153], which identified deforestation, habitat encroachment, shifting cultivation, and forest fires as significant challenges, and Bibi et al. [4], which highlighted grazing, urbanization, and the uprooting of medicinal plants as serious concerns.

To mitigate the threats to medicinal and aromatic plants (MAPs), villagers have adopted several conservation practices, including the domestic cultivation of high-demand species like *Paris polyphylla* and *Swertia chiraita* to reduce pressure on wild populations and maximize economic benefits. They also engage in reforestation efforts, sustainable harvesting techniques, such as selective and seasonal harvesting. Community-based forest management is also practiced, along with strict enforcement of rules against illegal collection.

5. CONCLUSION

The study reveals that Kepilasgadhi Rural Municipality is exceptionally rich in medicinal plants, with some community members possessing extensive knowledge about their uses; however, these plants remain largely unexplored. This knowledge of medicinal plants, is mainly passed down through generations but, nowadays there is a noticeable decline in interest among younger generations regarding traditional medicinal plants. This shift interest poses a risk to the preservation of this valuable indigenous knowledge. Urgent need for initiatives to engage and educate younger community members about the importance and benefits of traditional medicinal practices is needed. Additionally, the medicinal plants in the study area are threatened by unsustainable harvesting practices, animal

grazing, forest fires, deforestation, and illegal collection. Addressing these threats is crucial for maintaining the ecological balance, ensuring economic benefits, and conserving these vital resources for continued use.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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