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Ethnobotany of traditional medicinal plants used in Senapati district of Manipur, Northeastern India

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This study presents data on important ethnomedicinal plants that were gathered from Manipur's Senapati District. Modern medical facilities are lacking in this area, and traditional health care systems are still practiced. A total of 82 plant species under 46 families were documented from 23 informants. Questionnaires that were open-ended and semi-structured were used to collect the data. Ethnobotanical indices were used to indicate ethnomedicine's advantages, significance, and application. The highest ICF value was 1 for kidney diseases, general health or body weakness, and oral care, followed by skin diseases (0.76). *Rhus chinensis* Mill (0.52) has the highest relative frequency of citation value followed by *Zingiber officinale* Roscoe (0.39), *Psidium guajava* L. (0.39), *Gynura cusimbua* (D.Don) S.Moore (0.35), *Oroxylum indicum* (L.) Kurz (0.35). Decoction (47%) was the most commonly used method of preparation followed by raw/fresh (22%), paste (8%), juice (8%), crushed (10%), powder (2%), infusion (2%) and maceration (1%). In our study, 11 plant species were found to have a 100% fidelity level. These species could be a real natural reservoir of new biomolecule with a potential pharmacological activity. Therefore, the preservation of this heritage by documentation and scientific studies is an essential requirement.

Keywords: Documentation, Ethnobotany, Senapati, Traditional knowledge

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Human traditions have evolved understanding and use of therapeutic herbs over the ages[1]. Despite medical advances, many in developing countries still rely on traditional healers and their herbal remedies. This orally transmitted knowledge, primarily held by healers, is at risk of disappearing without proper documentation and preservation[2-4]. Since ancient times, herbs have been a constant source of preventive and therapeutic traditional medicine preparations for mankind[5]. Medicinal herbs have been utilised to cure a variety of health conditions for generations, and despite modern medicine's huge advancements, man continues to utilise this ancestral wisdom. According to the World Health Organization (WHO), more than 80% of the world's population uses medicinal plants for basic health care[6]. At least 25% of current medications contain one or more active components derived from plants[7]. Because of their abundance, cultural significance, and affordable pricing, medicinal plant use has seen a significant growth in recent years[8]. Studies on ethnomedicine indicate that around 28% of higher plant species are used for therapeutic purposes and that 74% of pharmacological principles are derived from plants[9]. While developing plant-based drugs requires a multidisciplinary approach involving botany, chemistry, and pharmacology, traditional medicine and ethnobotanical studies can simplify the search for active compounds by drawing on ancestral knowledge and practices. For thousands of years, oral transmission has passed indigenous knowledge down from generation to generation. Due to industrialization and changes in lifestyle, this tradition is being passed down less now[10]. As a result, it became critical to document the traditional applications of therapeutic herbs. The current study was conducted in Senapati District, Manipur, and it documented the medicinal species used for therapeutic reasons and the regional therapeutic techniques of traditional healers. The side effects of conventional drugs are increasingly recognized and pharmacovigilance systems have been developed to

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detect and manage these adverse effects[11]. The most industrialised nations still place a high value on traditional healthcare since it is perceived to have fewer side effects and is less expensive than current therapies[12,13]. Proper use of the country's medicinal plants in conjunction with efficient conventional treatments may have a favourable impact on the diabetic population's health and quality of life[14,15]. Global attempts to protect traditional knowledge have increased during the past few decades. As a result, documenting traditional medicinal plant use in a region contributes to plant biodiversity knowledge and, in turn, helps in applying that knowledge for other social and scientific interventions. The study aimed to document the various ethnomedicinal uses of plants in the area, to foster genuine herbal knowledge there, to safeguard cultural heritage, and to analyse ethnobotanical data using quantitative indices such as informant consensus factor (ICF), fidelity level (FL), use value (UV), and relative frequency citation (RFC) and to use the results for further scientific and social research.

Materials and Methods

Study area

The survey was conducted to gather information about the Senapati district's indigenous use of medicinal herbs (Fig. 1). The district is located between 1061 and 1788 meters above sea level. Terrace cultivation is frequently used by the populace, primarily in agriculture. The district's primary crops include grains, paddy, maize, cabbage, and potatoes. 20% of the territory is agricultural land, and the remaining 80% is forested. The scope of the study was explained to the informants, and verbal prior informed consent was sought. This work was performed using a pre-prepared questionnaire which includes the informant's information such as gender, age, educational level (primary, secondary, academic), information concerning medicinal plants such as vernacular names, the parts used, preparation method, and therapeutic uses by asking the informants about the uses of the plants, its mode of preparation, availability of the plants, its possible side effects,

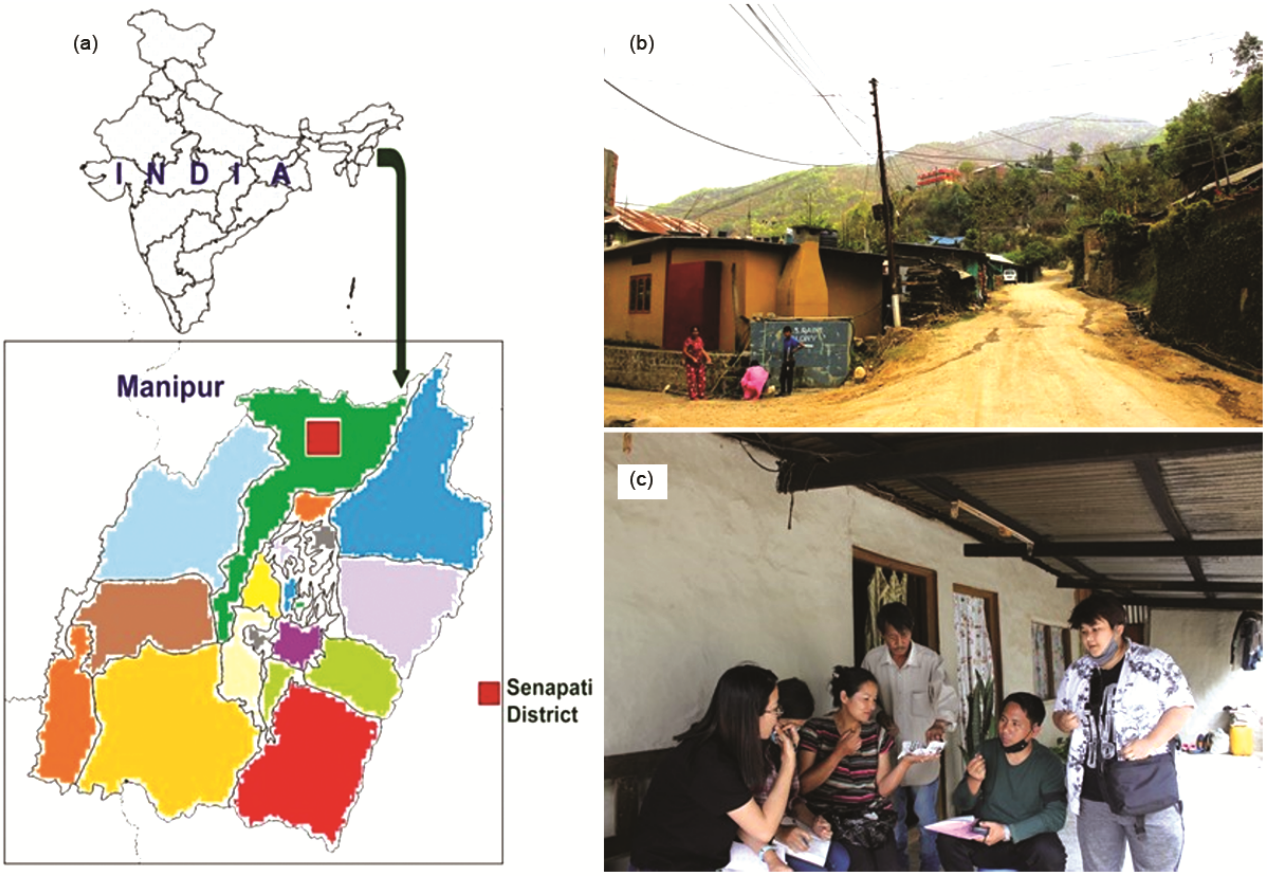

Fig. 1 — (a) Geographical location of the study area (b) Village view of the study site (c) Interview with the local informants. (Source of Map: https://allpngfree.com/all-png-free-transparent-background-clipart-ssqfid)

modes of administration and health conditions or symptoms treated.

Ethnobotanical survey and data collection

The ethnobotanical fieldwork of this quantitative study was conducted from March 2021 to November 2022. Information was gathered using traditional ethnobotanical techniques like participant observation and open and semi-structured interviews. Every participant was a local of the study area. Prior informed consent was carefully adhered to during the field survey, and the informants were informed of the research's goal, methodology, and nature. First, we have obtained consent for documentation of traditional knowledge of respective traditional healers for capturing their photographs and videography.

Data preservation

Each species' plant samples were gathered, pressed, and dried. Before mounting them on the herbarium sheets, they were treated with a 30% formaldehyde solution preservative. The recorded specimens were gathered with the assistance of local experts and identified by experienced botanists at our lab, where specimen vouchers were prepared and stored in the IBSD herbarium library. Voucher specimens were collected through repeated field surveys. For identification of the plant specimens, authentication of data, botanical names and families of each plant specimen were confirmed with the help of herbaria comparison, taxonomic literature, manuals and a concise book of Medicinal plants of Manipur. All plant names have been crosschecked with Tropicos (https://tropicos.org/home), WFO Plant List (https://wfoplantlist.org/plant-list), Plants of the World Online (https://powo.science.kew.org/).

Quantitative ethnobotanical data analysis

To assess the collected data, ethnobotanical indices such as fidelity level (FL) and informant consensus factor (ICF) were calculated. To measure the applicability and significance of a species for a specific disease category and the agreement of its use among healers, respectively, consensus indicators FL and ICF were used[16,17].

Use value (UV)

The use value is a quantitative measure of the relative importance of the species. It is used to record the most important plant species in the study area based on the number of uses cited by the number of people. UV was calculated according to the following formula[18].

$$UV=\Sigma U/n,$$

Where, U is the total number of used reports each informant mentioned for a particular plant species, and n is the total number of informants for that plant that were questioned. It shows the relative value of locally popular plants.

Informant consensus factor (ICF)

The informant consensus factor (ICF) was utilised to compare the similarity of the informants' information for each use category and verify the accuracy of the study. ICF is calculated using the following formula[19,20].

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

Nt represents the number of species reported in each category, while Nur represents the number of usage citations in each category. This number represents the degree of information homogeneity among the informants. If plants are picked at randomly or if informants do not share information about their use, ICF values will be low (around 0). If there is a clear selection criterion in the community and/or if information is shared across informants, the values will be high (around 1)[21].

Relative frequency citation (RFC)

The relative frequency of citation was calculated to assess the incidence of one particular plant species used to treat a particular disease or disease category. The following formula calculated the RFC:

$$RFC= FC/N\ (0 < RFC < 1).$$

This index is calculated without considering the used categories by dividing the number of informants who mentioned a valuable species FC or frequency of citation by the total number of informants in the survey (N)[22].

Fidelity level

By calculating the percentage of informants who claimed to use a certain plant for the same primary purpose, the fidelity level (FL) for the most frequently used category was calculated. FL index was calculated using the following formula[23].

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

N is the total number of use reports mentioned for any given species, and Np is the number of use reports for a given species reported for a specific disease category. A high FL value suggests that the informants in the study area frequently used the plant species to treat a certain category of illness.

Results

Demographic characteristics of informants

We found that 34% of the informants were women and 65% were men (Table 1). The informants can be divided into five main categories based on their ages (1) 31-40 years (8%), (2) 41-50 years (21%), (3) 51-60 years (21%), (4) 61-70 years (30%) and (5) 71-80 years (17%). 47.8% of the informants have the education of primary level, and 17.3% have the education of secondary level. 21.7% of the informants are graduated from different colleges and universities of Manipur. In comparison, 13% of the informants are illiterate due to poverty. 86.9% of the informants interviewed in our study are farmers. They work in the field and in the forest for the cultivation of crops and vegetables and in search of firewood. Since they are very much exposed to the life of the forest, they highly depend on the nature-based remedies.

Diversity of ethanomedicinally important medicinal plants and quantitative analyses

In this study, a total of 82 ethonomedicinally important plants were documented. We employed Use Value (UV), Relative Frequency of Citation (RFC), and Fidelity Level (FL) as quantitative metrics to analyze ethnomedicinal data (Table 2) and ICF (Table 3).

Table 1 — Demographic information of the informants

Variables	Demographic categories	Total	Percentages (%)
Gender	Men	15	65.2
	Women	8	34.7
Age groups	31-40	2	8.6
	41-50	5	21.7
	51-60	5	21.7
	61-70	7	30.4
	71-80	4	17.3
Education	Illiterate	3	13.0
	Primary	11	47.8
	Secondary	4	17.3
	Graduate	5	21.7
Occupation	Farmers	20	86.9
	Housewives	3	13.0
	Former Teacher	1	4.3

Medicinal plant diversity

Dominant families utilized were the Zingiberaceae (6 species), Lauraceae (6 species), Rosaceae (5 species), Moraceae (4 species) and Asteraceae (4 species) (Fig. 2). The number of species represented by these families highlights the deep knowledge locals possess about utilizing plants for traditional remedies.

Parts of medicinal plants used

(Fig. 3) indicates data on different plant parts used in traditional medicine. It was revealed that leaves (43%) were the most dominantly used plant parts in the preparation of traditional formulations, followed by fruits (19%), stem (9%), whole plant (9%), bark (5%), rhizome (5%), inflorescences (3%), flower (1%), petiole (1%), and grains (1%) each, respectively.

Method of preparation

Decoction (45%) was the most commonly used method of preparation followed by raw/fresh consumption (21%), crushed (11%), juice (9%), paste (8%), infusion (3%), powder (2%) and maceration (1%) (Fig. 4). Due to their simplicity, decoctions are typically listed as the main preparation method in

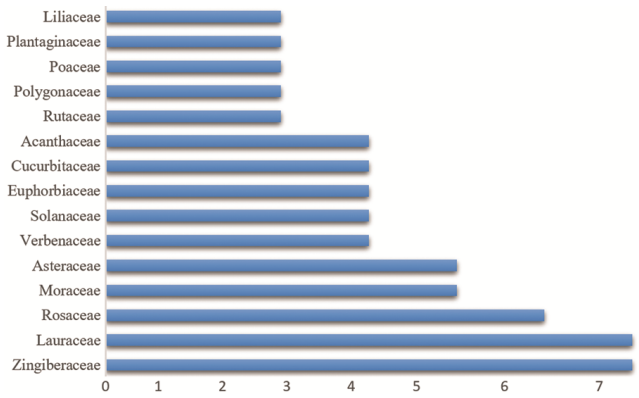

Fig. 2 — Top 15 plants family with maximum number of citations

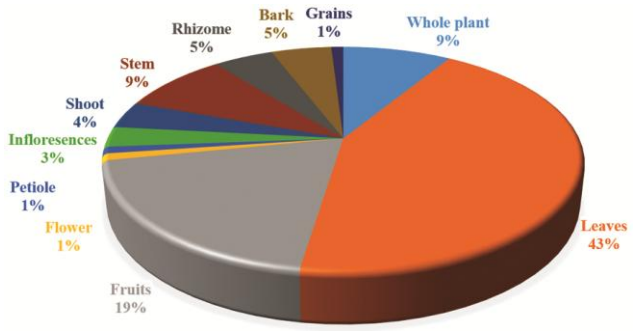

Fig. 3 — Parts of the plants used by the informants for treating various ailments

ethnopharmacological studies. After drying in the shade, plant parts are crushed to make powder, and water is added to grind fresh or dried plant parts to make paste.

Table 2 — List of medicinal plants used by the traditional healers of Senapati district, Manipur

Sl No.	Scientific Name	Family	Vernacular name	Traditional Uses	Parts used	Mode of preparation	UVs	RFC	FL
1	*Justicia adhatoda* L. (IBSD/SNP/2021/52)	Acanthaceae	Nongmangkha angouba	Headache	Leaves	Decoction	0.78	0.3	87.5
2	*Allium odorum* L. (IBSD/SNP/2021/44)	Alliaceae	Maroi nakkupi	Diarrhoea, Chicken Pox	Whole Plant	Decoction, Fresh, Paste	0.52	0.26	100
3	*Alocasia macrorrhizos* (L.) *G. Don* (IBSD/SNP/2021/79)	Araceae	Yendem	Blood purifier, Boils	Rhizome and Leaves	Decoction or Fresh	0.21	0.09	100
4	*Aloe vera* (L.) Burm.f. (IBSD/SNP/2021/15)	Asphodelaceae	Ghrita kumari	Boils, burn, sun burn, skin lotion	Leaves	Fresh	0.86	0.09	40
5	*Alpinia nigra* (Gaertn) Burth. (IBSD/SNP/2021/01)	Zingiberaceae	Pullei	Gout & colic	Whole plant, rhizome	Decoction	0.17	0.09	100
6	*Amaranthus viridis* L. (IBSD/SNP/2021/02)	Amaranthaceae	Chengkruk	Liver tonic, immune booster	Leaves	Decoction and fresh	0.13	0.09	66.6
7	*Auricularia delicata* (Mont.) Henn (IBSD/SNP/2021/05)	Auriculariaceae	Uchina	Diarrhoea and constipation	Whole	Decoction	0.78	0.13	60
8	*Azadirachta indica* A. Juss (IBSD/SNP/2021/42)	Meliaceae	Neem	Fever	Leaves	Powder	0.43	0.17	80
9	*Bauhinia purpurea* L. (IBSD/SNP/2021/06)	Fabaceae	Chingthrao	Menstrual disorder and leucorrhoea, diarrhoea, dysentery and intestinal worms	Flower	Paste	0.43	0.22	33.3
10	*Begonia picta* Sm. (IBSD/SNP/2021/07)	Begoniaceae	Samu mana manbi	Dysentery and diarrhoea	Leaf petiole	Decoction and paste	0.3	0.09	50
11	*Bidens pilosa* L. (IBSD/SNP/2021/47)	Asteraceae	Hameng sampakpi	Diarrhoea	Leaves	Decoction	0.34	0.13	60
12	*Blumea flava* DC. (IBSD/SNP/2021/83)	Asteraceae	Haochuk	skin diseases, congestion, cold	Whole plant	Decoction	0.43	0.17	100
13	*Calotropis gigantea* (L.) W.T. Aiton (IBSD/SNP/2021/36)	Apocynaceae	Angkot	Abdominal pain, ulcers and other skin diseases.	Leaves	Crushed or Decoction	0.43	0.09	66.6
14	*Cannabis sativa* L. (IBSD/SNP/2021/41)	Cannabaceae	Ganja	Diarrhoea	Leaves	Decoction	0.29	0.09	40
15	*Carica papaya* L. (IBSD/SNP/2021/66)	Caricaceae	Awathabi	Digestion, rheumatism, worms in body and diuretic	Fruit and seeds	Fresh	0.6	0.04	50
16	*Centella asiatica* (L.) Urb. (IBSD/SNP/2021/08)	Apiaceae	Peruk	Ulcer, stomach pain, skin inflammation	Whole plant	Decoction, Juice or paste	0.69	0.13	100
17	*Chimonobambusa callosa* (Munro) Nakai (IBSD/SNP/2021/80)	Poaceae	Laiwa	Energy booster	Shoot	Decoction	0.73	0.3	87.5
18	*Cinnamomum tamala* (Buch.-Ham.) T. Nees & C.H. Eberm. (IBSD/SNP/2021/09)	Lauraceae	Tejpata	Cough, headache and dizziness.	Leaves	Decoction	0.56	0.13	75
19	*Cinnamomum verum* J.Presl (IBSD/SNP/2021/72)	Lauraceae	Ushingsha	Diuretic, cough, stomachic and mouth freshener	Bark	Decoction	0.65	0.26	100
20	*Clerodendrum colebrookianum* Walp. (IBSD/SNP/2021/10)	Verbenaceae	Kuthap	Cough, dysentery, hypertension and skin diseases	Leaves	Paste or Fresh	0.39	0.17	80
21	*Curcuma angustifolia* Roxb. (IBSD/SNP/2021/11)	Zingiberaceae	Yaipal	Cough and dysentery	Inflorescences	Decoction	0.43	0.09	100
22	*Curcuma longa* L. (IBSD/SNP/2021/43)	Zingiberaceae	Yaingang	Wound healing	Rhizome	Decoction	0.82	0.04	100
23	*Malus indica* (Wall.) B.B.Liu (IBSD/SNP/2021/67)	Rosaceae	Heitup	Indigestion, typhoid, small pox, eczema and itches	Fruit	Decoction	0.82	0.13	60
24	*Elaeocarpus floribundus* Blume (IBSD/SNP/2021/69)	Oleaceae	Chorphon	Constipation and stomach pain	Fruit and Leaves	Crushed	0.08	0.22	83.3

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Table 2 — List of medicinal plants used by the traditional healers of Senapati district, Manipur (Contd.)

Sl No.	Scientific Name	Family	Vernacular name	Traditional Uses	Parts used	Mode of preparation	UVs	RFC	FL
25	*Phyllanthus emblica* L. (IBSD/SNP/2021/29)	Euphorbiaceae	Heikru	High blood pressure, constipation, diarrhoea, dysentery	Fruit	Decoction, Juice and Fresh	0.73	0.3	100
26	*Eryngium foetidum* L. (IBSD/SNP/2021/12)	Apiaceae	Awaphadigom	Hypertension, Diabetes, stomach pain	Whole plant	Decoction or Fresh	0.86	0.13	75
27	*Ficus auriculata* Lour. (IBSD/SNP/2021/30)	Moraceae	Heirit	Dysentery	Fruit, bark, seed	Crushed	0.34	0.13	75
28	*Ficus hispida* L.f. (IBSD/SNP/2021/31)	Moraceae	Asiheibong	Paste, dysentery, intestinal worm infection, boils	Fruit, Leaves and Fresh	Decoction, Fresh	0.52	0.13	75
29	*Ficus roxburghii* Wall. (IBSD/SNP/2021/32)	Moraceae	Moboshi (Mao)	Diarrhoea	Fruit	Juice, Fresh	0.73	0.09	50
30	*Laportea interrupta* (L.) Chew (IBSD/SNP/2021/81)	Urticaceae	Santhak	Diuretic	Leaves	Decoction and Fresh	0.17	0.04	50
31	*Gynura cusimbua* (D.Don) S.Moore (IBSD/SNP/2021/56)	Asteraceae	Terapaibi	Wound healing	Leaves	Crushed or Fresh	0.86	0.35	80
32	*Hedychium coronarium* J.Koenig (IBSD/SNP/2021/13)	Zingiberaceae	Takhellei	Stomachic, vomiting carminative, stimulant and tonic	Tender shoot	Decoction	0.91	0.22	83.3
33	*Houttuynia cordata* Thunb. (IBSD/SNP/2021/14)	Saururaceae	Toningkhok	Stomach ulcers, dysentery	Whole plant	Decoction or fresh	0.52	0.09	50
34	*Juglans regia* L. (IBSD/SNP/2021/40)	Juglandaceae	Heijugak	Dentrifrice, Skin allergy	Bark, leaves	Decoction	0.3	0.13	50
35	*Kalanchoe pinnata* (Lam.) Pers. (IBSD/SNP/2021/53)	Crassulaceae	Mana hidak	Diabetes	Leaves	Decoction orcrushed	0.56	0.22	55.5
36	*Lantana camara* L. (IBSD/SNP/2021/49)	Verbenaceae	Samballei	Fever	Leaves	Decoction	0.73	0.3	70
37	*Verbena officinalis* L. (IBSD/SNP/2021/70)	Verbenaceae	Tharoi phijhub	Astringent and rheumatism	Leaves	Decoction	0.43	0.09	50
38	*Mangifera indica* L. (IBSD/SNP/2021/03)	Anacardiaceae	Heinou	Laxative and diuretic	Leaves, fruit	Paste and Juice	0.08	0.04	33.3
39	*Manihot esculenta* Crantz (IBSD/SNP/2021/68)	Euphorbiaceae	U-mangra	Wart, sore, eczema, scabies	Leaves, root and tuber	Decoction	0.52	0.09	33.3
40	*Mentha spicata* L. (IBSD/SNP/2021/45)	Lamiaceae	Nungshi-hidak	Diarrhoea, Stomach ache, Gastric problems	Leaves	Decoction	0.6	0.26	100
41	*Mimosa pudica* L. (IBSD/SNP/2021/58)	Mimosaceae	Lam ekaithabi	Jaundice, boils and urinary complaints	Leaves	Decoction or Fresh	0.78	0.3	77.7
42	*Salvia dianthera* Roth (IBSD/SNP/2021/55)	Lamiaceae	Kanghuman	Nepel negative energy	Leaves	Paste	0.43	0.17	57.1
43	*Momordica charantia* L. (IBSD/SNP/2021/46)	Cucurbitaceae	Karot akhabi	Cough and Fever	Fruits	Paste	0.69	0.13	75
44	*Momordica dioica* Roxb. ex Willd. (IBSD/SNP/2021/16)	Cucurbitaceae	Karot	Diuretic, cough and ulceration	Tender leaves	Decoction	0.73	0.26	85.7
45	*Morus alba* L. (IBSD/SNP/2021/76)	Moraceae	Kabrangchak	Purgative and vermifuge	Leaves	Crushed or Juice	0.08	0.09	50
46	*Musa* × *paradisiaca* L. (IBSD/SNP/2021/78)	Musaceae	Laphu	Skin diseases, anthelmintic and stomachic	Stem	Decoction, Juice	0.13	0.04	50
47	*Oenanthe javanica* (Blume) DC. (IBSD/SNP/2021/37)	Umbelliferae	Komprek	Digestive problems	Whole plant	Decoction	0.21	0.17	66.6
48	*Oroxylum indicum* (L.) Kurz (IBSD/SNP/2021/62)	Bignoniaceae	Shamba	Diarrhoea, dysentery stomachic, expectorant, carminative, heart problem, throat, piles, bronchitis, cough, muscular sprain and general weakness	Bark	Fresh or Decoction	0.21	0.09	66.6

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Table 2 — List of medicinal plants used by the traditional healers of Senapati district, Manipur (Contd.)

Sl No.	Scientific Name	Family	Vernacular name	Traditional Uses	Parts used	Mode of preparation	UVs	RFC	FL
49	*Basella alba* L. (IBSD/SNP/2021/17)	Basellaceae	Urok sumbal	Diarrhoea and dysentery, muscular sprain and general weakness,	Leaves and inflorescences	Decoction	0.91	0.35	80
50	*Oryza sativa* L. (IBSD/SNP/2021/71)	Poaceae	Cheng	Grain infusion is used as hair lotion for scalp care and tenderness of hairs.	Grains	Decoction, Infusion	0.17	0.04	33.3
51	*Passiflora edulis* Sims (IBSD/SNP/2021/64)	Passifloraceae	Sitaphal	Improves digestion, Diabetes, hypertension	Fruit	Juice	0.47	0.09	50
52	*Phaseolus lunatus* L. (IBSD/SNP/2021/63)	Fabaceae	Kalandri	Worm disease in children	Leaves	Fresh or Infusion	0.47	0.17	57.1
53	*Phlogacanthus curviflorus* (Nees) Nees (IBSD/SNP/2021/18)	Acanthaceae	Nongmangkha (wild)	Cold and cough	Tender pods	Decoction or Fresh	0.65	0.22	62.5
54	*Phlogacanthus thyrsiformis* (Roxb. ex Hardw.) Mabb. (IBSD/SNP/2021/77)	Acanthaceae	Nongmangkha	Cold and Cough, Fever	Leaves	Fresh or crushed	0.17	0.04	33.3
55	*Plantago asiatica* subsp. *erosa* (Wall.) Z.Yu Li (IBSD/SNP/2021/19)	Plantaginaceae	Eshingyempat	Boils, muscular sprain, gout, diuretic and astringent	Whole plant	Decoction	0.3	0.09	66.6
56	*Plantago major* L. (IBSD/SNP/2021/50)	Plantaginaceae	Yempat	Arthritis	Leaves	Decoction, Crushed or powder	0.26	0.09	50
57	*Isodon ternifolius* (D.Don) Kudo (IBSD/SNP/2021/82)	Lamiaceae	Khoiju	Small pox, headache and skin diseases.	Leaves and inflorescence	Leaves	0.13	0.04	50
58	*Plumeria rubra* L. (IBSD/SNP/2021/54)	Apocynaceae	Khagileihao-angangba	Stomach pain	Leaves	Fresh or Decoction	0.73	0.3	87.5
59	*Pogostemon parviflorus* Benth. (IBSD/SNP/2021/38)	Lamiaceae	Sangbrei	Menstrual disorder	Leaves	Decoction, Crushed and paste	0.34	0.09	28.5
60	*Persicaria chinensis* (L.) H.Gross (IBSD/SNP/2021/20)	Polygonaceae	Angomyenshil	Hair lotion	Tender shoot and leaves	Decoction	0.8	0.04	50
61	*Persicaria posumbu* (Buch.-Ham. ex D.Don) H.Gross (IBSD/SNP/2021/75)	Polygonaceae	Phakpai	Fever	Leaves	Decoction or Fresh	0.13	0.13	60
62	*Prunus cornuta* (Wall. ex Royle) Steud. (IBSD/SNP/2021/35)	Rosaceae	Mokhoshi (Mao)	Improve digestion	Fruit	Fresh or Decoction	0.21	0.3	77.7
63	*Prunus cocomilia* Ten. (IBSD/SNP/2021/33)	Rosaceae	Mokhoshi	Astringent and diuretics	Fruit	Juice	0.26	0.09	50
64	*Prunus persica* (L.) Batsch (IBSD/SNP/2021/34)	Rosaceae	Chumbrei	Cough, digestive and diuretic	Fruit	Juice, paste	0.73	0.26	75
65	*Psidium guajava* L. (IBSD/SNP/2021/57)	Myrtaceae	Pungdon	Diarrhoea and dysentery	Leaves	Decoction, Crushed	0.95	0.39	69.2
66	*Rhus chinensis* Mill. (IBSD/SNP/2021/21)	Anacardiaceae	Heimang	Kidney stone, urinary complaints, dyspepsia and stomach ulcer, diarrhoea and dysentery	Fruit	Decoction and Maceration	0.86	0.52	100
67	*Punica granatum* L. (IBSD/SNP/2021/60)	Lythraceae	Kamphoi	Gastritis, diarrhoea, bronchitis	Leaves	Decoction, Infusion or Fresh	0.52	0.09	66.6
68	*Ricinus communis* L. (IBSD/SNP/2021/61)	Euphorbiaceae	Kege	Piles, skin inflammations and rashes.	Leaves	Decoction and Fresh	0.34	0.13	50
69	*Saccharum officinarum* L. (IBSD/SNP/2021/65)	Poaceae	Chu	Stomach-ache and jaundice	Stem	Fresh or crushed.	0.21	0.17	50

… *Contd.*

Table 2 — List of medicinal plants used by the traditional healers of Senapati district, Manipur (Contd.)

Sl No.	Scientific Name	Family	Vernacular name	Traditional Uses	Parts used	Mode of preparation	UVs	RFC	FL
70	*Schima wallichii* (DC.) Korth. (IBSD/SNP/2021/22)	Theaceae	Usoi	Immune booster	Tender leaves	Decoction	0.8	0.04	50
71	*Smilax ovalifolia* Roxb. ex D.Don (IBSD/SNP/2021/39)	Smilacaceae	Kwa manbi	Rheumatic, skin diseases dysentery, and urinary complaints	Leaves, roots and climber	Paste or Fresh	0.3	0.13	33.3
72	*Solanum nigrum* L. (IBSD/SNP/2021/24)	Solanaceae	Morokman	Stomach ache, skin diseases like ringworm, liver cirrhosis	Leaves	Decoction or Fresh	0.47	0.13	75
73	*Solanum torvum* Sw. (IBSD/SNP/2021/25)	Solanaceae	Sing khanga	Cough and tonsillitis	Fruit	Juice, Crushed and Decoction	0.56	0.09	50
74	*Solanum virginianum* L. (IBSD/SNP/2021/59)	Solanaceae	Leipungkhanga	Cough, chest congestion, sore throat, dysentery	Fruits	Decoction, Fresh, crushed or juice	0.82	0.22	55.5
75	*Acmella paniculata* (Wall. ex DC.) R.K.Jansen (IBSD/SNP/2021/23)	Asteraceae	Maanja-lei	Toothache	Leaves	Decoction	0.39	0.17	66.6
76	*Trichodesma indicum* (L.) Sm. (IBSD/SNP/2021/74)	Boraginaceae	Eleo-vu (Mao)	Stomach pain	Leaves	Decoction	0.21	0.22	55.5
77	*Viola hamiltoniana* D.Don (IBSD/SNP/2021/73)	Violaceae	Eveikoreio (Mao)	Stomach pain and ulcer.	Leaves	Decoction	0.39	0.13	33.3
78	*Wendlandia glabrata* DC. (IBSD/SNP/2021/26)	Rubiaceae	Pheija	Cough and dysentery	Tender inflorescences	Crushed or Decoction	0.26	0.17	50
79	*Zanthoxylum acanthopodium* DC. (IBSD/SNP/2021/27)	Rutaceae	Mukthrubi	Fever, antiseptic and toothache	Tender leaves, stem and fruit	Decoction or Fresh	0.56	0.17	66.6
80	*Zanthoxylum armatum* DC. (IBSD/SNP/2021/28)	Rutaceae	Oramomoshi (Mao)	Skin disease, rheumatism, fever and inflammation	Fruit	Decoction	0.43	0.17	80
81	*Zingiber purpureum* Roscoe (IBSD/SNP/2021/84)	Zingiberaceae	Tekhao-yaikhu	Inflammation, sprains, rheumatism, muscular pain, wounds and asthma	Rhizome	Decoction	0.69	0.26	85.7
82	*Zingiber officinale* Roscoe (IBSD/SNP/2021/51)	Zingiberaceae	Shing	Cold, cough and stomach pain	Rhizome	Decoction	0.91	0.39	81.8

Discussion

During the interview, it was observed that indigenous knowledge regarding the use of medicinal plants was more prevalent among individuals who worked as farmers (87%). However, similar knowledge declined among those with other livelihood occupation. This might be a result of the fact that farmers have long had direct touch with medicinal plants and are well acquainted with their uses. As a result of their extensive exposure to modern education, highly educated individuals have little interest in traditional medicine and are hence uninvolved in learning and using ethnobotanical knowledge.

The traditional users of medicinal plants appeared to know that the galls on the leaves of *Rhus chinensis* are known to have both curative and preventative effects on various illnesses (such as diarrhoea, dysentery, rectal and intestinal cancer, diabetes mellitus, sepsis, oral diseases and inflammation).

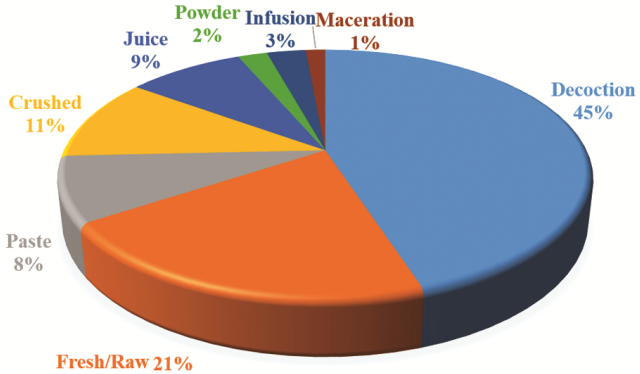

Fig. 4 — Method of preparation for herbal medicine

According to recent scientific studies, *Rhus chinensis* components have potent antiviral, antibacterial, anticancer, hepatoprotective, antidiarrheal, and antioxidant properties. Additionally, substances extracted from *Rhus chinensis* stem dramatically reduced HIV-1 activity in vitro[24]. *Zingiber officinale*

Table 3 — Categories of ailments and informant consensus factor (ICF) for each category

Sl. No.	Category	Ailments/Disorder	Abbreviation	ICF
1	Kidney diseases	Kidney stone	KD	1.00
2	Gastrointestinal related diseases	Gastritis, stomach pain/ache, gastric problems, abdominal pain, stomach ulcer, dyspepsia, constipation, purgative	GRD	0.44
3	Skin diseases	Skin inflammation, boils, burn, sun burn, ringworm, skin allergy, wound healing, eczema and itches, wart, sore, scabies	SD	0.76
4	Endocrine system related diseases	Menstrual disorder	ESRD	0.67
5	Respiratory tract diseases	Cold, cough, chest congestion, bronchitis, asthma, expectorant and sore throat	RTD	0.35
6	Skeletomuscular related disorders	Sprains, muscular pains, rheumatism and arthritis	KRD	0.56
7	Cardiovascular system diseases	Hypertension, lowers blood pressure, high blood pressure, heart problem, chest congestion	CSD	0.33
8	General health	General weakness	GH	1.00
9	Hair care	Grain infusion, scalp care, tenderness of hairs and hair lotion	HC	0.50
10	Nervous system related diseases	Headache	NSRD	0.50
11	Infectious diseases	Intestinal worm infection, small pox and fever	ID	0.38
12	Hematological system diseases	Blood purifier	HSD	0.67
13	Urology system disorder	Diuretic, diuretic, kidney trouble and urinary complaints	USD	0.47
14	Immunomodulator	Energy booster	IM	0.67
15	Microbial diseases	Antihelmentic and vermifuge	MD	0.50
16	Oral care	Mouth freshner	OC	1.00
17	Hepatoprotective	Jaundice	HP	0.75
18	Magico religious	Repel negative energy	MR	0.00

is valued beyond its nutritional benefits. It is believed that the Indian and Chinese populations have used ginger as a tonic for over 5000 years[25]. Since ancient times, various traditional medicinal plants have been utilised to heal illnesses, and a large portion of this traditional knowledge is still present today. One of the therapeutic herb plants found across Asia is called *Oroxylum indicum* (beko plant). It is a versatile plant with reports of a wide range of pharmacological activity in practically every component of the plant, including effects that are anti-inflammatory, anti-cancer, antibacterial, anti-hyperglycemia, neurogenic, cardioprotective, and anti-adipogenesis[26]. In many countries, the recent growth in chronic diseases including cancer, diabetes, and heart disease, is primarily attributable. As a result, creating nourishing, practical foods created expressly for human health and well-being is becoming increasingly important[27-29].

For 80% of the world's population, using plant extracts as supplements has improved access to primary healthcare. Many plant extracts have been the subject of extensive research, and it is believed that the secondary metabolites found in plants may be able to treat a variety of diseases[30-32]. Historically, all peoples have venerated medicinal herbs as a source of life. Plants and plant-based natural products offer of various nutritional advantages, including high concentrations of vitamins, minerals, phenolics, fiber, antioxidants, and bioactive metabolites. This makes their consumption a crucial public health concern[33]. Many species of Lamiaceae, which have a global distribution and possess anti-inflammatory, anti-microbial, and antioxidant characteristics, are utilised in traditional remedies. These fragrant medicinal plants are used frequently in cooking. They are known to be rich in phenolic and volatile compounds as well as secondary metabolites with various biological functions, such as flavonoids, iridoids, terpenoids, and anthraquinones[34-42]. The Asteraceae family is frequently cited as having a high bioactive substance concentration, contributing to its widespread usage in medicine[43].

The area's locals are extremely familiar with plants with a high RFC value. These plants may serve as research starting points for future analyses of phytochemical profiling and for the developing of new drugs. To assess the growth of commercial yields, such plants should be subjected to additional pharmacological research. Higher FL values are used to classify plants as model plants that can be used in future ethnopharmacological studies. The traditional system of healthcare and treatment of ailments through herbal medicines has been deeply ingrained in Manipuri culture, with herbal remedies becoming integral to daily diets. This holistic approach may have contributed to a generally healthier population.

Conclusions

The present study allowed us to inventory the medicinal species used in the Senapati District, Manipur (north-east of India). Precious information gathered through our survey clearly showed that the local population has important knowledge, proved by the large number used and prepared in different ways to treat a wide range of ailments. To fully understand the potential of these species, it is imperative that we prioritize chemical profiling, preservation of this knowledge, and analysis of this heritage through rigorous documentation and scientific studies. The current ethnobotanical and pharmaceutical survey in this area could help preserve the world's cultural history while also gathering critical data to build a national database and enhance existing data. The findings of this study generally demonstrated that herbalists and the local population have important significant knowledge, as evidenced by the variety of species used to treat illnesses. This can be a valuable source for obtaining additional ethnobotanical and pharmacological data in this region and comparing how civilizations and traditions may affect the entire basin's herbal knowledge; this can also benefit science in many fields, including pharmacy, medicine, biology, and chemistry.

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Conflicts of Interest

There are no conflicts of interest associated with this work.

Author Contributions

TB, OSK, BNS, SS, SN, SL, BN, LD carried out the survey and documentation; DA provided support and guidance during the survey; TB, OSK and BNS conceptualized, methodology, data curation, formal analysis and drafted the manuscript; PKB, PKM and NS, edited and provided critical review of the manuscript. The final version was read and approved by all authors.

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Ethics Approval

A verbal approval was obtained from every informant as well as approval to get photographs, records, and videos following the code of ethics of the International Society of Ethnobotany.

Data Availability

The authour's declare that all the data supporting the findings of this study are available from the corresponding author upon reasonable request.

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