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Traditional healing practices of Pnar and War communities in West Jaintia Hills district of Meghalaya, Northeast India

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Pnar and War are the most predominant and oldest ethnic community in the West Jaintia Hills of Meghalaya; they have faith in the medicinal plants for their primary health care. Information about the ethnomedicinal uses of several plants was collected through interviews of the local respondents following the standard ethnomedicinal methods. Statistical tools, informant consensus factors (F_{IC}), and fidelity levels (FL) were used to analyze the importance of ethnomedicinal plants. The present investigation revealed 70 plant species belonging to 64 genera under 44 families were being used against different ailments, and were classified into 11 groups. The results of the F_{IC} value of blood related disease category had the greatest agreement (FIC=1.0), followed by urinogenetal disease (0.90), antidote (0.85), dermatological, fungal and bacterial infections (0.82). The highest FL values were gastrointestinal, parasitic and hepatobiliary (*Melastoma malabathricum*, 95.83%), followed by external injuries and bleeding (*Centella asiatica*, 94.11%), oral, dental and otorhinolaryngolgical problems (*Curcuma longa*, 91.66%).

Keywords: Ethnomedicine, F_{IC} value, FL level, Jaintia, Pnar and War, Traditional healers

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The word "Ethnomedicine" is used as a synonym for traditional medicine, which is concerned with the diseases, illness and addresses the health care seeking process by healing practices. Plants are being used in the traditional healthcare system since time immemorial, particularly in various tribal communities. It is well known that human beings are highly dependent on plants for food, shelter, cloth, and need medicines for curing different ailments. Human beings have familiarized themselves with plants and have been using them in different ways throughout the ages. The medicinal plants are considered to be of great importance among villagers or indigenous communities found in many developing countries like India. Due to the extreme variation in geographical and climatic conditions in the country, India has rich vegetation with a huge diversity of plants; and is placed in mega-biodiversity countries which harbor about 45,000 plant species, out of which more than 35,000 plant species have been claimed to possess medicinal properties and are being used in various cultures around the world for medicinal purposes[1]. The World Health Organization (WHO), in 1978, has estimated that about 80% of the populations of developing countries are dependent on traditional medicines, mostly pharma-neutraceuticals for their primary health care needs[2]. In India, 65% of the population is still dependent on ethno medicine in rural areas, which is the only source of their primary health care[3].

Hence, it is necessary to collect traditional indigenous knowledge (TIK) of tribal and rural communities in different parts of India before it's lost permanently. Recently various ethno botanical studies have been reported to unearth the knowledge from the various tribal groups of India[4]. Every indigenous community seems to hold their usual knowledge of plant remedies ranging from minor to chronic diseases. Such indigenous identity of the particular community is derived due to the immemorial association with their floral and faunal environment. This kind of association has led to the usage of plants for food, fodder and medicinal purpose[5]. Therefore, the present research aims to collect the knowledge of medicinal plants used by traditional healers of Pnar and War community of West Jaintia Hills,

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Meghalaya, which has helped us to assess the conservation status of the medicinal plants among these oldest ethnic communities in India.

Methodology

Study Site

West Jaintia Hills District is one of the 11 districts of the Meghalaya and part of Jaintia Kingdom known as Sutnga kingdom. It encompasses in 1693 sq. km area, located between 91°58′ E to 92°39′ E and 25°05′ N to 25°46′ N; surrounded by Assam (North & East), Bangladesh (South) and east Khasi hill district of Meghalaya from West (Fig. 1). The research area harbours plenty of floral species and is a habitat of many sacred groves in the state. Pnar and War are the two major communities of the district, both they are matrilineal society, belonging to the Austro-Asiatic language group[6]. Both Pnars and Wars have astounding similarities in culture and customs, but they do differ only in the dialect they speak. Pnars reside towards northern parts of the district up to Assam, while Wars reside towards the Southern parts of the district up to Bangladesh.

Terminology used

All the terminologies used are shown in Table 1.

Data Collection

Studies were carried out during the month of July 2017 to April 2018 in the different villages located in various parts of West Jaintia Hills. Ethnomedicinal information about several plants was recorded through interviews with the local respondents who had the TK. The respondents were aged people (>30 and <80) permanently residing in the study area, medical healers, mostly depend on forest produces and the peoples, who were willing to share their TK, gathered by virtue of experience and knowledge. The details of the plants, about their vernacular names, parts used, composition, and dosages, were recorded. During the survey, necessary specimens and photographs were collected to ensure proper species identification. The correct identification for scientific names was determined with the help of existing key books *viz*. Flora of Tripura[7,8]; Flora of Assam[9-12], and various e-floras. The identification was confirmed later with BSI, Shillong, Meghalaya. The herbarium specimens were made accordingly[13], and were later deposited

Table 1 — Categorization of characters and availability status of plant species

Category	Character
Common (C)	Species those are found frequently
Cultivated (CU)	Species those are cultivated (agricultural and ornamental plants)
Occasional (O)	Species those are found irregularly or infrequently
Rare (R)	Species those are rarely found in the wild
Very common (VC)	Species those are found in different ecosystem very frequently
Mixed Forest (MF)	Species those are found in a forest dominated by broad leaves trees
Pine Forest (PF)	Species those are found in a forest dominated by pine trees

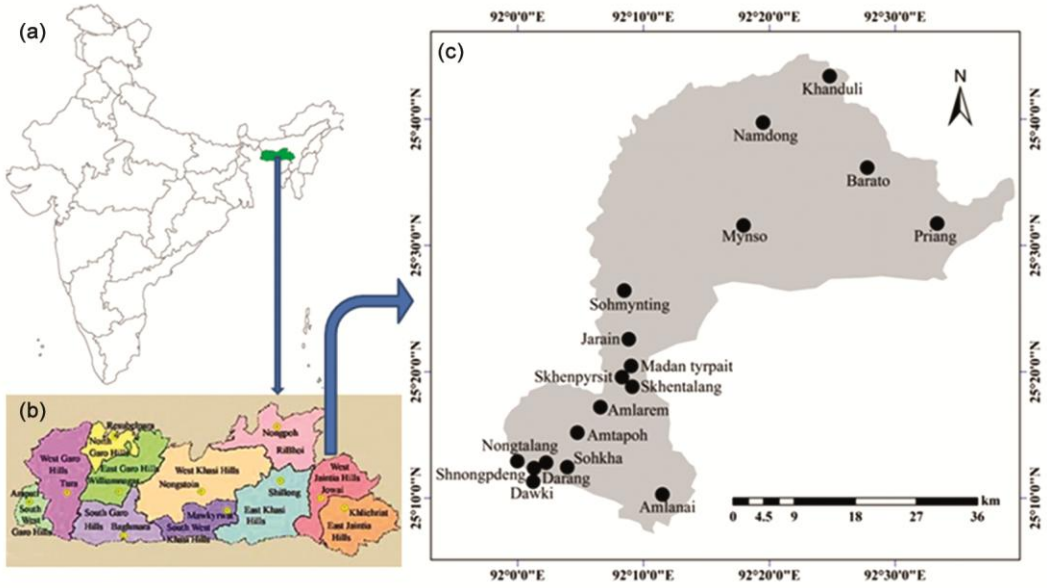

Fig. 1 — (a) Meghalaya in the state map of India; (b) District map of Meghalaya and (c) West Jaintia Hill district with visited sites.

in the Department of Forestry and Biodiversity for future reference.

Statistical analysis

The collected data were represented systematically in the MS Excel sheet. The information such as botanical name, local name, family, parts used, and ethno medicinal uses were attributed to each species.

Informants consensus factor (F_{IC})

Informant's consensus factor was calculated to find out the homogeneity in the information. The F_{IC} is calculated by the following formula[14]

$$F_{IC}=N_{ur}-N_t/ N_{ur}-1$$

where, N_{ur} is the number of use reported in a particular illness category by informants and N_t is the number of taxa or species used to treat that particular category by informants.

Fidelity level (FL) value

The fidelity level (FL), the percentage of informants claiming the use of certain plants for the same major purpose was calculated according to the following formula[15].

$$FL\ (\%) = I_p 100/I_u$$

where, $I_p$corresponds to the number of informants who independently suggested the use of multiple plant species for a particular disease and, I_u is the total number of informants mentioning the same plant for multiple diseases.

Results and Discussion

A total of 35 houses containing 207 informants in the age group of 30 to 80 years were interviewed during the field visit, comprised of 53.62% men and 46.38% of women (Table 2). The educational level of traditional healers interviewed during field visit revealed 53.62% illiterates, followed by 40.09%, 4.83% and 1.45% with primary, secondary and higher secondary education, respectively (Table 3).

Preferred mode of treatment

The results of investigation revealed that Pnar and War people are using all the modes of treatment for their ailments. 28.43% of the respondents reported that they were visiting allopathic doctor while 24% were visiting traditional healers and 18.62% were visiting both allopathic & traditional healers. About 6.86% of houses were visiting allopathic, homeopathic as well as traditional healer. Majority of the people who visited traditional healers and allopathic doctors both, mentioned that, they visit traditional healers for simple diseases and seek consultation of allopathic doctors in case of life-threatening diseases. Few respondents informed that whenever allopathic treatment fails to cure their ailment, they go to traditional healers for better treatment. It is worth mentioning that some people go to allopathic doctors or hospitals just for undergoing pathological tests like X-ray, CT-scan, etc. consequently, they go to traditional healers for the actual treatment of diseases *viz*. bone fracture and joint dislocation. While some have mentioned that, they preferred only traditional medicines as it was cheaper compared to allopathic medicines. It's a common belief amongst Pnar and War communities that cough, cold, fever, and headache are simple ailments that goes away within a short time by the use of traditional practice.

Habit of the plants

In the present study, it is revealed that about 70 plant species belonging to 64 genera comprising 44 families (Table 4) were used as ethnomedicine to cure various human ailments. The information on the ethnomedicinal plants used by the Pnar and War groups were arranged alphabetically with their family, genus and species (Table 5). Herbs were mostly used as ethnomedicine (51%) followed by shrubs (17%), trees (15.71%), climbers (5.71%), ferns and grasses (4.28%).

Table 2 — Age and gender distribution of traditional informant

Age group	Gender		Total respondents	Percentage
	Men	Women		
30-40	21	15	36	17.39
41-50	24	20	44	21.26
51-60	25	24	49	23.67
61-70	19	18	37	17.87
71-80	12	10	22	10.63
>80	10	9	19	9.18
Total	111	96	207	100%

Table 3 — Education level of the informants

Education level	No. of individuals	Percentage
Illiterate	111	53.62
Primary	83	40.09
Secondary	10	4.83
Higher secondary	3	1.45
College	-	
University	-	
Total	207	

Table 4 — Taxonomic diversity of recorded medicinal plants

Family	No. of genera	Percentage of genera	No. of species	Percentage
Anacardiaceae	1	1.42	1	1.42
Apiaceae	3	4.28	3	4.28
Apocynaceae	1	1.42	1	1.42
Araceae	1	1.42	1	1.42
Asparagaceae	2	2.85	2	2.85
Aspleniaceae	1	1.42	1	1.42
Asteraceae	5	7.14	5	7.14
Bromeliaceae	1	1.42	1	1.42
Caryophyllaceae	1	1.42	1	1.42
Commelinaceae	1	1.42	1	1.42
Crassulaceae	1	1.42	1	1.42
Cucurbitaceae	1	1.42	1	1.42
Cyatheaceae	1	1.42	1	1.42
Dryopteridaceae	1	1.42	1	1.42
Elaeagnaceae	1	1.42	1	1.42
Euphorbiaceae	2	2.85	2	2.85
Fabaceae	3	4.28	3	4.28
Gentianaceae	1	1.42	1	1.42
Lamiaceae	2	2.85	2	2.85
Lauraceae	1	1.42	1	1.42
Malaceae	1	1.42	1	1.42
Malvaceae	2	2.85	3	4.28
Melastomataceae	1	1.42	1	1.42
Moraceae	1	1.42	1	1.42
Musaceae	1	1.42	1	1.42
Myricaceae	1	1.42	1	1.42
Myrtaceae	1	1.42	1	1.42
Nephrolepidaceae	1	1.42	1	1.42
Orchidaceae	2	2.85	2	2.85
Phyllanthaceae	1	1.42	1	1.42
Phytolaccaceae	1	1.42	1	1.42
Pinaceae	1	1.42	1	1.42
Piperaceae	1	1.42	2	2.85
Plantaginaceae	1	1.42	1	1.42
Poaceae	2	2.85	2	2.85
Polygonaceae	3	4.28	3	4.28
Rosaceae	2	2.85	2	2.85
Rubiaceae	1	1.42	1	1.42
Rutaceae	1	1.42	1	1.42
Saururaceae	1	1.42	1	1.42
Solanaceae	2	2.85	3	4.28
Theaceae	1	1.42	1	1.42
Verbenaceae	1	1.42	1	1.42
Zingiberaceae	3	4.28	6	8.57
Total =44	64		70	

Availability status of the plants

Among the 70 medicinal plants recorded, 18 species were cultivated in home gardens, 14 species were commonly found neighbouring areas, and 10 species were found in mixed forest. In contrast, nine species were widely distributed in very common places like roadside and forest margins in wild state. Eight species were rarely found in the survey area. Six species were found occasionally, and five species were observed in pine forest.

Parts and uses of the plants

The data indicated that different parts were utilised for the treatment of various diseases with various mode of preparations (Table 6). The parts mostly used were leaves (20%), followed by leaves & stem (15.71%), stem (11.42%), rhizomes (10%), whole plant (10%), bark & fruit (2.85%), fruit and roots (2.85%). Other combinations *viz*. bark & leaves, bark & stems, leaves & roots, leaves & flowers, root & fruit, seed, stem & flower, and stem & roots were also used in few species.

Propagation method of the plants species

The data showed that propagation by seeds is the most prevalent mode (61.42%) followed by vegetative (31.42%) and seed & vegetative method (7.14%).

Informant`s consensus factor (F_{ic})

Informant's consensus analysis provided same assurance of reliability for the given claim of evidence. Medicinal plants used in treating different ailments were classified into 11 groups and F_{IC} values for each category was arranged (Table 7). The results of the F_{IC} showed that Blood related disease (1.00) had the greatest agreement with the F_{IC}, followed by Urinogenetal disease (0.90), Antidote (0.85), Dermatological, fungal and bacterial infection (0.82).

Fidelity level (FL value)

The diseases were recorded to highlight the most important plant species in each category. For this analysis, the plants mentioned once were not considered again. Fidelity level (FL) values were calculated for medicinal plants, which were mentioned by two or more informants for being used against a given ailment. It is found that the most important species, according to their fidelity level were Gastrointestinal, parasitic and hepatobiliary (*Melastoma malabathricum*; FL value 95.83%), followed by external injuries and bleeding (*Centella asiatica*, FL value 94.11%), Oral, dental and otorhinolaryngolgical problems (*Curcuma longa*, FL value 91.66%) etc. (Table 8).

Table 5 — Medicinal plants used by Pnar and War communities of West Jaintia hills district, Meghalaya

Plant name	Family	Local name	Habit	Availability status	Parts used	Propagation	Accession No.
Aegopodium podagraria L.	Apiaceae	Chera (P)	Herb	Common	Leaves	Seed/vegetative	FBD183
Alstonia scholaris (L.) R. Br.	Apocynaceae	N/A	Tree	Rare	Bark	Vegetative	FBD 203
Ananas comosus (L.) Merr.	Bromeliaceae	Sohmyntrooin (P)	Herb	Cultivated	Fruit, stem and leaves	Vegetative	FBD 201
Artemisia nilagirica (C.B. Clarke) Pamp.	Asteraceae	Jahinn (P)	Herb	Very common	Leaves	Seed	FBD 301
*Asparagus racemosus*Willd.	Asparagaceae	Krah-tyngkoh (W)/ TylleTyrkhang (P)	Herb	Rare	Tuber	Tuber	FBD103
Asplenium viviparum (L.f.) C. Presl	Aspleniaceae	Tyrkhangtharia (P)	Fern	Pine forest	Leaves	Seed	FBD 305
Bryophyllum pinnatum (Lam.) Oken	Crassulaceae	Syntu inn (P)	Herb	Rare	Leaves	Vegetative	FBD 308
Centella asiatica (L.) Urban	Apiaceae	Tyng-kheh (P)	Herb	Very common	Whole plant	Vegetative	FBD320
Cinnamomum javanicum Blume	Lauraceae	Dein-saruka (P)	Tree	Mixed forest	Bark	Seed	FBD 344
Citrus medica L.	Rutaceae	Sohraman (W/P)	Shrub	Cultivated	Fruit and leaves	Seed	FBD 249
Clerodendrum colebrookianum Walp.	Lamiaceae	Iaream (P)	Shrub	Occasional	Leaves and stem	Seed	FBD 222
Colocasia esculenta (L.) Schott	Araceae	Wang iong (P)	Herb	Cultivated	Stem	Rhizome	FBD 88
Commelina nudiflora L.	Commelinaceae	Phniangke (P)	Herb	Common	Leaves and stem	Seed	FBD 254
Curcuma longa L.	Zingiberaceae	Chyrmit (P/W)	Herb	Cultivated	Rhizome	Rhizome	FBD 135
Curcuma zedoaria (Christm.) Roscoe	Zingiberaceae	Syiniong (P/W)	Herb	Cultivated	Rhizome	Rhizome	FBD144
Cyathea medullaris (Fors. f)	Cyatheaceae	Tyrkhangheh (P)	Fern	Mixed forest	Leaves	Seed	FBD 288
Cymbidium aloifolium (L.) Sw.	Orchidaceae	Syntu inn (P)	Herb	Pine forest	Root	Seed/vegetative	FBD 167
Cynodon dactylon (L.) Pers.	Poaceae	Sain-tlape (P)	Grass	Very common	Leaves and stem	Vegetative	FBD 112
Datura arborea L.	Solanaceae	Duma blai (P)	Shrub	Common	Leaves	Vegetative	FBD 127
Dichrocephala integrifolia (L.f.) Kuntze	Asteraceae	Iaiurke (P/W)	Herb	Common	Leaves and stem	Seed	FBD 157
Docynia indica (Wall.) Decne.	Rosaceae	Deinsohptet (P)	Tree	Rare	Fruit	Seed	FBD 278
Drymaria cordata (L.) Willd	Caryophyllaceae	Phlangmooria (P/W)	Herb	Common	Leaves and stem	Seed/vegetative	FBD 279
Dryopteris filix-mas L. Schott	Dryopteridaceae	Tyrkhangjwat (P)	Fern	Common	Leaves	Seed	FBD 280
Duchesnea indica (Andrews) Th. Wolf	Rosaceae	Sohlatyab(P)	Herb	Common	Whole part	Seed	FBD 283
Elaeagnus umbellata Thunb.	Elaeagnaceae	Slachang (p)	Shrub	Pine forest	Bark and stem	Seed	FBD 291
Emilia sonchifolia (L.) DC	Asteraceae	Jalistiar (P)	Herb	Occasional	Leaves	Seed	FBD 303
Erythrina variegata Lam.	Fabaceae	Raksong (P)	Tree	Mixed forest	Bark and leaves	Seed	FBD 159
Eryngium foetidum L.	Apiaceae	Dhania (W)	Herb	Cultivated	Whole plant	Seed	FBD 128
Fagopyrum esculentum Moench	Polygonaceae	Jarain (P)	Herb	Very common	Leaves and stem	Seed/vegetative	FBD 285
Flemingia vestita Benth. ex Baker	Fabaceae	Saphlang/sohphlang (P)	Herb	Cultivated	Rhizome	Rhizome	FBD 248

(*Contd*.)

Table 5 — Medicinal plants used by Pnar and War communities of West Jaintia hills district, Meghalaya (*Contd*.)

Plant name	Family	Local name	Habit	Availability status	Parts used	Propagation	Accession No.
Galinsoga parviflora Cav.	Asteraceae	Myngngai (P)	Herb	Very common	Leaves and stem	Seed	FBD 331
Gynura cusimbua (Roxb. ex Willd)	Asteraceae	Jali-khim (P)	Herb	Common	Leaves and stem	Seed	FBD 334
Helenia elliptica D. Don	Gentianaceae	Phlang congress (P)	Herb	Rare	Whole plant	seed	FBD 335
Hibiscus rosa-sinensis L.	Malvaceae	Syntu-chulim(w)	Shrub	Common	Stem and flower	Vegetative	FBD 114
Houttuynia cordata Thunb.	Saururaceae	Myrdoh (P)	Herb	Very common	Whole plant	Seed	FBD 271
Jatropha curcas L.	Euphorbiaceae	Raskonbhoi (P)	Shrub	Occasional	Stem	Seed	FBD 188
Kaempferia galanga L.	Zingiberaceae	Syingsmoh (P)	Herb	Rare	Rhizome	Rhizome	FBD 198
Kaempferia rotunda L.	Zingiberaceae	Dawaithlen (W)	Herb	Mixed forest	Rhizome	Rhizome	FBD 199
Lantana camara L.	Verbenaceae	Syntulahari (P)	Shrub	Very common	Leaves and roots	Seed	FBD 200
Melastoma malabathricum L.	Melastomataceae	Dein-saludong (P/W)	Shrub	Common	Leaves and stem	Seed	FBD 72
Mimosa pudica L.	Fabaceae	Phlangkyrbait (P)	Herb	Occasional	Root And fruit	Seed	FBD 73
Morus alba L.	Moraceae	Soh-miaw(w)/soh-bliat (P)	Tree	Cultivated	Leaves	Vegetative	FBD 75
Musa sp. L.	Musaceae	Pachorladaw (P)	Tree	Cultivated	Stem	Rhizome	FBD 83
Myrica esculenta Buch.-Ham.ex. D. Don	Myricaceae	Saphai (P)	Tree	Mixed forest	Bark and fruit	Seed	FBD 146
Nephrolepis cordifolia (L.) K. Presl	Nephrolepidaceae	Tyrkhang-samen (P)	Fern	Mixed forest	Tuber	Tuber	FBD 255
Ophiopogon japonicus (L.f.) Ker Gawl.	Asparagaceae	Sohsimkhyndaw (P)	Grass	Rare	Leaves & root	Seed	FBD 256
Phyllanthus emblica L.	Phyllanthaceae	Sohmyrlain (W)	Tree	Cultivated	Bark	Seed	FBD 157
Phytolacca acinosa L.	Phytolaccaceae	Jada (P)	Herb	Occasional	Fruit and leaves	Seed	FBD 276
Pinus kesiya Royle ex. Gordon	Pinaceae	Deinkseh (p)	Tree	Pine forest	Stem	Seed	FBD 277
Piper betle L.	Piperaceae	Pathi (P/W)	Climber	Cultivated	Leaves	Vegetative	FBD 281
Piper longum L	Piperaceae	Pathi-chrieh (P)	Climber	Rare	Bark and fruit	Seed	FBD149
Plantago major L.	Plantaginaceae	Chkorblang (P)	Herb	Common	Leaves	Seed	FBD150
Polygonum hydropiper L.	Polygonaceae	Chiruswo (W)/ rasyin (P)	Herb	Very common	Leaves and stem	Seed	FBD197
Psidium guava L.	Myrtaceae	Deinsohpriam (P/W)	Tree	Cultivated	Stem	Seed, and vegetative	FBD139
Rhus chinensis Mill	Anacardiaceae	Dein-sama (P)	Shrub	Pine forest	Stem	Seed	FBD 311
Ricinus communis L.	Euphorbiaceae	Sla renda (P)	Shrub	Cultivated	Leaves	Seed	FBD 140
Rubia cordifolia L.	Rubiaceae	Tylle so (P)	Climber	Mixed forest	Whole plant	Seed	FBD 221
Rubus ellipticus Smith	Rosaceae	Sohchieh (P);krahshiah (W)	Shrub	Occasional	Stem and roots	Seed	FBD 247
Rumex nepalensis Sprengel	Polygonaceae	Sla rben (P)	Herb	Very common	Whole plant	Seed	FBD 251
Salvia splendens Sellow ex J.A Schultes	Lamiaceae	N/A	Herb	Cultivated	Leaves and flower	Seed	FBD 252

(*Contd*.)

Table 5 — Medicinal plants used by Pnar and War communities of West Jaintia hills district, Meghalaya (*Contd*.)

Plant name	Family	Local name	Habit	Availability status	Parts used	Propagation	Accession No.
Schima khasiana Dyer	Theaceae	Dein-chyrngan (P)	Tree	Mixed forest	Stem	Seed	FBD 253
Sida acuta Burm. f.	Malvaceae	Surobhoi (P/W)	Herb	Common	Leaves	Seed	FBD 174
Sida cordifolia L.	Malvaceae	Bamdohei (P/W)	Herb	Common	Leaves and stem	Seed	FBD 175
Solanum indicum L.	Solanaceae	Sohngang (P)	Shrub	Cultivated	Fruit	Seed	FBD 79
Solanum aculeatissimum Jacq.	Solanaceae	Chieh ait masi (P)	Herb	Common	Seed	Seed	FBD 80
Tainia elmeri Ames	Orchidaceae	Laliang (P)	Herb	Mixed forest	Tuber	Tuber	FBD 173
Thysanolaena maxima (Roxb.) Kuntze	Poaceae	Dein-suroiung (P)	Grass	Cultivated	Stem	Vegetative	FBD 244
Trichosanthes wallichiana L.	Cucurbitaceae	Slaroh (P)	Climber	Mixed forest	Root	Seed	FBD 245
Zingiber officinale Roscoe	Zingiberaceae	Syin-bam (P/W)	Herb	Cultivated	Rhizome	Rhizome	FBD 186
Zingiber zerumbet (L.) Roscoe ex Sm	Zingiberaceae	Syinblai (P/W)	Herb	Cultivated	Rhizome	Rhizome	FBD 187

P, Pnar; W, War.

Table 6 — Mode of preparation of doges

Plant name	Diseases	Mode of preparation of doges (Supportive literature)
Aegopodium podagraria	Anemia	The leaves of the plant are eaten raw as salad for the prevention of anaemia.
Alstonia scholaris	Dysentery, diarrhoea and malaria.	The bark of the tree is cooked and taken as soup twice a day to cure these diseases[16].
Ananas comosus	Stomach ache, digestive system, snake bite	The fruit of the plant is eaten raw as juice for promoting healthy digestive tract; the stem juice is used in stomach aches; the leaves are used in curing snake bite[17].
Artemisia nilagirica	Malaria, tonsil and headache.	The young boiled leaves are taken to prevent malaria and headache; the leaf paste is applied externally in the case of tonsil[18].
Asparagus racemosus	Tuberculosis	The soup of the tuber is taken twice a day with a half cup tea to prevent tuberculosis[19].
Asplenium viviparum	Pollen allergy (*Rhus succedanea*), skin diseases.	The whole plant is grounded, mixed with vegetable oil and applied externally to cure allergic skin rash.
Bryophyllum pinnatum	Urination problems eye sore and burn.	Boiled leaves of the plant are taken thrice daily to cure urination problem; fresh leaf juice is used to cure eyesore, and leaf paste is used to cure burns[20].
Centella asiatica	Thorns or woody get stuck in body and further infection	The plant, along with the Goat excreta and little salt, is made to paste, applied externally to the wound affected with thorns to prevent further infection.
Cinnamomum javanicum	Wound , broken bone	The bark paste is applied externally to the critical wound, cut, and broken bone.
Citrus medica	High fever and flu	The hot steam of boiled leaves is inhaled for speedy recovery of flu; the fruit juice of the plant taken orally and applied externally during high fever[21].
Clerodendrum colebrookianum	High blood pressure	The decoction of leaves is taken orally; one cup thrice a day is taken to prevent high blood pressure.
Colocasia sp.	Ear infection	Two to three drops of plant juice are applied two times a day to cure ear infection.
Commelina nudiflora	Swelling	The plant paste is applied externally to cure swelling.
Curcuma longa	Cough sore throat, skin diseases, furuncle/ carbuncles, nail infection.	One teaspoon of the powdered plant is taken along with sugar and water or honey to cure cough and sore throat; the fresh rhizome paste is applied externally to cure skin disease (furuncles/carbuncles and nail infection)[21].
Curcuma zedoaria	Stomach ache	The rhizome of the plant is taken as soup.
Cyathea medularis	Pollen allergy and skin disease.	The young leaves are fried in mustard oil and applied externally in allergy and skin diseases.

(*Contd*.)

Table 6 — Mode of preparation of doges (*Contd*.)

Plant name	Diseases	Mode of preparation of doges (Supportive literature)
Cymbidium aloifolium	Burns wound.	The root paste is applied externally to heal burns[22].
Cynodon dactylon	Dysentery, diarrhoea, carbuncle/furuncle	Boiled leaves and stems are taken orally thrice a day to cure dysentery and diarrhoea. The paste of stem and leaves are mixed with *Drymaria cordata* and *Datura arborea* leaves and applied externally to cure carbuncle/furuncle[21].
Datura arborea	Furuncles/Carbuncles gangrene.	The leaves, *Cynodon dactylon* and *Drymaria cordata* are paste together and applied externally to cure furuncles/carbuncles and gangrene.
Dichrocephala integrifolia	Cut, boils and skin diseases	The plant paste is mixed with a small amount of lime, applied externally to cure wounds, boils and skin infection[23].
Drymaria cordata	Skin disease, Furuncles/carbuncles, snake bite, wound.	The paste of leaves, along with *Cynodon dactylon* and *Datura arborea* is applied externally to cure skin disease (furuncles/ carbuncles), snake bite and wound[24].
Dryopteris filix-mas	Scorpion, insect poisonous sting and ring worm.	The leaf paste is applied externally in scorpion &insect bites. The leaves are partially burned and ground with mustard oil and applied externally for ringworm[25].
Duchesnea indica	Snake bite, boils	The leaf paste is applied externally to cure snake bites and boils.
Docynia indica	Indigestion	The fruit powder is taken two to three times a day to improve digestion.
Eleagnus umbellate	Food allergy (nettle rash), cough	The leaf paste is applied on the body to cure food allergy. The bark is taken with ginger as soup with half cup of tea daily to cure cough[26].
Emilia sonchifolia	High fever, asthma, jaundice	The raw leaves are eaten for prevention of high fever; 50ml leaf juice for three days is taken in empty stomach to cure asthma and jaundice[27].
Erithrina indica	Broken bone and muscular pain.	The leaves and bark paste is applied externally to join broken bone[28].
Erygium foetidum	Malaria, head ache	Two-three teaspoons of plant juice are applied externally to cure high fever and headache[29].
Fagopyrum esculentum	Insect bite and caterpillar sting infection, high blood pressure, eye and ear complaints.	The plant paste is applied externally to cure insect bite. The juice of the plant used to prevent high blood pressure[30].
Flemingia vestita	Deform	Two or three teaspoon bark powder is mixed with 100ml of water; one or two teaspoon is given to children and 50ml to the adults[31].
Gynuracus imbua	Wound and woody or thorn gets stock inside the body.	The leaves, along with the *Centella asiatica*, goat excreta, and small amount of salt are made a paste, applied to wounds inflicted with thorns to prevent further infection[32].
Galinsoga parviflora	Wound	The paste of leaves and stem are applied externally to stop bleeding[21].
Helenia elliptica	Coughing, asthma	Leaves and stems are taken as soup thrice daily to cure cough and asthma[33].
Hibiscus rosa-sinensis	Dysentery	One cup of juice of shoots and flowers is taken thrice daily to cure dysentery[17].
Houttuynia cordata	Respiratory tract problem, inflammation of urinary tract, snake bite, skin disorder	The whole plant or decoction is taken to cure respiratory tract problems and inflammation of the urinary tract, externally used for snakebite and skin disorder[34].
Jatropha curcas	Skin diseases, parasitic infection	The latex of the plant is mixed with coconut oil and applied externally to cure skin diseases, also used to cure parasitic infection on livestock.
Kaempferia galangal	Cough and chest complain	50 ml of decoction of the tuber is taken thrice daily to cure cough and chest complaints.
Kaempferia rotunda	Swelling	The juice of the plant is applied externally to cure inflammation.
Lantana camara	Malaria and inflammation of skin	50ml decoction of the root is taken thrice daily to cure malaria; leaf paste is mixed with mustard oil and applied externally to cure skin inflammation[35].
Melastoma malabathricum	Dysentery, diarrhoea and wound	Shoot soup is taken thrice daily to cure dysentery and diarrhoea; leaf paste is applied to stop bleeding.
Mimosa pudica	Skin diseases	The leaf paste is mixed with a small amount of lime and applied externally to cure skin diseases[36].

(*Contd*.)

Table 6 — Mode of preparation of doges (*Contd*.)

Plant name	Diseases	Mode of preparation of doges (Supportive literature)
Morus alba	Rash	The paste of young leaves is applied to stop rashes.
Musa sp.	Mouth sore and ulcer, burns.	The juice of the tree trunk is applied in mouth sore and ulcer. The leaves are used in skin burns[37].
Myrica esculenta	Rash ,diarrhoea and dysentery	The bark paste is applied externally to cure rashes; juice of the fruit is used to cure diarrhoea[38].
Nephrolepis cordifolia	Urination problem and cough	The tuber is taken a day thrice to control urination problems and cough[39].
Ophiopogon japonicus	Snake bite	Paste of the whole plant is applied externally to cure snake bite.
Phyllathus emblica	Colic, indigestion	Half or one teaspoon of bark decoction twice a day is taken to cure colic, whereas one or halfcup with tea for indigestion[17].
Phytolacca acinosa	Rash and boil	Paste of the plant is applied externally to cure rash and boil[40].
Pinus kesiya	Gum infection, feet crack	Fresh resin of stem is applied to strengthen both gums and teeth, applied to cure cracked heels.
Piper betle	Cellulitis	The leaves are grounded with areca nut, tobacco, and a small amount of lime, applied externally to cure cellulite.
Piper longum	Asthma and chest complaints	The decoction of the fruit and bark is taken twice a day to cure asthma and chest complaints.
Plantago major	Snake bike, boils, skin disease	The leaf paste is applied externally to cure snake bite, boils, and skin diseases.
Polygonum hydropiper	Skin disease (rash), ring worm	The leaf paste is applied to the infected area[21].
Psidium guajava	Dysentery and diarrhoea	Half cup of lukewarm decoction of the shoot is taken two times daily.
Rhus chinensis	Dysentery	Shoots of the plant are cooked and taken orally thrice a day[38].
Ricinus communis	Broken bone, bone dislocation, join and muscular pain, constipation	The leaves of the plant are soaked in hot water, and used for massaging broken bones, bone dislocation and muscular pain. The leaves are grounded with *Piper betle*, *Areca nut*, *Alliumcepa*, *Allium sativum* mixed with mustard oil, and applied externally to cure constipation.
Rubia cordifolia	Abdominal pain, insect sting and skin infection	Half or one teaspoon of the boiled bark is taken twice a day to cure abdominal pain after parturition; leaf paste is used for skin and insect bite[41].
Rubus ellipticus	Dysentery, diarrhoea, rash and skin infection	Shoots and roots of the plant are cooked and taken orally thrice a day to cure dysentery; leaves are paste and applied externally to cure rash and skin infection[42].
Rumex nepalensis	Boil and carbuncle.	Paste of the plant is used externally to cure boil and carbuncle[21].
Salvia splendens	Sore throat, tonsil, diarrhoea	The leaves and flowers of the plant are boiled in water, and then the water is used as gargle for sore throat, and tonsil, the water is taken orally for diarrhoea; the leaves paste are apply externally for tonsil.
Schima khasiana	Stomach complaints	Shoots of the plant are cooked and take orally thrice a day to cure stomach complaints.
Sida acuta	Snake bite, cellulites, minor wound	Leaves are ground to make a paste and are used externally for the treatment of snakebite, cellulite, and minor wound[34].
Sida cordifolia	Gangrene, cellulites others skin infection, minor wound	The leaves of the plant are pasted and applied externally to the infected area to cure gangrene, cellulitis (skin infection), and minor wound[31].
Solanum indicum	Malaria and fever	The fruits of the plant are taken raw or fried along with a meal to prevent malaria and fever[19].
Solanum aculeatissinum	Tooth decay	The seeds of the plant are burnt and placed on the infected area[43].
Tainia elmeri	Burns	The tuber is ground to paste and is applied externally to cure burns.
Thysanolaena maxima	Eye injury	The juice of soft stem is used to cure eye injury and for removal of impurities from the eye, such as dust, sand, etc.
Trichosanthes wallichiana	Malaria	The cooked bulbs are eaten thrice daily for prevention and cure of malaria.
Zingiber officinale	Cough, asthma, sore mouth and throat, skin diseases, stomas ache, etc.	Decoction of rhizome is taken, eaten raw, or can be taken in mixture with honey to cure cough, asthma, and sore throat; the paste of rhizome is applied to skin diseases[44].
Zingiber zerumbet	High fever, headache, stomach, vomit, etc.	The paste of rhizome is applied externally on the forehead in case of high fever and headache; the decoction of the rhizome is taken in case of stomach ache and vomiting[45].

Table 7 — Informant's consensus factor (F_{IC}) by diseases category

Diseases category	Uses report (N_{ur})	Number of Taxa (N_t)	F_{IC}%.
Antidote	58	9	0.85
Blood related diseases.	5	1	1.00
Cardiovascular diseases	10	4	0.66
Dermatological, fungal and bacterial infection.	154	28	0.82
External injuries and bleeding	52	13	0.76
Gastrointestinal, parasitic and hepatobiliary.	73	24	0.68
Musculoskeletal and bone fracture.	12	3	0.81
Oral, dental and ENT	36	12	0.68
Others (fever, flu, cold, cough, malaria, headache).	80	14	0.83
Pulmonary diseases	28	6	0.78
Urinogenetal diseases	22	3	0.90

Table 8 — Fidelity level (FL) value of medicinal plants against a given ailment category

Medicinal plants	Therapeutic categories	I_p	I_u	FL %
Melastoma malabathricum	Gastrointestinal, parasitic and hepatobiliary	23	24	95.83
Nephrolepsis cordifolia	Urinogenetal diseases	16	18	88.88
Polygonum hydropiper	Dermatological, fungal and bacterial infection	11	13	84.61
Piper longum	Pulmonary diseases	10	13	76.92
Dichrocephala integrifolia	External injuries and bleeding	12	14	85.71
Ricinus communis	Musculoskeletal and bone fracture	15	18	83.33
Citrus medica	Others (fever, flu, cold, cough, malaria, headache).	9	10	90.00
Curcuma longa	Oral, dental and ENT	11	12	91.66
Drymaria cordata	Antidote	6	9	66.66
Cynodon dactylon	Gastrointestinal, parasitic and hepatobiliary	9	10	90.00
Bryophyllum pinnatum	Urinogenetal diseases	13	15	86.66
Cyathea medularis	Dermatological, fungal and bacterial infection	3	4	75.00
Fagopyrum esculentum	Cardiovascular diseases	8	11	72.72
Helenia elliptica	Pulmonary diseases	6	9	66.66
Centella asiatica	External injuries and bleeding	16	17	94.11
Cinnamomum javanicum	Musculoskeletal and bone fracture	4	7	57.14
Erygium foetidum	Others (fever, flu, cold, cough, malaria, headache).	6	7	85.71
Musa sp.	Oral, dental and ENT	10	13	76.92
Duchesnea indica	Antidote	4	6	66.66
Myrica esculenta	Gastrointestinal, parasitic and hepatobiliary	3	7	42.85
Datura arborea	Dermatological, fungal and bacterial infection	5	6	83.33
Gynura cusimbua	External injuries and bleeding	10	12	83.33
Salvia splendens	Others (fever, flu, cold, cough, malaria, headache).	3	7	42.85
Rubia cordifolia	Antidote	9	11	81.81

Conclusion

The present study showed that the two ethnic communities of West Jaintia Hills district of Meghalaya depend on a variety of plants to meet their requirements and to cure various diseases. Different plant parts are being used for medicinal preparation in different modes of administration, medicinal doses, as per their traditional beliefs. The selected plants with medicinal properties may be chemically investigated for isolation, characterization, identification of bioactive compounds which could be used for drug designing programme in the near future. This shall be a great contribution to pharmaceutical and herbal industries. Our findings revealed that human encroachment such as unscientific mining and quarry, shifting cultivation, unmanaged fuel wood collection and charcoal extraction, etc. has led to habitat loss of medicinal plants, and are the root causes of reduction of the biodiversity of medicinal plants. Appropriate awareness programs and conservation planning is essential to preserve the medicinal biodiversity in West Jaintia Hills district. To preserve these plants in natural habitat, it is crucial to introduce the alternative or modern agriculture to the people instead of primitive shifting cultivation. It is also essential to establish medicinal gardens for *ex-situ* conservation by mobilizing the local ethnic people. *In-situ* conservation will also help in restoring highly usable and depleting species by propagating, reintroducing, regular monitoring and evaluating processes.

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ASL and BD designed the work; ASL collected the field data; ASL wrote the manuscript consultation with BD; AD and CP helped in the identification of species and provide accession number and help in data analysis, AB helped in the manuscript correction.

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