Original Article:

Ethnobotanical Study on Medicinal Plants for Dermatological Disorders at Chittagong Hill Tracts, Bangladesh

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ABSTRACT

Background: Dermatological disorders affect people in all age groups and prevail all around the globe. In this regard, medicinal plants play a significant role as they are usually the first line of treatment in dermatological disorders. Because traditional healers in Bangladesh know little about the use of plants to treat different skin diseases, we carried out an ethnobotanical survey of medicinal plants in the Chittagong Hill Tracts (CHT) to explore the traditional uses for healing wounds and skin problems.

Objectives: This study aimed to list the plants employed as remedies against various dermatological disorders in CHT.

Methods: The survey was performed from January 2016 to December 2017 with fieldwork undertaken in CHT of Rangamati, Bandarban, and Khagrachari. Open-ended and semi-structured questionnaires were used for interviewing a total of 387 people comprising traditional healers, Ayurvedic/Unani drug manufacturers, and local inhabitants. A total of 56 plant species of 32 families were documented. The most frequently used plant parts were leaves. The majority of the species were shrub in nature, while paste represented their main mode of drug preparation. Most plants grew wild in forests, with some cultivated in homestead and gardens.

Results: There was remarkable diversity in the doses of different plant preparations for various treatments. The presence of identified active compounds can rationalize the conventional use of many plants to treat dermatological disorders in Bangladesh.

Conclusion: This documentation accounts for the preliminary information necessary to perform future phytochemical investigations and is vital for the conservation of these plants.

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Introduction

Herbal plants have long been used as medications in all cultures around the globe [1]. The use of Traditional Medicine (TM) has expanded globally during the last decade and continued to gain popularity. TM has been used not only in developing countries for primary health care of the poor but also in countries where conventional medicine is the predominant practice in the national health care system [2]. According to one study, about two-thirds of the world population relies on medicinal plants for treating a variety of illnesses [3, 4].

Despite being more effective than phytomedicines, synthetic drugs and antibiotics often come along with unavoidable side effects and high prices. Moreover, because of the historical and cultural biases prevailing among people, synthetic drugs still have limited usage in different parts of the world, especially in the rural areas of developing countries. Consequently, the researchers have accelerated their quest to explore new drugs from natural sources in recent years [5]. The study of medicinal plants and their traditional uses has increased during the last few decades in different parts of the world [6]. Plants are extensively being studied to identify the phytochemicals and lead compounds responsible for their pharmacological and therapeutic efficacy. In this regard, ethnobotanical surveys of medicinal plants have made essential contributions to the discovery and conservation of novel biological resources [7, 8].

Bangladesh is a country gifted with a rich plant diversity because of its various environmental conditions such as warm and humid climate and fertile alluvial land. About 6000 species of indigenous and naturalized plants grow in the country [9], among which more than 1000 species contain medicinally active chemical substances [10]. Chittagong Hill Tracts (CHT) is the only extensive hilly region of Bangladesh located in the southeastern part. Known as a land of splendid natural beauty with landscape, lakes, and rivers, the area has hills and cliffs covered with dense jungles of bamboo, shrubs, and creepers harboring an abundance of floral species [9]. The tribal and other native communities are mainly dependent on traditional medicinal healers for treating different ailments.

Local inhabitants hold a strong belief in the healing properties of herbal medicine. A large portion of the population are deprived of modern medical facilities. This condition has also contributed to their dependence on TM [11, 12]. Unfortunately, medicinal plants and the abundant knowledge associated with them are facing the risk of serious loss owing to aberrant climate, deforestation and other human-made hazards, and migrations of traditional medicinal healers to different jobs [13]. Besides, the knowledge of traditional therapeutic practice has been passed only verbally from one generation to the other [14], and the written documents are unavailable in most cases [15, 16].

Skin diseases are general disorders that affect people from all age groups and produce damages in various ways [17]. It is difficult to define skin diseases precisely since they include a wide range of different disorders. Their prevalence rates are influenced by nutrition, habits, genetics, and socioeconomic status of a particular community [18]. The growing proportion of dermatological diseases encountered in general practice causes a significant part of morbidity in children; however, little information is available about the frequency of specific skin diseases. Although the overall incidence rate of all diseases combined has decreased in general practice, the incidence rates of the bacterial, mycotic, and atopic skin diseases have increased [19].

Transmissible skin diseases are major public health problems in many developing countries like Bangladesh. Lack of proper hygiene and basic amenities, and especially the difficulty of traveling to distant health care facilities in hilly terrains, are the major risk factors of dermatological diseases [20]. Herbal plants are considered as the first line of treatment against skin disorders in many rural areas of Bangladesh. According to the literature, some ethnobotanical studies have already been performed on dermatological diseases in the country [21-25]. However, these studies have not covered the areas, which we have specifically focused on our research. Our research is the first to document the plants used for treating dermatological diseases in some particular hilly regions located in CHT of Bangladesh. Because of the diversity of dermatological disorders, we attempted to focus on those disorders which are found to be treated by the preparations of the documented plants in our survey. The most prominent disorders include boils, eczema, bruise, itching, sore on different areas of the body (such as mouth, throat, tongue, and foot), dandruff, acne, scabies, scurvy, chickenpox, measles, leprosy, and skin ulcer. Apart from documenting the plants, our study aimed to provide relevant information about the plants and their potential applications in novel drug discovery.

Materials and Methods

Study area

CHT, with an area of about 13184 km^2, is bordered by Myanmar to the southeast, the Tripura state of India to the north, Mizoram state of India to the east, and Chittagong district of Bangladesh to the west. It is situated between

21°25'N to 23°45'N and 91°54'E to 92°50'E [9, 26]. Tropical monsoon climate prevails in the region with an average annual rainfall of 2540 mm in the north and east, and 2540 mm to 3810 mm in the south and west. The hills soils, characterized by strongly acidic nature, are chiefly yellowish-brown to reddish-brown loams graded into broken shales, mottled sands or sandstones at varying depth. The vegetation type of the area falls under semi-evergreen (deciduous) and tropical evergreen forests. Along with natural vegetation, Jhum cultivation is practiced on the slopes of the hills. The main rivers are Karnafuli, Sangu, Feni, and Matamuhuri, which drain into the Bay of Bengal. According to the 1991 census, the area population is about 1.042 million dominated by Mongolian, Chakma, Tripura, Murong, and Magh tribes. The inhabitants mainly depend on the resources coming from the hilly areas [9]. The present ethnobotanical study was conducted in three districts of CHT: Rangamati, Bandarban, and Khagrachari. Figure 1 shows the different areas of data collection.

Sampling of informants

The ethnomedicinal survey was conducted between January 2016 to December 2017, and the aim was to cover at least five Kabiraj/Hakim/Unani/Ayurvedic practitioners in each area. In the districts where tribes live, we emphasized the fieldwork. Reputed Hakims and Ayurvedic drug manufacturers such as Hamdard, Ayurvedia Pharmacy, Shakti, Sadhana, and Kundeshwari, along with the experts in Unani and Ayurvedic Board were consulted, too. We also interviewed local people with practical or empirical knowledge on medicinal plants, and a total of 387 people were chosen for this purpose. The inhabitants with enough knowledge of local medicinal plants or involved in medical practice with plants for a long time were the ones selected for interviews. Besides, the age and gender of interviewees along with their educational background and experience on the use of traditional medicinal plants, were also taken into consideration. Ayurvedic and Unani medical practitioners usually have

Table 1. Demographic information of the informants

Variables	Categories	No.
Gender	Female	141
	Male	246
Age (y)	<20	19
	20-30	41
	30-40	58
	40-50	92
	50-60	133
	>60	44
Educational background	Illiterate	22
	Completed 5 years education	54
	Completed 8 years education	81
	Completed 10 years education	113
	Completed 12 years education	71
	Some undergraduate degree (16 years education)	34
	Graduate (Higher education)	12
Experience[a] (y)	<2	38
	2-5	73
	5-10	134
	10-20	97
	>20	45
Profession	Hakim	47
	Unani	32
	Ayurvedic	41
	Independent healer	140
	Other[b]	127

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[a] Related to treating people; [b] People who gained medicinal knowledge by themselves and generally involved in professions not relevant to medicine.

their formularies available in printed form. However, in this survey, the formularies were not enough as their authenticity could not always be confirmed. There could have been biased information, either intentionally put on by the practitioners, or based on local beliefs. This was another aspect where interviewing people with practical knowledge of medicinal plants and a long history of practice provided us with more reliable information.

Ethnomedicinal data collection

Verbal consent was obtained by the interviewer from each informant, ensuring that the objectives of the study were clearly explained to them. Most interviews were arranged by local people who were familiar with traditional healers and could communicate with native communities at the same time. Bengali, the official language of the country, was used for conducting interviews. Local bilingual translators helped during the communication with indigenous populations with different mother tongues.

The survey employed open-ended and semi-structured questionnaires [13], which included the following information: A. The local name; B. Plants part/s used; C. Source of plant material; D. The method of preparation; E. Solvent/adjuvant used; F. Mode of application; G. Dermatological and other medicinal uses; H. Voucher specimen number; and j. Dose and dosage forms. The scientific names, family names, habit, habitat, nature, relative abundance, and conservation status of plants were documented either upon consultation with Botanist Mr. Md. Manzur-ul-Kadir Mia, former Principal Scientific Officer and Curator of Bangladesh National Herbarium, Dhaka (DACB), or by the literature search. The voucher specimen of each plant was deposited in Bangladesh National Herbarium, Dhaka, and after consulting with Botanist Mr. Md. Manzur-ul-Kadir Mia, the accession numbers of the plants, were documented. The accession number of each plant is mentioned in its respective voucher specimen, and all voucher specimens are provided in the supplementary section (Supplementary Tables, Table S.1).

Books, research articles, and relevant web pages were also studied during the survey to collect data on phytochemical compounds of the plants as well as any reported toxicity studies. We also documented the compounds commonly found in the reported plant species.

Data analysis

The species of plants were listed in alphabetical order by their scientific name, family, local name, generic name, habit, habitat, geographical distribution, relative abundance, nature, plant parts used, mode of preparation, the solvent used and Frequency of Citation (FC) [21, 27]. The FC of the species of plants in this survey was evaluated using the following formula:

FC=Number of times a particular species was mentioned/ The total number of times that all species was mentioned× 100. Frequency distribution was calculated using the SPSS V. 19 [27].

The taxonomic identification of each plant was performed following the guidelines on the website http://www.tropicos.org/NameSearch.aspx and upon consultation with Botanist Mr. Md. Manzur-ul-Kadir Mia.

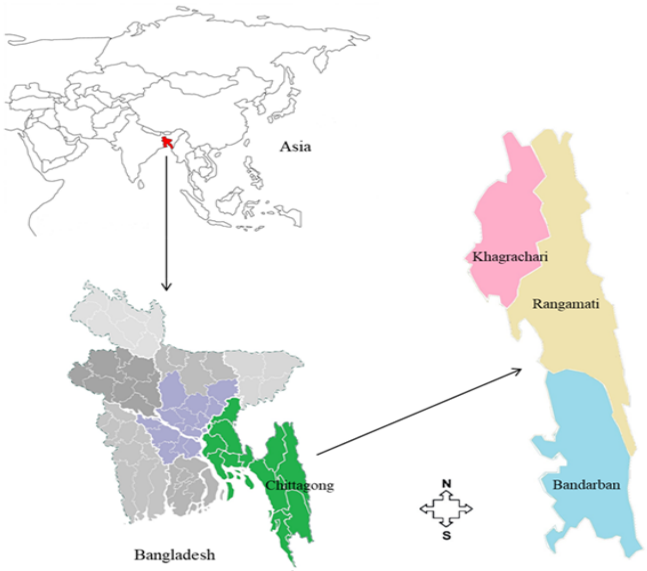

Figure 1. Location of the study area, Chittagong Hill Tracts, Bangladesh

Table 2. Therapeutic preparation of the available plants

Sl. No.	Scientific Name of the Plant	Prescription
1	*Aloe barbadensis* Mill.	A mucilaginous substance separated from the leaf of the plant is applied externally on the infected skin twice a day for 3 days. Also, musabber (dried mucilaginous substance of the leaves of the plant) can be used for the treatment of the disease.
2	*Anamirta cocculus* (L.) Wight & Arn.	An extract is made with the leaves of the plant by boiling in water. It is used for washing hairs twice a week until the disease is cured.
3	*Ardisia solanacea* Roxb.	An extract is made with the root-barks of the plant. It is used to wash the sore once a day for 4 days.
4	*Argyreia capitiformis* (Poir.) Ooststr.	A paste is made with the stems and leaves of the plant and used for having a hot bath once a day for 5 days. Fresh juice is extracted from the leaves of the plants. After warming, it is applied to the infected skin externally once a day until the disease is cured.
5	*Azadirachta indica* A. Juss.	Cottonseed-sized pills are made with the dried leaves of the plant. It is taken once a day (One pill each time) for 7 days. A decoction is made with the leaves of the plants by boiling with water (1:3 ratio) to reduce the quantity of the water into about 1/3 of its original volume. It is taken thrice a day (50 mL each time) for 7 days, after adding some sugar. An extract is made with the leaves of the plant by boiling with water. It is used or having hot bath once a day until the disease is cured.
6	*Buddleja asiatica Lour.*	An extract is made with the barks and leaves of the plants. A hot bath is advised to have once a day for 7 days until the disease is cured.
7	*Byttneria pilosa* Roxb.	A paste is made with the leaves of the plant. It is used for washing hairs once a day until the disease is cured. The paste is also made with the roots of the plant. Before washing, it is applied externally on the head. The medicine should be used for one week.
8	*Cassia occidentalis L.*	A decoction is made with the leaves and roots of the plants by boiling with water (1:3 ratio) to reduce the quantity of the water into about 1/3 of its original volume. Seeds are taken raw. It is used for having a hot bath once a day until the disease is cured.
9	*Cassia sophera L.*	A decoction is made with the leaves and roots of the plants through boiling with water (1:3 ratio) to reduce the quantity of the water into about 1/3 of its original volume. Seeds are taken raw. The decoction is taken thrice a day (50 mL each time) for 7 days, after adding some sugar.
10	*Cissus quadrangularis L.*	Fresh juice is extracted from the leaves of the plant. A paste is made with the shoots and stems of the plant. The juice is taken twice a day (200 mL each time) for 4 days.
11	*Clerodendrum viscosum Vent.*	An extract is made with the leaves of the plant by boiling with water. It is used for having a hot bath once a day until the disease is cured.
12	*Commelina erecta L.*	The fresh juice is extracted from the leaves of the plant, which is applied externally on the acne twice a day (1 to 2 drops each time) for 4 days. A paste is made with the leaves and stems of the plant, and it is applied to the infected face twice a day until the disease is cured.
13	*Crassocephalum crepidioides* (Benth.) S. Moore	Leaf paste of the plant is applied twice a day externally for 5 days on the mouth of the boils.
14	*Crotalaria pallida Aiton*	An extract is made with the seeds of the plants. It is advised to apply it externally to the infected site once a day until the disease cured.
15	*Croton caudatus Geiseler*	A paste is made with the leaves of the plant. It is applied externally on the boils once a time for 7 days. At the same time, an extract is also made with the leaves of the plant by boiling in water. It is taken thrice a day (100 mL each time) for 7 days.
16	*Cucumis melo L.*	The fresh juice is extracted from the fruits and seeds of the plant. The juice is taken twice a day (200 mL each time) for 4 days.
17	*Curcuma longa L.*	A paste is made with rhizome of the plant. After adding a little amount of mustard oil and warming in the sun, it is applied externally on the affected skin once a day until the disease is cured. The newly-made paste is advised to use every day.
18	*Dioscorea anguina* Roxb.	A paste is made with the leaves of plants. It is applied externally on the sore twice a day for 4 days.

Sl. No.	Scientific Name of the Plant	Prescription
19	*Diospyros blancoi A.* DC.	Fresh juice is extracted by squeezing the unripe fruits of the plants. The juice is taken twice a day (200 mL each time) for 3 days.
20	*Eclipta alba (L.)* Hassk.	A paste is made with the leaves and stems of the plant. It is applied externally on the affected skin for 7 days. Besides, fresh juice is also extracted from the stems and leaves of the plant by squeezing. It is taken thrice a day (5 mL each time) for 7 days.
21	*Entada rheedii* Spreng.	A paste is made with the leaves of the plants. It is applied externally on the infected skin twice a day until the disease is healed.
22	*Flemingia congesta* Roxb. ex W.T. Aiton	Fresh juice is extracted from the roots of the plants by squeezing. It is applied externally on the cutting wound twice a day for 2 days. A paste is made with the leaves and stems of the plant. It is applied externally on the boils once a day for 5 days.
23	*Holarrhena pubescens* Wall. ex G. Don	A paste is made with the seed of the plant and is applied externally on the infected skin twice a day until the disease is cured.
24	*Hyptis suaveolens (L.)* Poit.	A paste is made with the leaves of the plant. It is applied externally on the infected skin once a day for 5 days.
25	*Ichnocarpus frutescens (L.)* R. Br.	A decoction is made with the roots of the plants by boiling with water (1:3 ratio) to reduce the quantity of the water into about 1/3 of its original volume. It is applied externally on the infected skin twice a day until the disease is cured. A paste is made with the leaves of the plants. It is applied externally on the infected skin, after washing, twice a day for 3 days.
26	*Ixora acuminata* Roxb.	A paste is made with the leaves of the plant, which is applied externally on the wound twice a day for 3 days.
27	*Ixora athroantha* Bremek.	An extract is made with the barks and leaves of the plant by boiling in water. It is taken twice a day (200 mL each time) for 4 days. At the same time, it is used for taking a hot bath once a day for 3 days.
28	*Lagerstroemia speciosa (L.)* Pers.	A paste is made with the leaves of the plants. It is advised to apply externally to the infected site once a day until the disease cured.
29	*Lawsonia inermis L.*	Fresh juice is extracted from the leaves of the first plant by squeezing, and then it is mixed with the green fruit paste of the second plant. The paste is applied externally on the head-skin once a day until the disease is cured. Ten grams of the dried root powder of the plant is taken per day for 7 days, after adding little amount of salt and water.
30	*Leea indica (Burm. f.)* Merr.	The fresh juice is extracted from the leaves and roots of the plant by squeezing. About 10 mL of that juice is taken every day until the disease is cured.
31	*Melia azedarach L.*	An extract is made with the leaves of the plant. It is used in hair washing once a day for 7 consecutive days. A mixture is made with the dried bark powder of the plant, sugar and water. It is taken twice a day (10 mL each time) until the disease is cured.
32	*Mimosa pudica L.*	A paste is made with the roots, stems, and leaves of the plant. About 10 g of that paste is mixed in 200 mL of water. It is applied externally on the infected skin twice a day until the disease is cured.
33	*Mirabilis Jalapa L.*	An infusion is made with the leaves of the plant. At the same time, a paste is made with the roots of the plant. They are applied externally on the infected skin twice a day until the disease is cured.
34	*Musa paradisiaca L.*	Pea-sized pills are made with the roots and leaves of the plant. Those pills are advised to take one per day (one tablet each time) until the disease is cured.
35	*Mussaenda roxburghii Hook*. f.	A paste is made with the leaves of the plant. It is applied externally on the infected skin twice a day until the disease is cured.
36	*Ocimum americanum L.*	Fresh juice is extracted from the leaves of the plants by squeezing. It is taken twice a day (200 mL each time) for 4 days.
37	*Ocimum tenuiflorum L.*	A paste is made with the leaves of the plants. It is applied externally on the affected part of the body thrice a day for 2 days.
38	*Ophiorrhiza harrisiana* B. Heyne	Fresh juice is extracted from the barks of the plants by squeezing. It is taken thrice a day (5 mL each time) until the disease is cured.

Sl. No.	Scientific Name of the Plant	Prescription
39	*Peperomia pellucida (L.) Kunth*	A paste is made with the leaves and stems of the plant. It is applied externally on the infected skin twice a day until the disease is cured.
40	*Piper sylvaticum* Roxb.	An extract is made with the whole plant by boiling in water (1:10). It is used for having a hot bath once a day for 3 days.
41	*Plumbago indica L.*	A paste is made with the leaves of the plant. It is applied externally on the infected skin and kept there for 3 days. In the same way, the medicine should be used 6 times.
42	*Portulaca oleracea L.*	Fresh juice is made with the whole plant by boiling in water. It is advised to use for washing the infected skin twice a day for 4 days.
43	*Psychotria calocarpa* Kurz	An extract is made with the whole plant by boiling in water. It is advised to use it for washing the infected skin twice a day for 7 days.
44	*Pterocarpus santalinus L. f.*	Infusion and fresh juice are made from the stems of the plant by boiling in water. They are applied externally on the head-skin twice a day until the disease is cured.
45	*Rhynchotechum ellipticum* (Wall. ex D. Dietr.) A. DC.	The fresh juice is extracted from the roots of the plant by rubbing with a stone. It is taken thrice a day (5 mL each time) until the disease is cured.
46	*Rourea commutata*	Decoction and fresh juices are made with the root-barks of the plant. It is used to wash the sore once a day for 6 days.
47	*Sarchochlamys pulcherrima*	A paste is made with the leaves of the plant. After cleaning the skin, it is applied externally to the infected place twice a day until the disease is cured. The paste is also made with the leaves of the first plant and fruits of the second plant. It is applied externally on the wetted head and kept half an hour. Then the head is washed with soap and water. The procedure should be followed for consecutive 7 days.
48	*Saurauja roxburghii*	Fresh juice is extracted from the roots and leaves of the plant by squeezing. It is taken thrice a day (5 mL each time) until the disease is cured.
49	*Senna alata (L.)* Roxb.	A paste is made with the leaves of the plant. It is applied externally on the infected skin twice a day for 3 days. At the same time, a hot bath is advised to have once a day for 7 days with that extract.
50	*Sesamum indicum L.*	A paste is made with the leaves of the plants; it is used for washing hairs once a day until the disease is cured.
51	*Sida acuta Burm. f.*	The fresh juice is extracted from the roots of the plants by rubbing with a stone. It is applied externally on the boils thrice a day for 4 days and on the acne twice a day until the disease is cured.
52	*Solena amplexicaulis (Lam.)* Gandhi	Fomentation is given on infected skin, with the fresh leaves of the plant after heated on fire.
53	*Staurogyne argentea* Wall.	A paste is made with the leaves of the plants. After washing the infected skin, it is applied externally on the infected skin two times a day for 3 days.
54	*Synedrella nodiflora (L.)* Gaertn.	A paste is made with the leaves and stems of the plant. It is applied externally on the infected skin twice a day until the disease is cured.
55	*Zizyphus mauritiana* Lam.	An infusion is made with the fruits of the plant. At the same time, fresh juice is extracted from the stems of the plant by boiling in water. It is taken thrice a day (100 mL each time) for 7 days.
56	*Zizyphus oenoplia (L.)* Mill.	Fresh juice is extracted from the fruits of the plants by squeezing. It is taken thrice a day (5 mL each time) until the disease is cured.

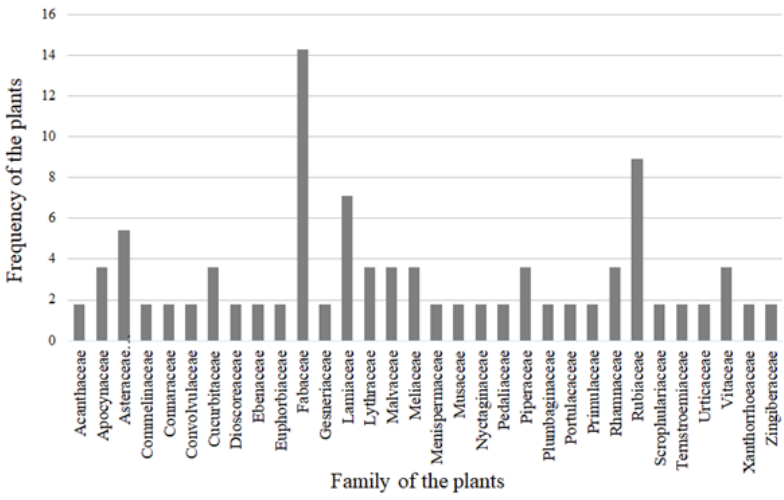

Figure 2. Family of the plants with their frequencies

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3. Results

Informants

Of 387 informants interviewed, the majority were male. Most of them were 50-60 years old, followed by informants aged 40-50 years. Nearly every interviewee was an independent healer and completed at least 10 years of education. Also, a substantial number of professional alternative medicine practitioners were interviewed. The majority of interviewees had 5-10 years of practical experience or empirical knowledge who were followed by people with 10-20 years and 2-5 years of experience (Table 1).

Plants used in the treatment of dermatological disorders and other relevant information

Among the 189 plants collected from 3 different districts, 56 species were used by the traditional healers to treat dermatological diseases in Bangladesh, and they belong to 32 different families. The most significant number of species belonged to the Fabaceae family (8 species), followed by Rubiaceae (5 species), Lamiaceae (4 species) and Asteraceae (Compositae) (3 species) (Figure 2). Different plant parts were reported to be used, among which leaves (33.9%) were the most frequently used ones. They were followed by leaves and root (10.7%), leaves and stems (7.1%), bark and leaves (5.4%) and the whole plant (5.4%). The dominant mode of preparation was paste (35.7%) fol-

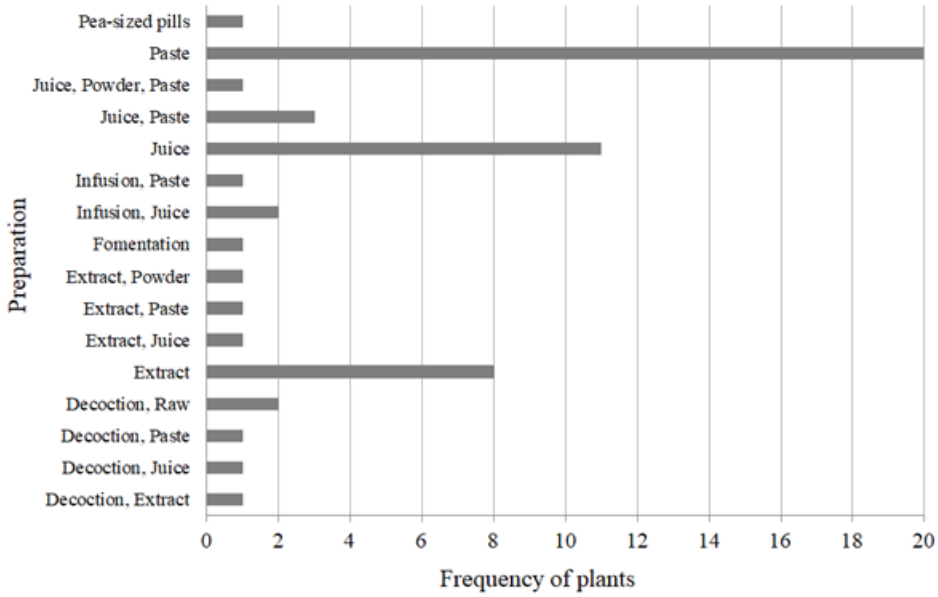

Figure 3. Preparations of plants used for treating dermatological disorders in Chittagong Hill Tracts, Bangladesh

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Table 3. Name of the plants similar to our findings used to treat dermatological disorders in other regions of the world

Sl. No.	Scientific Name of the Plant	Region	Medicinal Use Matching to Our Survey	Other Medicinal Uses	Reference
1	*Aloe barbadensis* Mill.	Jammu, Kashmir, and Ladakh, India	Abscess, burns, boils, wounds	Headache, gonorrhea, irregular periods, diabetes, vermicidal	[50]
2	*Anamirta cocculus* (L.) Wight & Arn.	Kurdish autonomous region, Iraq; Bali, Indonesia	Mastitis	Diarrhea, breast cancer	[50, 51]
3	*Ardisia solanacea* Roxb.	Central and Western Ghats, Karnataka, India	Itching	-	[52, 53]
4	*Azadirachta indica* A. Juss.	Nalbari district, Assam, India; South-western Nigeria; Bali, Indonesia	Acne, eczema, skin diseases, scabies, measles	Leucorrhea, fertility problem, diabetes, dental care, diuretic, gastrointestinal disorder, heartburn, malaria	[29, 54, 55]
5	*Buddleja asiatica Lour.*	Gallies Abbottabad, Northern Pakistan; Jammu and Kashmir, India	Superficial red color skin lesion	Asthma, coughing with blood	[5, 56]
6	*Cassia occidentalis L.*	China; Odisha, India	Ulcer, skin infections	Hepatitis, hyperlipidemia, stomachache, habitual constipation, acute conjunctivitis	[57, 58]
7	*Cissus quadrangularis L.*	Gabon; Northern Bengal, India	Antileishmanial, antifungal, anti-inflammatory, antimicrobial	Bone fracture, paralysis, leg pain	[59, 60]
8	*Clerodendrum viscosum Vent.*	Northern Bengal, India	Skin disease, boils	Stomach worm, stomach pain, tooth pain	[60]
9	*Commelina erecta L.*	Valley of Juruena region, Legal Amazon, Mato Grosso, Brazil	Ringworm, wound healing	Inflammation, cleanser, rheumatism	[61]
10	*Crassocephalum crepidioides* (Benth.) S. Moore	Batan Island, Philippines	Cut, wounds	Heartburn, indigestion	[62]
11	Crotalaria pallida Aiton	Northern Thailand; Tripura state of India	Ringworm	Kidney stone, urinary problem	[63, 64]
12	*Croton caudatus Geiseler*	Nagaland, India	-	Sinusitis, gastrointestinal problem, cancer	[65]
13	*Cucumis melo L.*	Kurdistan, Iraq; Albanian Alps, Kosovo	-	Prostate cancer, stomach pain, intestinal inflammation, colon problems, diabetes, diarrhea	[66, 67]
14	*Curcuma longa L.*	Papua New Guinea; Mato Grosso, Brazil; Rodrigues Island	Tropical ulcer, leprosy, measles, skin cancer, chickenpox, acne	Obesity, pneumonia, throat infection, asthma, bronchitis, heartache, thrombosis	[68-70]
15	*Eclipta alba (L.) Hassk.*	Mato Grosso, Brazil; Krabi and Songkhla provinces of Southern Thailand	Ulcer, wounds, bruises	Flatulence, colic, kidney problems	[61, 71]
16	*Holarrhena pubescens* Wall. ex G. Don	Guinea-Bissau; Chipinge district, Zimbabwe	-	Stomachache, venereal disease, amoebic dysentery, diarrhea, helminthic infections, hypotensive, toothache	[72, 73]

Sl. No.	Scientific Name of the Plant	Region	Medicinal Use Matching to Our Survey	Other Medicinal Uses	Reference
17	*Hyptis suaveolens (L.)* Poit.	Ogbomosho, Southwest Nigeria; Tripura, North East India	Allergy, skin diseases	Liver troubles, body pain, malaria	[74, 75]
18	*Ichnocarpus frutescens (L.)* R. Br.	West Bengal, India; Odisha, India	Treating sores in between fingers, nail disease, scabies	Piles, anorexia, burning sensation, fever	[58, 76]
19	*Ixora acuminata* Roxb.	Uttarakhand, India	-	Jaundice	[77]
20	*Lawsonia inermis L.*	Senegal; Western Sahara; Jammu, Kashmir, and Ladakh, India	Skin diseases, wound healing, itching, leucoderma	To dye and perfume hair, dye skin and nails, hemorrhages, antiphlogistic, toothache, urinary tract infection	[50, 78, 79]
21	*Leea indica (*Burm. f.) Merr.	Andaman and Nicobar Islands; West African countries	Buruli ulcer, skin injuries	Abdominal pain, diarrhea, dysentery, dysuria, bone fracture, pain in eye, snake bite	[80, 81]
22	*Melia azedarach L.*	Patriata, New Murree, Pakistan; Swat, North Pakistan; Maidan valley, Lower Dir, Pakistan	Boils, pimples, scabies, pustules, allergy, skin disease	Gastric trouble, fever with cough, anthelmintic, carminative, sexual tonic, night blindness, vomiting	[82-84]
23	*Mimosa pudica* L.	Northern Bengal, India	Wounds and swelling, reddening of the eye	Piles, infertility, dental pain, hydrocele, jaundice, placenta prolepses	[60]
24	*Mirabilis Jalapa L.*	Khyber Pakhtunkhwa, Pakistan; Northern Peru	Wound healing, discharging pus, abscess	Epilepsy, renal and hepatic ailments, Body-ache, eye inflammation	[6, 50]
25	*Musa paradisiaca L.*	Amazonia	Leishmaniasis	-	[85]
26	*Mussaenda roxburghii* Hook. f.	Assam, India	-	Post-natal care, jaundice	[86]
27	*Ocimum americanum L.*	Karnataka, India	Dandruff, dark pigmentation on skin	-	[53]
28	*Ocimum tenuiflorum L.*	Karnataka, India	Dermatitis	-	[53]
29	*Plumbago indica L.*	Karnataka, India	Eczema	-	[53]
30	*Portulaca oleracea L.*	Soan valley, Salt Range, Pakistan	Scabies, burns	Headache, piles	[3]
31	*Psychotria calocarpa* Kurz.	China and Thailand	-	Internal bleeding	[87]
32	*Pterocarpus santalinus L.* f.	Rwanda	Traditional cosmetics and skin-care herbal	-	[88]
33	*Senna alata (L.)* Roxb.	Guatemala and Nicaragua, Central America	Skin infections, rashes, sores	Diabetes, kidney and urinary complaints, hypertension	[89]
34	*Sida acuta* Burm. f.	The Ashanti region, Ghana; Songkhla and Krabi Province of Southern Thailand	Measles, rubella, shingles	Skin, breast, colorectal cancer	[90, 91]
35	*Solena amplexicaulis* (Lam.) Gandhi	Parbat district of Western Nepal	-	Menstrual disorder, earache	[92]
36	*Zizyphus mauritiana* Lam.	India	Hair-fall, dandruff	-	[93]

Table 4. Literature review of active phytochemicals of the studied plants

Sl. No.	Scientific Name	Active Compounds	Properties	Reference
1	*Aloe barbadensis* Mill.	Mannose-6-phosphate and anthraquinone	Wound healing and antibacterial	[94, 95]
2	*Ardisia solanacea* Roxb.	Bergenin	Antifungal	[41]
3	*Azadirachta indica* A. Juss.	Margolone, margolonone and isomargolonone	Antibacterial	[96, 97]
4	*Cassia sophera L.*	L-flavonol-C-glycoside, sennosides phyScion, and beta-sitosterol	Antioxidant	[98]
5	*Clerodendrum viscosum* Vent.	Alkaloids, tannins, reducing sugars, steroids and flavonoids	Antioxidant, antispasmodic	[99-101]
6	*Curcuma longa L.*	Turmeric oil	Inhibit dermatophytes and pathogenic molds, antifungal activity	[102]
7	*Holarrhena pubescens* Wall. ex G. Don	Steroid alkaloids	Antibacterial	[103]
8	*Lawsonia inermis L.*	1,5Diphenylpent-3-en-1-ynes and methyl naphthalene carboxylates; 2-hydroxy-1, 4-naphthoquinone	Anti-inflammatory and antifungal	[104-106]
9	*Leea indica* [Burm. f.] Merr.	Flavonoids, steroids	Antifungal	[107-109]
10	*Melia azedarach L.*	Meliacarpin, meliacin, hydroxycoumarins, beta-carboline alkaloids, monoterpenes, limonoids	Antiviral, antifungal, anti-inflammatory, antibacterial, antimicrobial and insecticidal	[110-118]
11	*Mimosa pudica L.*	Phenols	Wound healing	[119]
12	*Peperomia pellucida [L.]* Kunth	Essential oil and flavonoids	Against skin complications	[120]
13	*Saurauja roxburghii*	Ursolic acid derivatives	Cytotoxic	[121]
14	*Commelina erecta L.*	Antiamoebic and antiplasmodial compounds	Antiamoebic, antiplasmodial	[122]
15	*Crotalaria pallida* Aiton	Antimicrobial peptides	Antimicrobial	[123]
16	*Croton caudatus* Geiseler	Anticandidal compounds	Anticandidal	[124]
17	*Dioscorea anguina* Roxb.	Cardinolides	Nematocidal	[125]
18	*Diospyros blancoi A.* DC.	Terpenoids	Anti-inflammatory	[126]
19	*Holarrhena pubescens* Wall. ex G. Don	Steroids	Antibacterial	[103, 127]
20	*Lawsonia inermis L.*	Carboxylates	Anti-inflammatory	[105]

Sl. No.	Scientific Name	Active Compounds	Properties	Reference
21	*Mimosa pudica L.*	Flavonoids, phenol	Antibacterial, free radical scavenging activity, wound healing, neuroprotective	[119, 128]
22	*Piper sylvaticum* Roxb.	Alkamides	Antibacterial	[129]
23	*Senna alata [L.]*	Rhein	Anti-allergic activity	[130]
24	*Sesamum indicum L.*	Lignans	Antioxidant	[131]
25	*Sida acuta Burm. f.*	Saponins, tannins and anthraquinones	Antifungal and antibacterial activity	[132, 133]

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Table 5. Literature review of the surveyed plants with toxicity

Sl. No.	Scientific Name	Toxic Part	Toxic Compounds	Toxic Effects	Reference
1	*Aloe barbadensis* Mill.	-	Toxic carbohydrates and polyphenols	Antitumor, pesticidal, hepatotoxic	[134-136]
2	*Anamirta cocculus* (L.) Wight & Arn.	Berry	Picrotoxin	Poisonous	[46, 47]
3	*Azadirachta indica* A. Juss.	Seed	Azadirachtin	Encephalopathy, generalized seizures, ophthalmopathy, pesticidal, tachypnea, drowsiness, loss of consciousness, coma	[48, 49]
4	*Cassia occidentalis L.*	-	Pyrrolizidine alkaloid	Hepatotoxic	[137]
5	*Crotalaria pallida Aiton*	-	Pyrrolizidine alkaloid	Hepatotoxic	[138]
6	*Cucumis melo L.*	-	-	Allergic reactions	[139]
7	*Eclipta alba (L.) Hassk.*	-	-	Histopathological alterations in liver	[140]
8	*Hyptis suaveolens (L.)* Poit.	-	-	Toxic	[141]
9	*Lawsonia inermis L.*	-	-	Contact allergy and type-I hypersensitivity reactions, hemolysis	[142]
10	*Melia azedarach L.*	-	-	Gastrointestinal and CNS disturbances	[143]
11	*Senna alata (L.) Roxb.*	-	-	Genotoxic	[144]
12	*Sesamum indicum L.*	-	-	Toxic	[145]
13	*Zizyphus mauritiana Lam.*	-	-	Latex-fruit syndrome	[146]

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lowed by juice (19.6%) and extract (14.3%) (Figure 3). The solvents used for the preparations were water (53.6%), milk (19.6%), honey (16.1%), and wine (10.7%). The mode of administration was found to be topical (67.9%), oral (21.4%), and both topical and oral (10.7%). Among the reported species, 32.1% was shrub followed by herb (28.6%), and climber and tree (10.7% both). Of the plant species, 19.6%, 14.3% and 12.5% grow in the forest, homestead, hill forest and homestead, respectively. Significant portions also grow in the garden (8.9%) and marshy places (3.6%). Based on availability, the species are categorized as common (66.1%), less frequent (23.2%) and rare (10.7%). The majority of the plants are wild (66.1%); some are both cultivated and wild (17.9%) while others are only grown (16.1%). Figure S.1, Figure S.2, and Figure S.3 elaborate on the use of different solvents, mode of administration and nature of plants, respectively (supplementary figures). The doses of the available plants varied widely (Table 2).

Frequency of citation of the plants

The most cited species of plants were *Aloe barbadensis* Mill., *Azadirachta indica* A. Juss., *Commelina erecta L.*, *Flemingia congesta* Roxb. ex W.T. Aiton, *Ichnocarpus frutescens* (L.) R. Br., *Lawsonia inermis* L., *Melia azedarach* L., *Sarchochlamys pulcherrima*, and *Sida acuta* Burm. f. (Supplementary Tables, Table S.1).

Discussion

In the present investigation, Fabaceae was the most dominant family of plants. Being the second-largest family of medicinal plants, Fabaceae covers more than 490 plant species, the majority of which are applied in TM. The worldwide prevalence of a high number (approximately 20000) of species of trees, vines, shrubs, and herbs can also relate to the predominance of this family in our study [28]. Leaves were the major plant parts used against dermatological disorders either alone or mixed with other plant parts. Other previously conducted studies produced similar results [1, 13, 29-32]. The medicinal value of leaves is attributed to the presence of photosynthates, which make them the primary photosynthetic organs [32]. The ease of collection of leaves, compared to other parts of plants such as roots, fruits, and flowers, is another reason behind their widespread use [29, 33]. Fresh leaves are prepared as paste and applied to skin infections as reported in previous studies [34]. That is why paste is the main mode of preparation in our investigation. Shrubs, herbs, and trees were the most common habit of plants. This state could be attributed to the natural abundance of shrubs or herbaceous plants in this geographical area and their accessibility to the communities of local traditional healers [35, 36].

A comparative study between the cited plants of our research and those of other investigations revealed some noteworthy similarities. Of 56 species, 36 plants have been reported in the treatment of many dermatological problems in other countries such as India, Nepal, Pakistan, South America, etc. (Table 3). The use of the same plants in different communities of the world for similar purposes support the pharmacological efficacy of these plants. However, we did not categorize the medicinal uses of the plants in other communities. Few plants were found in different surveys that were used to treat a particular ailment, while for most of the other plants, the available information was minimal. Therefore, Table 3 lacks the informant consensus of the plants to determine the most widely used plants for a particular disease in that study region.

High FC values indicate the various and numerous medicinal properties of the plants, and thus, they demand further phytochemical, pharmacological, and toxicological analysis for the discovery of potential novel drugs. For instance, *Aloe barbadensis* Mill., and *Azadirachta indica* A. Juss., are popular market preparation of reputed pharmaceuticals mainly for their emollient and wound healing properties.

The majority of the plants reported in our study, apart from dermatological disorders, are used in many other diseases, which are listed in the supplementary section (Table S. 2). This trend is an indication of the tradition, as mentioned elsewhere, to develop a local healing system through trials and errors for ideal treatment practices [37, 38].

Several studies have been conducted to find the specific compounds responsible for the use of the reported plants to cure dermatological disorders. However, not all plant species in our study have been subjected to extensive phytochemical investigations. Carrying out a detailed phytochemical investigation in all plant species is a gigantic task and somewhat beyond the scope of the study. Nevertheless, based on the previous investigations, Table 4 has identified and listed the compounds behind the dermatological potential of several plants.

To explain the mode of action of all 56 reported plants individually is beyond our scope. Generalizing the mechanism of actions of all plants would not be rational either since it would result in the exclusion of lots of valuable information. Nonetheless, several studies have been carried out to underpin the role of these active compounds, which would validate their contribution to treating dermatological disorders. For instance, anthraquinone derivatives are known as antibacterial agents that, in particular, are highly effective against the gram-positive bacterium S. *aureus*. They can penetrate the bacterium by interacting with the

Table S.1. Other relevant information about the plants

Sl. No.	Scientific Name of the Plant	1Habit	2Habitat	3Nature	4Plants parts used	5Preparation	6Solvent/ Adjuvant	7Mode of Application	8Relative Abundance	9Conservation Status	10FC	Voucher Specimen
1	*Aloe barbadensis* Mill.	H	Hs	W	L	extract, J	W	T	Sy	C	3.20	NIS 05 (DACB)
2	*Anamirta cocculus* (L) Wight & Arn.	C	F, P	W	L	extract	W	T	Rm	C	1.81	NIS 247 (DACB)
3	*Ardisia solanacea* Roxb.	S	F	Cu	B, R	extract	W	T	K	C	2.10	NIS 161 (DACB)
4	*Argyreia capitiformis* (Poir.) Ooststr.	S	Hf	W	L, St	Pa	H	T	Cht	Lc	1.50	NIS 367 (DACB)
5	*Azadirachta indica* A. Juss.	T	F	Cu, W	L	cotton-seed-sized pills, D, extract	W	O, T	Sy	C	3.71	NIS 39 (DACB)
6	*Buddleja asiatica* Lour.	S, T	Hf	W	B, L	extract	Wi	T	B	Lc	1.58	NIS 209 (DACB)
7	*Byttneria pilosa Roxb.*	Wc	Hf	W	L, R	Pa	W	T	Rm	R	2.90	NIS 98 (DACB)
8	*Cassia occidentalis L.*	H	Hf, Hs	W	L, R, S	D, R	M	T	Sr	C	1.30	SRB 103 (DACB)
9	*Cassia sophera L.*	S	F, Rs, Wp	W	L, R, S	D, R	M	O	Su	C	1.50	NIS 141 (DACB)
10	*Cissus quadrangularis L.*	C	Hs	Cu	L, Sh, St	J, Pa	W	O	H	C	1.75	NIS 324 (DACB)
11	*Clerodendrum viscosum Vent.*	S, T	Hf, Hs	Cu	L	extract	W	T	Sr	C	1.64	NIS 92 (DACB)
12	*Commelina erecta L.*	H	F, Op	W	L, St	J, Pa	H	T	Cht	Lc	2.90	NIS 244 (DACB)

Sl. No.	Scientific Name of the Plant	1Habit	2Habitat	3Nature	4Plants parts used	5Preparation	6Solvent/ Adjuvant	7Mode of Application	8Relative Abundance	9Conservation Status	10FC	Voucher Specimen
13	*Crassocephalum crepidioides* (Benth.) S. Moore	H	F	W	L	Pa	M	T	Sh	C	1.66	NIS 128 (DACB)
14	*Crotalaria pallida* Aiton	H, S	Rs, Wp	Cu, W	S	extract	M	T	Sh	C	1.71	NIS 411 (DACB)
15	*Croton caudatus* Geiseler	S	Hs	W	L	extract, Pa	Wi	O, T	Su	Lc	1.48	NIS 42 (DACB)
16	Cucumis melo L.	C	Hs	Cu, W	Fr, S	J	Wi	O	Cht	Lc	1.30	NIS 94 (DACB)
17	*Curcuma longa L.*	H	Hs	Cu	Rh	Pa	W	T	Cb	C	1.50	NIS 158 (DACB)
18	*Dioscorea anguina* Roxb.	C	Hf, Hs	W	L	Pa	W	T	Sy	C	1.65	SRB 95 (DACB)
19	*Diospyros blancoi A.* DC.	C	Hf, Hs	W	Fr	J	W	O	Sy	C	1.50	SRB 129 (DACB)
20	*Eclipta alba (L.)* Hassk.	H	Wl	W	L, St	J	W	O, T	Rm	Lc	1.50	NIS 232 (DACB)
21	Entada rheedii Spreng.	H	F	W	L	Pa	M	T	B	Lc	1.50	NIS 102 (DACB)
22	*Flemingia congesta* Roxb. ex W.T. Aiton	S	Gl, Wl	W	L, R, St	J, Pa	Wi	T	K	C	3.13	NIS 281 (DACB)
23	*Holarrhena pubescens Wall.* ex G. Don	T	Hf	W	S	Pa	H	T	Su	R	1.53	NIS 442 (DACB)
24	*Hyptis suaveolens* (L.) Poit.	S	Hf, Hs	W	L	Pa	W	T	Cht	R	1.64	NIS 116 (DACB)

Sl. No.	Scientific Name of the Plant	1Habit	2Habitat	3Nature	4Plants parts used	5Preparation	6Solvent/ Adjuvant	7Mode of Application	8Relative Abundance	9Conservation Status	10FC	Voucher Specimen
25	*Ichnocarpus frutescens (L.) R. Br.*	C, S	Hf, Hs, Sc	W	L, R	D, Pa	W	T	Cht	C	3.55	SRB 425 (DACB)
26	*Ixora acuminata Roxb.*	S	Hs	W	L	Pa	M	T	Cht	Lc	1.21	SRB 322 (DACB)
27	*Ixora athroantha Bremek.*	S	Hs	W	B, L	extract	W	O, T	B	C	1.34	SRB 44 (DACB)
28	*Lagerstroemia speciosa (L.) Pers.*	S	F	Cu, W	L	Pa	W	T	B	C	1.67	SRB 419 (DACB)
29	*Lawsonia inermis L.*	S, T	F, Hs	Cu, W	Fr, L, R	J, P, Pa	W	O, T	Rm	C	2.95	SRB 373 (DACB)
30	*Leea indica (Burm.f.) Merr.*	S	G	W	L, R	J	H	O	K	C	1.50	SRB 105 (DACB)
31	*Melia azedarach L.*	T	F	Cu, W	B, L	extract, P	W	O, T	H	C	3.08	SRB 581 (DACB)
32	*Mimosa pudica L.*	H	Hf, Hs	Cu, W	L, R, St	Pa	W	T	Sr	C	1.50	NIS 168 (DACB)
33	*Mirabilis Jalapa L.*	H	F, G	Cu, W	L, R	I, Pa	Wi	T	Sy	C	1.84	NIS 273 (DACB)
34	*Musa paradisiaca L.*	T	Mp	Cu, W	L, R	pea-sized pills	W	O	H	C	0.92	NIS 342 (DACB)
35	*Mussaenda roxburghii Hook. f.*	S	F	W	L	Pa	W	T	H	Lc	1.26	NIS 19 (DACB)
36	*Ocimum americanum L.*	H	Hs	W	L	J	M	O	B	C	1.71	NIS 175 (DACB)

Sl. No.	Scientific Name of the Plant	1Habit	2Habitat	3Nature	4Plants parts used	5Preparation	6Solvent/ Adjuvant	7Mode of Application	8Relative Abundance	9Conservation Status	10FC	Voucher Specimen
37	*Ocimum tenuiflorum* L.	Ss	G	Cu	L	Pa	H	T	B	C	1.09	NIS 408 (DACB)
38	*Ophiorrhiza harrisiana B.* Heyne	H	Hf	W	B	J	H	O	Rm	Lc	1.61	NIS 113 (DACB)
39	*Peperomia pellucida* (L.) Kunth	H	Mp	W	R, St	Pa	W	T	Cht	Lc	1.79	NIS 364 (DACB)
40	*Piper sylvaticum* Roxb.	H	F	W	Wp	extract	W	T	Cht	C	1.93	NIS 279 (DACB)
41	*Plumbago indica L.*	S	Rs	Cu, W	L	Pa	W	T	Su	C	0.82	NIS 09 (DACB)
42	*Portulaca oleracea L.*	S	G, Rs, Wp	Cu	Wp	J	M	T	Su	R	1.63	SRB 517 (DACB)
43	*Psychotria calocarpa Kurz*	S	G	Cu	Wp	extract	M	T	Rm	R	1.27	SRB 180 (DACB)
44	*Pterocarpus santalinus L. f.*	T	F	W	St	I, J	H	T	Sy	C	0.75	SRB 348 (DACB)
45	*Rhynchotechum ellipticum* (Wall. ex D. Dietr.) A. DC.	Us	F, Hf	W	R	J	W	O	Rm	R	1.89	SRB 104 (DACB)
46	*Rourea commutata*	S	F, Sc	W	B, R	D, J	H	T	B	Lc	1.86	SRB 485 (DACB)
47	*Sarcochlamys pulcherrima*	Su	F	W	Fr, L	Pa	W	T	B	C	2.95	SRB 177 (DACB)
48	*Saurauja roxburghii*	T	F	W	L, R	J	Wi	O	Sh	C	1.48	SRB 511 (DACB)
49	*Senna alata (L.) Roxb.*	S	G	Cu	L	Pa	W	T	Cb	C	1.69	SRB 148 (DACB)
50	*Sesamum indicum L.*	H	G	Cu	L	Pa	W	T	Cht	C	0.83	NIS 389 (DACB)

Sl. No.	Scientific Name of the Plant	1Habit	2Habitat	3Nature	4Plants parts used	5Preparation	6Solvent/ Adjuvant	7Mode of Application	8Relative Abundance	9Conservation Status	10FC	Voucher Specimen
51	*Sida acuta Burm. f.*	Wh	Hf, Hs	W	R	J	H	T	Sy	Lc	3.14	NIS 576 (DACB)
52	*Solena amplexicaulis (Lam.) Gandhi*	C	F, P	W	L	Fo	M	T	Cht	C	1.35	NIS 99 (DACB)
53	*Staurogyne argentea Wall.*	H	H	W	L	Pa	W	T	Cb	C	1.68	NIS 135 (DACB)
54	*Synedrella nodiflora (L.) Gaertn.*	H	F, P	W	L, St	Pa	W	T	K	C	1.50	SRB 107 (DACB)
55	*Zizyphus mauritiana Lam.*	S	Gl	W	Fr, St	I, J	W	O	Sy	C	1.52	NIS 510 (DACB)
56	*Ziziphus oenoplia (L.) Mill.*	S	F, Rs	W	Fr	J	M	O	B	C	0.70	NIS 267 (DACB)

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Wh: Woody herb; C: Climber; S: Shrub; H: Herb; T: Tree; Wc: Woody climber; Us: Under shrub; Su: Succulent; Ss: Sub-shrub. 2Habitat: Hf: Hill Forest; HsS: SHomestead; Wp: Waste place; Rs: Roadside; G: Garden; F: Forest; Mp: Marshy place; Op: Open pinelands; P: Plain; Hs: Hilly slopes; Sc: Scrub; Wl: Woodland; GlS: SGrassland. 3Nature: Cu: Cultivated; W: Wild. 4Plants parts used: B: bark; LS: SLeaves; Fr: Fruit; R: Root; Rh: Rhizome; S: Seeds; Sh: Shoots; St: Stem; Wp: Whole plant. 5Preparation: D: Decoction; J: Juice; I: Infusion; R: Raw; PS: SPowder; Pa: Paste, Fo: Fomentation. 6Solvent/Adjuvant: M: Milk; H: Honey; WS: SWater, Wi: Wine. 7Mode of application: O: Oral; T: Topical. 8Relative Abundance: B: Bandarban; Cb: Cox's bazar; Cht: Chittagong hill tracts; H: Habiganj; KS: Khagrachori; Rm: Rangamati; Sh: Sherpur; Sr: Srimongal; Sy: Sylhet; SuS: SSundarbans. 9Conservation status: C: Common; Lc: Less Common; R: Rare. 10FC: Frequency of Citation.

Table S.2. The scientific name, dermatological applications and other medicinal uses of the plants

Sl. No	The Scientific Name of the Plant	Local/ Bangla Name	English Name	Family	Dermatological Applications	Other Medicinal Uses
1	*Aloe barbadensis* Mill.	Ghritokumari	Common Indian aloe	Xanthorrhoeaceae	Eczema, dullness of skin, facial paralysis	Asthma, cirrhosis, constipation, dehydration
2	*Anamirta cocculus* (L.) Wight & Arn.	Kabukbi fang	Crow's bane	Menispermaceae	Dandruff	Constipation, dysmenorrhea, fever, gout
3	*Ardisia solanacea Roxb.*	So kra pong	Shoebutton ardisia	Primulaceae	Skin sore, bruise	Diarrhea, dysmenorrhea, gout, mental disorder
4	*Argyreia capitiformis (Poir.) Ooststr.*	Bobu toring, Bhouto turing	-	Convolvulaceae	Boils, eczema	Bone fracture, epilepsy, fever, liver cancer

Sl. No	The Scientific Name of the Plant	Local/ Bangla Name	English Name	Family	Dermatological Applications	Other Medicinal Uses
5	*Azadirachta indica* A. Juss.	Neem gach, Tama gach	Indian lilac	Meliaceae	Boils, itching, scabies, skin diseases	Allergy, chest pain, gastric ulcer, jaundice
6	*Buddleja asiatica Lour*.	Dhubtora, ludi	White butterfly bush	Scrophulariaceae	Boils, skin disease	Cough, leucorrhea, mania inantum, rheumatism
7	*Byttneria pilosa Roxb.*	Choiloimrobang, Choloing paing	-	Malvaceae	Boils, dandruff, lice infestation	Rheumatalgia, snakebite, syphilis
8	*Cassia occidentalis L.*	Boro kalkeshande	Western senna	Fabaceae	Skin disease	Purgative
9	Cassia sophera L.	Kalkeshande	Senna sophera	Fabaceae	Skin disease	Purgative
10	Cissus quadrangularis L.	Hadjorha lata	Granadilla	Vitaceae	Scurvy	Stomachic, menstruation, fracture
11	*Clerodendrum viscosum Vent.*	Bhat gach	Glorybower, bagflower, and bleeding-heart	Lamiaceae	Itching, scabies	Anemia, cluster headache, diabetes, diarrhea
12	*Commelina erecta L.*	Woak kre, woak kry, Woak cri woak	Erect day flower	Commelinaceae	Acne, scabies	Otitis media, rheumatoid arthritis, weight loss
13	*Crassocephalum crepidioides* (Benth.) S. Moore	Dhub baishak	Ebolo, thickhead, redflower ragleaf, or fireweed	Asteraceae (Compositae)	Boils	Body pain, epilepsy, headache, tuberculosis
14	*Crotalaria pallida Aiton*	Shon phul	Rattlepods	Fabaceae	Boils, skin disease	Anemia, cold, cough, flatulence
15	*Croton caudatus Geiseler*	Ning nojja	-	Euphorbiaceae	Boils	
16	*Cucumis melo L.*	Photi	Muskmelon	Cucurbitaceae	Eczema	Diuretic
17	*Curcuma longa L.*	Kaji alid	Turmeric	Zingiberaceae	Eczema, scabies	Anal blister, bone discoloration, bone fracture, gonorrhea
18	*Dioscorea anguina Roxb.*	Mou alu	-	Dioscoreaceae	Skin sore	-
19	*Diospyros blancoi A.* DC.	Gab gach	Mabolo	Ebenaceae	Skin disease	-
20	*Eclipta alba (L.) Hassk*.	Kala sona	False daisy	Asteraceae (Compositae)	Boils, burning wound, foot mud sore, leprosy	Gout, irregular menstruation, pneumonia, vertigo

Sl. No	The Scientific Name of the Plant	Local/ Bangla Name	English Name	Family	Dermatological Applications	Other Medicinal Uses
21	*Entada rheedii Spreng.*	Giley ludi	Mackary bean, ladynut	Fabaceae	Skin ulcer (cancer)	-
22	*Flemingia congesta* Roxb. ex W.T. Aiton	Lahok woa rok, Ara lichu	-	Fabaceae	Boils, skin sore	Abdominal pain, bone fracture, epistaxis, food poisoning
23	*Holarrhena pubescens Wall. ex* G. Don	Baro tita	-	Apocynaceae	Leprosy, sore in the mouth	Abdominal pain, amoebic dysentery, gastric tumor, gastric ulcer
24	*Hyptis suaveolens (L.) Poit.*	Nang gri	Chinese mint, Mint weed	Lamiaceae	Itching	-
25	*Ichnocarpus frutescens (L.) R. Br.*	Dudhilata, Sikamchu aunty	Black Creeper	Apocynaceae	Skin disease, eczema	Bone fracture, dental caries, measles, lipoma (tumor), leucorrhea
26	*Ixora acuminata Roxb.*	Baro muiya	-	Rubiaceae	Boils, skin sore, scabies	Blood dysentery, epilepsy, fever, jaundice, painful micturition
27	*Ixora athroantha Bremek.*	Singi nuk mahagi	-	Rubiaceae	Boils, skin sore, scabies	Blood dysentery, epilepsy, fever, jaundice, painful micturition
28	*Lagerstroemia speciosa (L.) Pers.*	Jari phul	Queen of flowers, Pride of India	Lythraceae	Eczema	Abdominal pain, anemia, antenatal care, body pain
29	*Lawsonia inermis L.*	Mendi bofang, Pawai bofang	Henna, Jamaica mignonette	Lythraceae	Dandruff, skin disease, sore in the mouth, sore in the throat	General weakness, leucorrhea, spermaturia
30	*Leea indica (Burm. f.) Merr.*	Kurbakchara	Bandicoot Berry	Vitaceae	Boils, itching	Bone fracture, epilepsy, gastric tumor, gout
31	*Melia azedarach L.*	Ghora neem	-	Meliaceae	Skin disease, dandruff, lice infestation	Allergy, septic sore
32	*Mimosa pudica L.*	Chanachi	Sensitive plant	Fabaceae	Boils, measles, sore on breast	Amoebic dysentery, bronchitis, gastric tumor, gonorrhea

Sl. No	The Scientific Name of the Plant	Local/ Bangla Name	English Name	Family	Dermatological Applications	Other Medicinal Uses
33	*Mirabilis Jalapa L.*	Krisnakoli/Sanda malati	Four o'clock flower, Marvel of Peru	Nyctaginaceae	Boils	Purgative, aphrodisiac
34	*Musa paradisiaca L.*	Atta kola gach	-	Musaceae	Boils in rectum	Asthma, blood dysentery, diarrhea, lipoma (tumor)
35	*Mussaenda roxburghii Hook. f.*	Gach ranirak	-	Rubiaceae	Skin disease	Abdominal pain, bleeding, breast pain, cirrhosis, epilepsy, food poisoning
36	*Ocimum americanum L.*	Bontulsi	Hoary Basil, Rosary Basil	Lamiaceae	Skin disease	-
37	*Ocimum tenuiflorum L.*	Tulsi bofang	-	Lamiaceae	Chickenpox, measles, itching	Asthma, bronchitis, cold, cough, prickly heat, respiratory troubles
38	*Ophiorrhiza harrisiana B. Heyne*	Jariphul	-	Rubiaceae	Boils, bruise, sore on tongue, sore in the mouth	Chest pain, dysentery, epilepsy, febrile convulsion
39	*Peperomia pellucida (L.) Kunth*	Hangara giluk shak	Shiny bush	Piperaceae	Boils, eczema	Allergy, gastric tumor, headache, poisonous insect sting, snakebite
40	*Piper sylvaticum Roxb.*	Bhut pan	Mountain long pepper	Piperaceae	Boils	Abdominal pain, allergy, asthma, bronchitis
41	Plumbago indica L.	Aguni tida	Rosy-flowered leadwort	Plumbaginaceae	Leprosy	Abortion, body pain, diarrhea, dysentery, jaundice, piles, rheumatism
42	*Portulaca oleracea L.*	Noma	Common Purslane, Garden Purslane	Portulacaceae	Scurvy	Liver disease
43	*Psychotria calocarpa Kurz*	Mri rang khey	-	Rubiaceae	Itching, scabies	Allergy, paralysis, rheumatoid arthritis, rheumatism
44	*Pterocarpus santalinus L. f.*	Rakta chandan	Red Sanders, Red Sandalwood	Fabaceae	Boils	Astringent, tonic

Sl. No	The Scientific Name of the Plant	Local/ Bangla Name	English Name	Family	Dermatological Applications	Other Medicinal Uses
45	*Rhynchotechum ellipticum* (Wall. ex D. Dietr.) A. DC.	Chifai mang	-	Gesneriaceae	Boils	Cirrhosis, hoarseness, rheumatism
46	*Rourea commutata*	Anone lou chari/ Hrung mung	-	Connaraceae	Skin sore	-
47	*Sarchochlamys pulcherrima*	Chechsabing	Dogal tree	Urticaceae	Dandruff, eczema	Cutting wound, bone fracture, flatulence, jaundice, painful micturition, paralysis
48	*Saurauja roxburghii*	Panipuri gach	-	Ternstroemiaceae	Boils, eczema	Epilepsy, fever, gout, hydrocele, piles
49	*Senna alata (L.)* Roxb.	Dattalong	Ringworm shrub	Fabaceae	Skin disease	Goiter, hookworm infestation, ringworm
50	Sesamum indicum L.	Nahaing pang	Sesame	Pedaliaceae	Dandruff	-
51	*Sida acuta Burm. f.*	Predolulang, Wak khi peleh	Broom weed, spinyhead sida	Malvaceae	Acne, boils	Blister, carbuncle, hematuria, jaundice, painful micturition
52	*Solena amplexicaulis (Lam.) Gandhi*	Sejak shak	Clasping-stemmed Solena	Cucurbitaceae	Skin disease	Abdominal pain, asthma, belching, diabetes, epilepsy, flatulence, hysteria
53	*Staurogyne argentea Wall.*	Woanabalaai	-	Acanthaceae	Skin disease	-
54	*Synedrella nodiflora (L.) Gaertn.*	Heid ozon	Synedrella, Cinderella weed	Asteraceae (Compositae)	Eczema, foot mud sore	Vertigo
55	*Zizyphus mauritiana Lam.*	Borai	Jujube fruit tree	Rhamnaceae	Scabies, boils	Cooling, astringent
56	*Zizyphus oenoplia (L.) Mill.*	Shiakul, Bon	Jackal Jujube, Small-fruited Jujube	Rhamnaceae	Wound	Stomachic

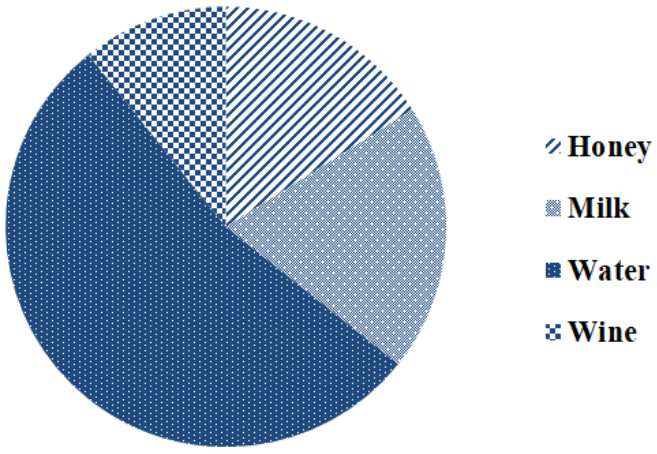

Figure S.1. Solvent/adjuvant used for the plants

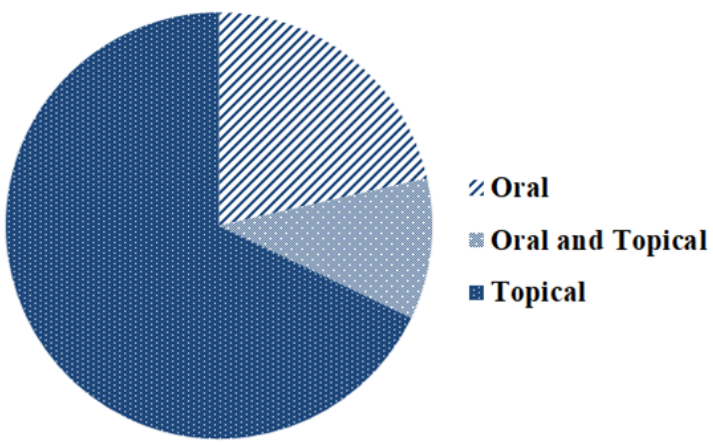

Figure S.2. Mode of application of plant

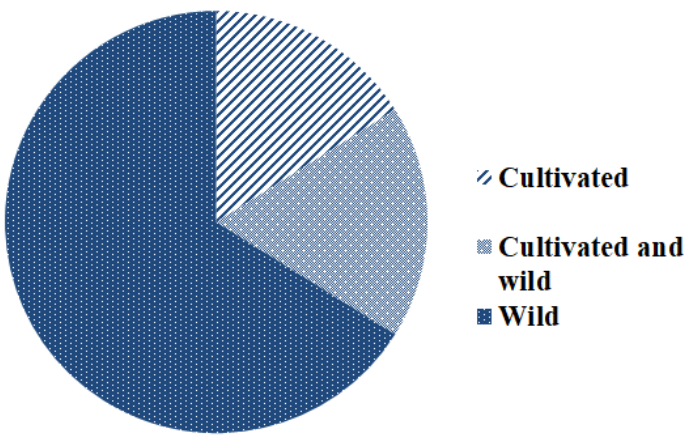

Figure S.3. Nature of plants used for treating dermatological disorders in Chittagong Hill Tracts, Bangladesh

cell membrane which ultimately results in the inhibition of the cell growth at its logarithmic phase [39]. Mannose-6-phosphate is responsible for the wound healing property of certain medicinal plants by inhibiting transforming growth factor-beta [40]. Besides, bergenin is one of the compounds accountable for antifungal action, which works by inhibition of spore germination [41]. However, alkaloids, tannins, and flavonoids are well-known antioxidants that work by inhibiting either the formation or the proliferation of free radicals. The increase of free radicals is blocked either by scavenging species that initiate peroxidation or chelating metal ions so that they are incapable of producing reactive species or decompose lipid peroxides [42, 43]. The anti-inflammatory property of hydroxycoumarins and terpenoids is due to the inhibition of interleukin-6 production [44] and modification of critical cell signaling pathways, respectively [45].

Through the literature study, 13 plant species have been found to possess potential toxic compounds (Table 5). Apart from picrotoxin and azadirachtin found respectively in the berries of *Anamirta cocculus* [46, 47] and seeds of *Azadirachta indica* [48, 49], the rest are toxic mainly due to high doses of ingestion.

Conclusion

The present inventory sheds light on the contribution and importance of the natural flora of Bangladesh in treating different dermatological disorders. The knowledge in this survey supports the potential development of novel plant-based medications. Preliminary studies in these medicinal plants have provided the basis of their pharmacological efficacy against dermatological disorders; however, further investigations are necessary for ensuring safe therapy concerning traditional medicinal plants.

Ethical Considerations

Compliance with ethical guidelines

The authors took verbal consent from all the traditional medicine practitioners and indigenous people for participating and providing the relevant information in this survey.

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Authors' contributions

Conceptualization: M.M.K. Mia; Methodology: M.M.K. Mia, Mohammad Fahim Kadir; Investigation: M.M.K. Mia, Md. Rafi Anwar, Nurul Islam Setu, Raunak Jahan; Writing-original draft: Shejuti Rahman Brishty, Mohammad Fahim Kadir; Writing-review & editing: Shejuti Rahman Brishty and Rabiul Islam; Resources: Shejuti Rahman Brishty, Rafi Anwar, Rabiul Islam, Nurul Islam Setu; Supervision: M.M.K. Mia, Mohammad Fahim Kadir, and Rabiul Islam.

Conflict of interest

The authors declared no conflict of interest.

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