

# Ethno-botanical study on medicinal plant species utilized by Marma community of Wagga Union in Rangamati Hill District, Bangladesh

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**Abstract.** Ray TK, Dutta S, Das S, Chakma K. 2024. *Ethno-botanical study on medicinal plant species utilized by Marma community of Wagga Union in Rangamati Hill District, Bangladesh. Asian J Ethnobiol 7: 105-114.* The utilization of medicinal plant species to cure various health-related ailments is a common practice among the ethnic communities of Bangladesh. This study, conducted in Wagga Union of Kaptai upazila, Rangamati hill district, Bangladesh, aimed to document indigenous traditional knowledge (ITK) regarding using ethnomedicinal plants to cure various diseases. The extensive field data collection and various established ethnobotanical survey methods revealed significant findings. The results recorded a total of 53 medicinal plant species belonging to 53 genera and 38 families from the study area, generally used to treat 51 diseases. The family most widely used in the context of the number of medicinal plant species is Asteraceae (9%), followed by Apocynaceae (7%), Amaranthaceae (6%), and Rubiaceae (6%). The research results revealed that leaves are the most widely used plant part (40%) utilized by the local Marma community to make herbal medicine, followed by the whole plant (17%) and roots (14%). The results showed that ethnomedicinal plants were most widely utilized to treat fever (13.21%) and jaundice (11.32%). This study emphasizes the significance of documenting the indigenous traditional knowledge (ITK) of sustainable natural resource management in biodiversity-rich forest areas, fostering a sense of responsibility and commitment.

**Keywords:** Bangladesh, ethnomedicine, indigenous traditional knowledge, Marma community, medicinal plants

## INTRODUCTION

Plants have been utilized for medicinal purposes long before prehistoric times (Ghani 2003). Medicinal plant species, generally used for traditional medicinal systems (e.g., Ayurveda, Unani, Folk medicine, etc.) along with numerous allopathic medicinal practices, play a significant role in the primary healthcare systems for the majority of rural people (Hamayun et al. 2003; Paul et al. 2019). The World Health Organization (WHO) estimated that more than 80% of people in the developing world rely on traditional medicine, and most medicines are directly derived from various plant species (Senthilkumar et al. 2013). Simultaneously, the acceptance and use of plant-based medicines are increasing globally (Tugume et al. 2016). The indigenous people of different countries living in nature have first-hand knowledge of plant benefits, including medicinal values. The indigenous communities gradually utilized plant species not only to treat various ailments but also as preventive measures against different ailments (Rahmatullah et al. 2011).

Additionally, several important modern pharmaceuticals have been derived from different plant parts used by indigenous communities, including antibiotics, anti-malarial drugs, cardio-tonic, sympathomimetic, and parasympathomimetic (Balick and Cox 1996). Historically, forest inhabitants and ethnic communities of developing countries like Bangladesh use medicinal plant species as herbal remedies from the ancient periods, and the

utilization of various medicinal plant species in rural Bangladesh is considered a traditional heritage (Rahmatullah et al. 2011; Paul et al. 2019). Ethnic people still depend on local medicinal plant species for the treatment of different diseases, and they have their own traditional medicinal practitioners, locally known as *Baidhya*, who process the parts of medicinal plant species for therapeutic as well as preventive purposes (Mohiuddin et al. 2012; Sarker et al. 2013). The knowledge of such healthcare uses has been going on for centuries from ancestors to offspring of the ethnic communities in verbal form by traditional herbal healers and elderly persons in their communities (Paul et al. 2019).

Several researchers (Kadir et al. 2012; Uddin 2014) reported that numerous ethnic communities (about 12) reside in the Chittagong Hill Tracts (CHTs) of Bangladesh. However, currently, the indigenous healthcare knowledge of the Marma community of Wagga Union, Kaptai Upazila, Bangladesh, is at great risk due to the existence of various external threats like allopaths, homeopaths, etc. Furthermore, ethno-medicinal knowledge and medicinal plant resources are depleting at an alarming rate nowadays due to the availability of modern medical facilities and other socio-economic factors. Recent research findings by Uddin et al. (2013), Faruque et al. (2019), and Islam et al. (2020) indicated, that social issues, urbanization, and modernization, the impact of advanced medication, the unwillingness of the younger generation toward traditional treatment systems, etc., are key reasons for the extinction

of the indigenous knowledge on medicinal plant utilization. Suppose the present trend of eroding status prevails; in that case, the valuable knowledge possessed by the indigenous Marma people on available medicinal plants will be lost forever without being properly recorded and documented (Uddin 2014; Paul et al. 2019). Few works have been found on ethnomedicinal plant species of Chittagong Hill Tracts, conducted by several researchers (Alam 1992; Rahman 1997; et al. 1998; Chakma et al. 2003; Uddin et al. 2004; Yusuf et al. 2002, 2005, 2006). Nevertheless, no inventory on focusing medicinal plant species of the Wagga Union of Kaptai Upazila, Rangamati Hill District, and their medicinal role in Marma Ethnics has been found.

Hence, an attempt has been made to comprehensively document the usage of medicinal plant species for the treatment of various diseases, as practiced by the indigenous practitioners of Marma community residing in Wagga Union of Kaptai Upazila, Rangamati Hill District, Bangladesh. The study was conducted to elucidate the distribution and abundance of medicinal plant species belonging to different families across the study area and conserve the endangered Marma-based ethno-medicines. The specific objective of this study was to determine the utilization pattern of medicinal plants and preparation approaches of herbal medicines by traditional herbal healers for curing numerous diseases across the study area. Simultaneously, the study dispensed several policy recommendations to conserve and sustain the ITK of the study area.

## MATERIALS AND METHODS

### Study area

The present investigation was carried out for about one year, from June 2021 to June 2022, at Wagga Union in Kaptai Upazila, Rangamati Hill District of Bangladesh. The Kaptai Upazila consists of 5 unions (i.e., Chandraghona, Chitmaram, Kaptai, Raikhali, and Wagga); 10 Mauzas; and 144 villages with an estimated population

of more than 66,000 people (BBS 2001). The region has a tropical climate with heavy rainfall intensified in the monsoon period (Feroz et al. 2014). Wagga Union is geographically located in the biodiversity-rich zone of Kaptai Upazila (Figure 1). The general features of the Wagga Union are expressed in Table 1.

### Experimental design of the study

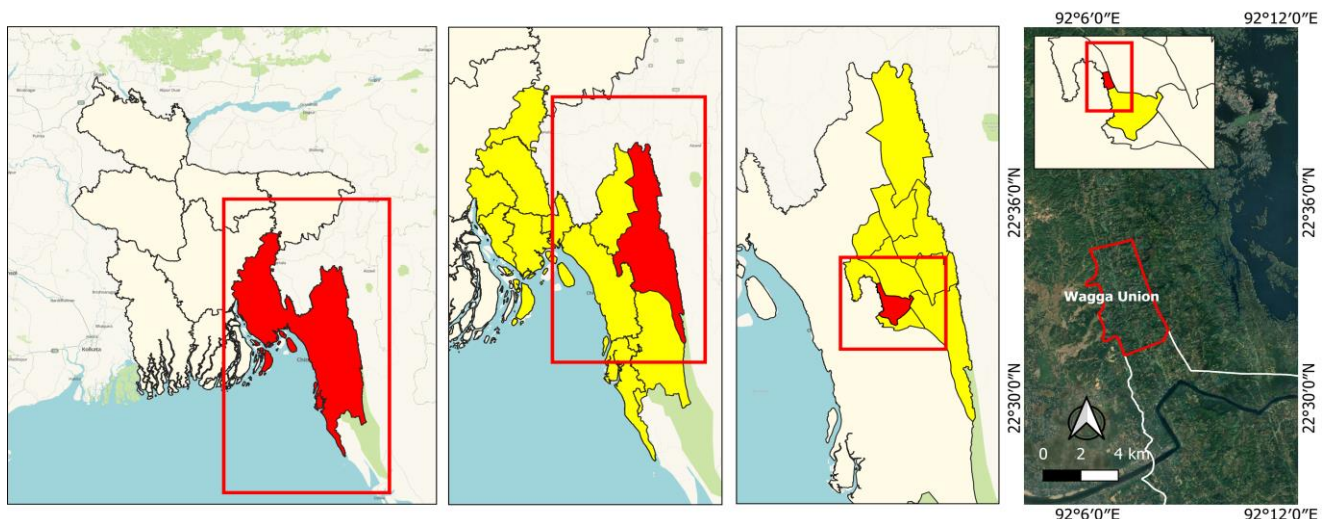
The experimental design of this study includes a reconnaissance survey (pre-fieldwork), the development of the questionnaire, the selection of the respondents (traditional herbal healers/herbalists) from the Marma community of the Wagga Union, extensive fieldwork, data collection, and compilation, and finally, data analysis and scientific representation of the key findings.

### Reconnaissance survey

Kukimara Marma para at Wagga Union of Kaptai Upazila, Rangamati Hill District, was selected for the investigation due to its geophysical location, accessibility, availability, and abundance of the desired communities. Before the main research, a reconnaissance survey/pre-fieldwork (field observation) was conducted in the study area to attain a general idea regarding the physiographic and overall conditions of the study site, with particular attention to ethnic majorities, species composition, the occurrence of medicinal species, and activities of herbal practitioners. Such observation provided a basis to carry out the in-depth principal investigation.

### Sampling design

A total of 8 field trips were conducted from June 2021 to June 2022 to determine the utilization pattern of different medicinal plant species among the residents of Wagga Union, Kaptai Upazila, Bangladesh. Considering their proximity and availability, traditional herbal healers were selected from the study area. The community and respondents were selected randomly using a random number table proposed by Nath et al. (2013).



**Figure 1.** Study area at Wagga Union in Kaptai Upazila, Rangamati Hill District of Bangladesh

**Table 1.** General features of the Wagga Union of Kaptai Upazila, Rangamati Hill District, Bangladesh

Parameters	Data	Sources
Geographic features		Chowdhury et al. (2020); BBS (2001); ULR (2021)
Area (acre)	12,160	
Latitude	22°21' and 22°35' North	
Longitude	92°05' and 92°18' East	
Average annual rainfall (mm)	2,653	
Soil type	Clay and sandy silt	
Demographic features		
Population	9,170	
Male (%)	52.4	
Female (%)	47.6	
Major ethnicity	Marma, Chakma, Thanchangya	
Minor ethnicity	Tripura, Murang, Khayang, Pankhoa	
Literacy rate (%)	43.93	
Income sources	Agriculture (41%), service (37%), commerce (12%), transport (2%), remittance and others (8%)	

### Data collection through interviews and Focus Group Discussions (FGDs)

Ethnomedicinal information about the study area was collected by applying different established ethnobotanical survey methods. A total of 25 herbal healers (locally called *baidya*) were selected randomly and then interviewed with a pretested semi-structured questionnaire to collect information on herbal treatments. The *baidyas* that been directly involved with the herbal treatment processes for a long time were selected for this survey. The interview schedule was designed to attain all relevant information regarding medicinal plant resources and their utilization in the study area. Information was collected on the mentioned local names of plants, uses, methods of uses, formulations, diseases for which the formulations were utilized, and dosages. Information was also collected on the season of plant collection, which plant parts were used, application of the processed medicines, etc.

### Data validation

Collected information was validated through five Focus Group Discussions (FGDs). Specifically, FGD was used in the clarification of information gathered. Each FGD consists of 7-8 (minimum) persons, including herbal healers, local community leaders (headmen), local villagers, resource collectors, members of the administrative unit, and resource-dependent persons. An interpreter who translated the Marma language (locally known as *Marama/Mraima*) into Bengali was involved in data collection and sharing. The authors identified the common plant samples in the field, and the unidentified species were preserved in the herbarium sheet and finally identified with the help of plant taxonomists. Voucher specimens were deposited in the herbarium of Bangladesh Forest Research Institute (BFRI), Chattogram, Bangladesh. Simultaneously, several types of literature, published articles, publications, institutional data, etc. checked out and reviewed as secondary data during the study.

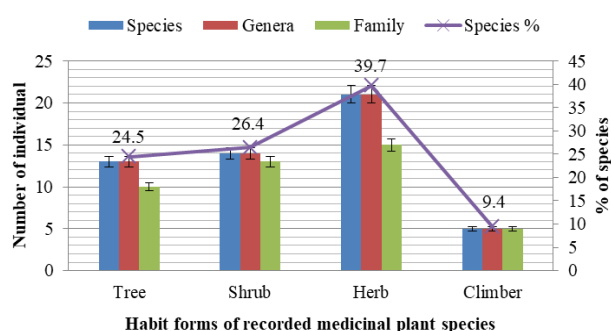
### Data analysis and representation of the findings

All the collected qualitative and quantitative data were gathered and sorted cautiously using spreadsheet software (Microsoft Excel, version MS 2010). Then, the sorted data was compiled and analyzed to obtain the desired findings. The final results of this study are expressed scientifically through tables, graphs, and pictures.

## RESULTS AND DISCUSSION

### Distribution of medicinal plant species recorded from the study area

The study enumerated a total of 53 medicinal plant species belonging to 53 genera from the study area, which are used in treating different ailments by the studied Marma community; the plants were distributed into 38 families. All the recorded medicinal plant species were categorized based on their habit form and classified under genus and family. Herb constitutes the major plant category (21 species) among the 53 medicinal plant species and occupies (39.7%) of all the recorded plants, followed by shrub (26.4%), tree (24.5%), and climber (9.4%). The distribution of medicinal plant species under four major vegetation types (habit forms) is shown in Figure 2.



**Figure 2.** Distribution of various medicinal plant species recorded from the study area

**Table 2.** Marma ethnic communities across the study area utilize medicinal plant species to treat different health-related ailments

Scientific name	Family	Vernacular/ Bengali name	Marma name	Habit	Plant parts used	Ailment
<i>Achyranthes aspera</i> L.	Amaranthaceae	<i>Apang</i>	<i>Nairahang creung</i>	Herb	Root	Abdominal pain
<i>Aerva sanguinolenta</i> (L.) Blume.	Amaranthaceae	<i>Bishallyakarani</i>	<i>She shan da</i>	Herb	Whole plant	Stomach pain
<i>Allophylus cobbe</i> (L.) Raeusch.	Sapindaceae	<i>Rakhalphul</i>	<i>Maygransi</i>	Shrub	Leaf	Joint pain, gout, paralysis
<i>Alpinia conchigera</i> Griff.	Zingiberaceae	<i>Konchi elachi, khetranga</i>	<i>Pada gru</i>	Herb	Rhizome	Gastric problem
<i>Alstonia scholaris</i> (L.) R. Br.	Apocynaceae	<i>Chhatim, chhatian</i>	<i>Chuinui pang, chai lang</i>	Tree	Bark	Joint pain, chronic diarrhea, dysentery, fever, earache
<i>Amaranthus spinosus</i> L.	Amaranthaceae	<i>Kantanotey, kantadenga</i>	<i>Mong gue pang</i>	Herb	Whole plant	Burning urination
<i>Anogeissus acuminata</i> Roxb. ex DC.	Combretaceae	<i>Chakwa, kanta koroï, itchri, hitchri</i>	<i>Samankhuum</i>	Tree	Leaf	Diarrhea, dysentery, anemia, toothache
<i>Blumea lacera</i> (Burm.f.) DC.	Asteraceae	<i>Kuksunga</i>	<i>Pongma</i>	Herb	Leaf, root	Toothache
<i>Bryophyllum pinnatum</i> (Lam.) Oken	Crassulaceae	<i>Patharkuchi</i>	<i>Wakhia pangboo</i>	Herb	Leaf	Asthma, gallstone, cough
<i>Buddleja asiatica</i> Lour	Buddlejaceae	<i>Budbhota, neemda, badbhota</i>	<i>Lulangbow</i>	Shrub	Leaf	Skin diseases
<i>Byttneria pilosa</i> Roxb.	Sterculiaceae	<i>Harbangha lota</i>	<i>Choloibri</i>	Climber	Leaf	Boils
<i>Clerodendrum viscosum</i> Vent.	Verbenaceae	<i>Ghetu, bhat</i>	<i>Khung prik chai</i>	Shrub	Whole plant	Boils
<i>Crinum latifolium</i> L.	Liliaceae	<i>Sukhdarshan</i>	<i>Kegaincrac scoain</i>	Herb	Tuber	Stomach pain
<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	<i>Swarnalata, algusi, halde algusi lata</i>	<i>Jirgo nuya</i>	Herb	Whole plant	Jaundice, intestinal worms
<i>Desmodium triquetrum</i> (L.) DC.	Fabaceae	<i>Kodialia</i>	<i>Kingmring</i>	Shrub	Whole plant	Fistula, piles
<i>Embllica officinalis</i> Gaertn.	Euphorbiaceae	<i>Amloki</i>	<i>Chachabang</i>	Tree	Whole plant	Digestive problems, skin disease
<i>Equisetum diffusum</i> D. Don	Equisetaceae	<i>Kurkure jhar, ashalah</i>	<i>Rossa crassa</i>	Herb	Stem	Muscle stiffness
<i>Ficus hispida</i> L. f.	Moraceae	<i>Dumur</i>	<i>Khanaung</i>	Tree	Leaf	Gastric problem
<i>Flueggea virosa</i> (Roxb. ex Willd.) Baill.	Phyllanthaceae	<i>Khaukra, shikori</i>	<i>Craw yong</i>	Shrub	Whole plant	Smallpox
<i>Gynura pseudochina</i> (L.) DC.	Asteraceae	<i>Nurachina</i>	<i>Mring seba</i>	Herb	Leaf	Snake bite
<i>Heliotropium indicum</i> L.	Boraginaceae	<i>Hatishur</i>	<i>Saimagri</i>	Herb	Leaf	Injured muscle
<i>Hibiscus surattensis</i> L.	Malvaceae	<i>Ram bhindi</i>	<i>Pungru mra</i>	Shrub	Leaf	Itching, tumor
<i>Hymenodictyon orixense</i> (Roxb.) Mabb.	Rubiaceae	<i>Kali-kadam, bhui-kadam</i>	<i>Khujai, chuung paing craw</i>	Tree	Leaf, bark	Snakebite, jaundice
<i>Ichnocarpus frutescens</i> (L.) R. Br.	Apocynaceae	<i>Shamalata</i>	<i>Tabu chi</i>	Climber	Leaf	Hemorrhage
<i>Imperata cylindrica</i> (L.) Beauv.	Poaceae	<i>Uluhor</i>	<i>Chida chon</i>	Herb	Root	Burning urination
<i>Jasminum scandens</i> Vahl	Oleaceae	<i>Ban-juï</i>	<i>Nacheraung</i>	Shrub	Whole plant	Paralysis, sexual disease, insect bites
<i>Justicia adhatoda</i> L.	Acanthaceae	<i>Basak</i>	<i>Shin mang gree</i>	Shrub	Leaf	Cough, asthma, fever
<i>Leucas zeylanica</i> (L.) R. Br.	Lamiaceae	<i>Shetadrone</i>	<i>Pai sung cha</i>	Herb	Leaf, root	Joint pain, fever, insomnia, gout, paralysis
<i>Litsea glutinosa</i> (Lour.) C. B. Rob.	Lauraceae	<i>Kukurchita, meda</i>	<i>Chak show</i>	Tree	Bark	Fracture healing
<i>Maesa indica</i> (Roxb.) A. DC.	Myrsinaceae	<i>Ramjoni</i>	<i>Thah mong shu</i>	Shrub	Whole plant	Fever, headache, dizziness
<i>Maranta arundinacea</i> L.	Marantaceae	<i>Arrarut</i>	<i>Siksa dery</i>	Herb	Rhizome	Cold, cough
<i>Melastoma malabathricum</i> L.	Melastomataceae	<i>Bon tej pata</i>	<i>Quaindium</i>	Shrub	Root	Satanophobia
<i>Melia azedarach</i> L.	Meliaceae	<i>Goranim, kawanim, mahanim, bokain</i>	<i>Agoroi</i>	Tree	Leaf, root	Diarrhea
<i>Mikania cordata</i> (Burm. f.) Robinson	Asteraceae	<i>Assam lata, refuzi lata, toofani lata, taru lata</i>	<i>Rifuzi nuiyee moi dui nuiyee</i>	Herb	Young, fresh leaf	Hemorrhage

<i>Mimosa pudica</i> L.	Mimosaceae	<i>Lajjaboti, sarminda</i>	<i>Thrapayeng, khrapaing</i>	Shrub	Whole plant	Abscess, lymphedema
<i>Molineria capitulata</i> (Lour.) Herb.	Hypoxidaceae	<i>Dhoti sara, satipata</i>	<i>Awlee</i>	Herb	Stem	Stop bleeding, fracture healing
<i>Moringa oleifera</i> Lam.	Moringaceae	<i>Sajna, sajina</i>	<i>Daing tho rai</i>	Tree	Leaf, bark	High blood pressure, rheumatic pain, cough, headache
<i>Neolamarckia cadamba</i> (Roxb.) Bosser	Rubiaceae	<i>Kadam, bul-kadam</i>	<i>Mou bang, rang khi</i>	Tree	Leaf	Liver disease
<i>Nyctanthes arbor-tristis</i> L.	Oleaceae	<i>Sheuli</i>	<i>Chhia raja</i>	Herb	Leaf	Tonsils
<i>Oroxylum indicum</i> (L.) Kurz	Bignoniaceae	<i>Khona, thona</i>	<i>Croncha</i>	Tree	Bark	Jaundice
<i>Paederia foetida</i> L.	Rubiaceae	<i>Gondho badali</i>	<i>Nuyebook</i>	Climber	Whole plant	Rheumatic pain, stomach pain
<i>Pandanus foetidus</i> Roxb.	Pandanaceae	<i>Keyakata</i>	<i>Thasu sua</i>	Herb	Stem	Hydrocele
<i>Piper longum</i> L.	Piperaceae	<i>Pepul</i>	<i>Shin mang thui</i>	Shrub	Leaf	Breast pain
<i>Plumeria rubra</i> L.	Apocynaceae	<i>Kat golap, chalta golap, golak champa</i>	<i>Anggra bang</i>	Tree	Bark	Anemia, facial paralysis, jaundice, piles, asthma
<i>Premna esculenta</i> Roxb.	Verbenaceae	<i>Lalana, lalong</i>	<i>Kamarah</i>	Shrub	Leaf, bark	Fever, headache, abdominal pain, high blood pressure, respiratory problems
<i>Rauvolfia serpentina</i> (L.) Benth ex Kurz	Apocynaceae	<i>Sarpagandha</i>	<i>Bongmaraja</i>	Shrub	Leaf, root, bark	Constipation
<i>Scoparia dulcis</i> L.	Scrophulariaceae	<i>Bandhoney</i>	<i>Tang-ganja</i>	Herb	Leaf	Toothache
<i>Sonchus wightianus</i> DC.	Asteraceae	<i>Ban palang</i>	<i>Pema, tougmula</i>	Herb	Root	Constipation, gastric problems
<i>Stephania japonica</i> (Thunb.) Miers	Menispermaceae	<i>Akandi manik</i>	<i>Tung nah way</i>	Climber	Whole plant	Constipation
<i>Stereospermum colais</i> (Buch.-Ham. ex Dillwyn) Mabb.	Bignoniaceae	<i>Dharmara, pahari awal, atkapali</i>	<i>Saing sek pang</i>	Tree	Bark	Intestinal worms
<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	<i>Jam, kala jam</i>	<i>Sochi tobri</i>	Tree	Bark	Jaundice, dysentery
<i>Thunbergia grandiflora</i> Roxb.	Acanthaceae	<i>Neel lota</i>	<i>Laksui nuye</i>	Climber	Stem	Eye allergy
<i>Vernonia cinerea</i> (L.) Less.	Asteraceae	<i>Kukshim</i>	<i>Rakhain</i>	Herb	Root	Fever

**The abundance of medicinal plant species among different families**

The study revealed the abundance of recorded plant species from different families varied enormously. About 44% of plant species were represented by 8 dominant families, whereas 30 families represented the rest of the 56% of species. Among the dominant plant families, Asteraceae contained the highest number of species (9%), followed by Apocynaceae (7%), Amaranthaceae (6%), Rubiaceae (6%), Bignoniaceae (4%), Acanthaceae (4%), Verbenaceae (4%), and Oleaceae (4%) (Figure 3).

**Medicinal ailments and uses of the recorded plant species**

The value of recorded plant species was assessed based on several criteria, e.g., the frequency of utilization, the number of ailments treated, and the parts of the plant used. The healers' reliance on specific plants for treating multiple ailments highlighted their perceived efficacy and importance within the community. During the study, interviews and focus group discussions revealed variations in using certain plants. While most herbal healers agreed on the use of specific plants for common ailments, there were instances of contradictory uses. For instance, some herbal healers used a particular plant to treat fever, while others used the same plant for gastrointestinal issues. These contradictions indicate the dynamic and diverse nature of traditional knowledge within the Marma community of the study area. All the recorded plant species were listed along with their scientific name, local name, Marma name, family, habit, used parts, and illness treated. Table 2 represents each species' scientific and local name, family name, part(s) used, and diseases treated.

This study documented the use value of different medicinal plant species utilized by the Marma community. Most of the plants recorded during the study had multiple uses. The medicinal plant species used to cure different ailments by the Marma community were herbs 38% (20 species), followed by shrubs 26% (14 species), trees 25% (13 species), and climbers 11% (6 species) (Figure 4).

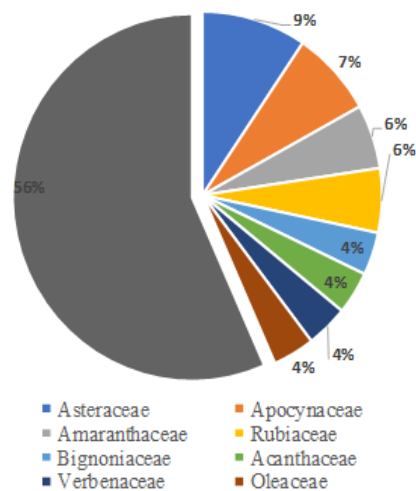
**Utilization of plant parts for folk medicine preparation**

The study revealed that Marma community of the study area uses various plant parts, e.g., leaf, stem, root, rhizome,

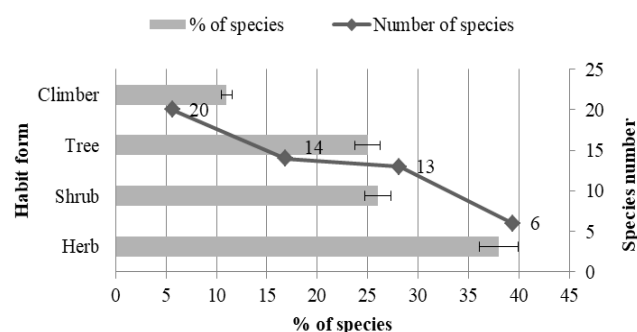
bark, fruit, flower, and tuber, to treat multiple diseases. Among the plant parts, leaves constituted the major plant part-used category (40%) for treating ailments, followed by whole plant (17%), root (14%), and bark (13%). Other plant parts, i.e., stem (8%), rhizome (5%), flower (1%), fruit (1%), and tuber (1%), were also used for the preparation of medicines (Figure 5).

**Preparation of the herbal medicines by the traditional herbal healers in the study area**

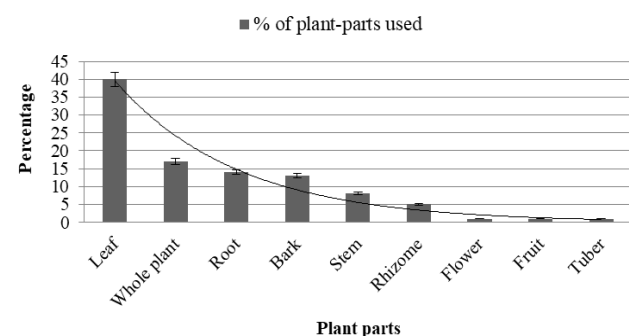
In the study area, it was observed that local herbal healers (*baiddyas*) process plant parts and prepare herbal medicines by applying different methods. One of the most common methods of herbal medicine preparation in the study area is manufacturing liquid juice (using extract or sap of any medicinal plant part). Other observed herbal medicine preparation techniques are paste preparation, powder manufacturing, decoction (boiling plant parts), mixtures (soaking plant parts in water) production, shower, etc. Local herbal healers (*baiddyas*) of the study area gradually prepare various herbal medicines by blending the ingredients (as pastes, juices, or decoctions) of plant parts with a variety of substances (e.g., honey, spices, milk, oils, chemicals, and/or other pharmacological agents).



**Figure 3.** Abundance of medicinal plant species belonging to different families



**Figure 4.** Percentage of recorded medicinal plant species belonging to various vegetation types used by the Marma community across the study area



**Figure 5.** Distribution (%) of plant parts used in folk medicine preparation

Leaf juices are the major ingredients used to treat numerous diseases by the Marma herbal healers in the study area. Leaf juices of *Melia azedarach* are used for treating diarrhea by herbal healers. Leaves of *Justicia adhatoda* are highly used for treating cough, asthma, and fever. Traditional herbalists processed the leaves of *Heliotropium indicum* to cure the injured muscle. Leaf juices of two rare plant species, i.e., *Gynura pseudochina* and *Hymenodictyon orixense*, are utilized to treat snakebite by the Marma herbal healers. Moreover, leaf juices of *Alstonia scholaris* used directly on skin lesions in cases of wounds, dermatitis, and earache. Leaf juices and pastes of *Moringa oleifera* are applied to treat high blood pressure, rheumatic pain, cough, and severe headache. Meanwhile, traditional herbal healers apply leaf juice in the case of painful diseases or the paste of the leaves and massage directly at the human organ of pain.

This study indicated that about 13.21% plants were used to treat fever followed by jaundice (11.32%), cough (9.43%), skin ailments (9.43%), stomach problem (9.43%), toothache (9.43%), asthma (7.55%), burning urination (7.55%), diarrhea (7.55%), dysentery (7.55%), headache (7.55%), different types of pains (7.55%) and paralysis (7.55%). Gastric problems, boils, constipation, insect bites, satanophobia, anemia, hemorrhage, sexual diseases, and rheumatism are the other major complaints treated by local herbal healers (*baiddyas*). However, the *baiddyas* use about seven plant species to treat fever problems, indicating that this disorder is very common among the Marma community of Wagga Union, Kaptai Upazila, Bangladesh. Frequencies of various medicinal plant species used for curing numerous diseases are presented in Figure 6.

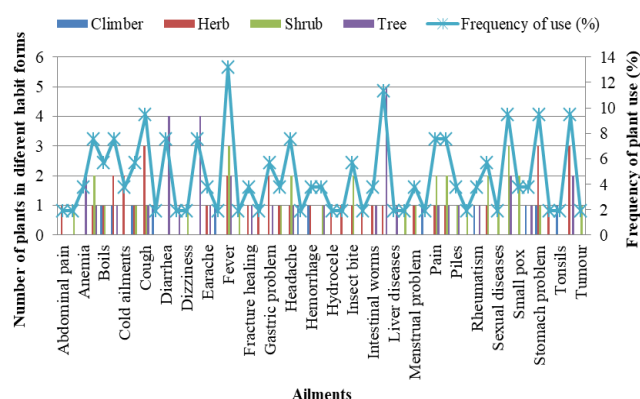
**Discussion**

The Marma community is one of the major ethnic communities residing at the Kaptai Upazila of Rangamati Hill District, Chittagong Hill Tracts (CHTs) in the southeast portion of Bangladesh. The Marma community of

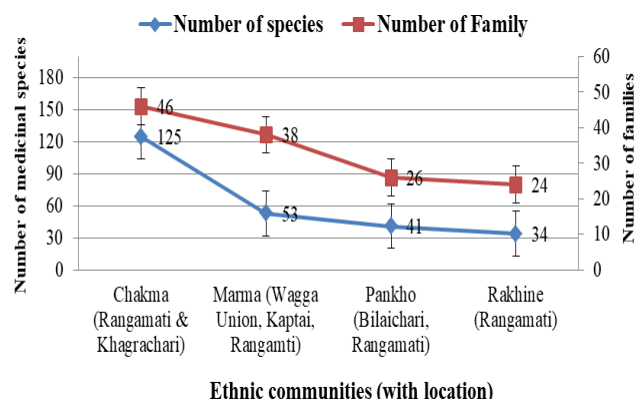
Wagga Union of Kaptai Upazila utilizes diverse medicinal plant species to cure numerous daily ailments. This study was of interest to comprehensively document their traditional medicinal practices due to the long history and affluent tradition of their medicinal practices in this region. The study revealed that the richness of medicinal plant species and their utilization by the Marma community in the Wagga Union of Kaptai Upazila were comparatively higher than the medicinal plant composition of Bilaichari Union of Rangamati Hill District utilized by the local Pankho Community. Sarker et al. (2013) reported the utilization pattern of about 41 medicinal plant species belonging to 26 families for the preparation of herbal medicines by the herbal healers of Pankho community of Bilaichari Union in Rangamati Hill District, Bangladesh.

Key findings of this study revealed that Marma community utilizes 53 medicinal plant species belonging to 38 families, which is quite lower than that of Paul et al. (2019). An extensive study conducted by Paul et al. (2019) on medicinal plant utilization identified 125 plant species belonging to 46 families utilized by the Chakma Ethnic Communities in Rangamati and Khagrachari Hill Districts of Bangladesh.

This study identified and documented 53 medicinal plant species belonging to 38 families from the study area, which was comparatively higher than the research findings of Hossan et al. (2009). A study conducted by Hossan et al. (2009) on the Rakhine Ethnic inhabiting Chittagong Hill Tracts (CHTs) of Bangladesh identified 34 plant species belonging to 24 families. Figure 7 compares medicinal plant utilization by different ethnic communities (i.e., Chakma, Marma, Pankho, and Rakhine) in different parts of Bangladesh. The study's findings disclosed that the Marma ethnic community of the study area highly depends on conventional plant-based medication to remedy various diseases and for therapeutic purposes, which was consistent with the findings of similar research (Alam 1992; Yusuf et al. 2005; Hossan et al. 2009).



**Figure 6.** Frequency of medicinal plant species used for curing numerous diseases in the study area



**Figure 7.** Medicinal plant utilization by different ethnic communities of Bangladesh

Marma ethnic communities of the study area have distinct traditional knowledge of using medicinal plant species for different purposes. The study identified that the Marma ethnic communities utilize different plants and plant parts to treat different diseases and illnesses as remedies in their daily life. The commonly treated disease/illness is fever caused by different flues. Some commonly treated diseases are Gastro-Intestinal Tract (GIT) disorders and respiratory problems such as diarrhea, dysentery, gastric and stomach pain, digestive disorders, cough and cold, influenza, etc. On the other hand, local herbal healers/ traditional practitioners of the Marma community utilize different medicinal plant species for dermatological ailments such as skin disease, jaundice, scurvy, scabies, general weakness with burning and headache, menstrual problems, vomiting, pain, urinary diseases, etc. Our findings consistently support similar research conducted by Yusuf et al. (2005) and Hossan et al. (2009).

From the field observation, it is assumed that many Marma ethnics are exploiting medicinal plants along with various non-wood forest products from the study area. Marma communities exploit medicinal plant species and collect different non-timber species for fuel, fencing, and other household necessities in the study area. These observations indicate that plant resources in the study area (especially medicinal plantations and non-timber forests) are decreasing alarmingly. This alarming decrease is not unique to our study area but is a common scenario in other hill regions of Bangladesh (Dutta et al. 2014a). Therefore, the need for scientific management and sustainable protection of plant resources in the study area is not just important but urgent.

This study recorded 53 medicinal plant species belonging to 38 families from the Wagga Union of Kaptai Upazila, which is comparatively lower than that of Dutta et al. (2014b). Dutta et al. (2014b) recorded 65 plant species having medicinal values from a nearby Botanical Garden and Ecopark located in the hill forests of Sitakunda, Chattogram, Bangladesh. From the study, it was confirmed that herbal healers of the Marma community are habituated to processing the leaves of different medicinal plant species for herbal medicine most of the time because leaves of various medicinal plants are available, easy to collect, easy to process, facile to conserve long-time as paste, juice, liquid or solid forms. Not only the Marma community of the study area but also other ethnic communities of the country utilize the leaves of numerous medicinal plant species, as mentioned by other researchers (Alam 1992; Chakma et al. 2003, 2021; Yusuf et al. 2005; Dutta 2016).

The investigation indicated that numerous medicinal plant species, i.e., *Bryophyllum pinnatum*, *Hibiscus surattensis*, *Jasminum scandens*, *Oroxylum indicum*, *Syzygium cumini*, etc., are utilized by the Marma community for the treatment of asthma, gallstone, and cough; itching and tumor; sexual disease; jaundice, dysentery, and diabetes etc. respectively, which is also reported by Chakma et al. (2021). Meanwhile, this study elucidated that various parts of the *Emblica officinalis* plant are highly utilized by the Marma Communities to treat

several health-related problems, e.g., digestive problems, fever, and skin diseases, which consistently support the results of similar research illustrated by Chowdhury et al. (2008).

Moreover, the study ensured the occurrence of several exotic plant species in the study area, severely harming nature and ecosystems. The study revealed the existence of various exotic plant species, i.e., *Mikania cordata* (Assamlata), *Mimosa pudica* (Lajjaboti), etc., in the study area that grow aggressively on other plants, though those plant species have tremendous medicinal values. Marma community residing across the study area utilizes those exotic plant species daily due to their potential medicinal value. Like Marma community of the study area, different ethnic communities of Bangladesh utilize a substantial number of exotic-medicinal plant species due to their numerous remedial qualities (Dutta et al. 2015). A study carried out by Dutta et al. (2015) reported that Tripura, Ethnic, and Hindu communities of Chattogram, Bangladesh, process several noxious weeds and exotic plant species, e.g., *M. cordata* (Assamlata), *M. pudica* (Lajjaboti), etc. for different medicinal purposes.

The research showed that the traditional ethno-medicinal knowledge of the Marma people and biodiversity was declining alarmingly. Therefore, the traditional ethno-medical knowledge of the Marma people living in the study area must be preserved by taking immediate initiatives and paying immediate attention to conservation strategies. This research is important in promoting sustainable natural resource management and preserving Indigenous Traditional Knowledge (ITK) in the Wagga Union of Kaptai Upazila by actively participating in community engagement and advocating for conservation efforts.

Overall, this study recommends that further research be conducted to preserve the traditional ethnomedicinal knowledge of the Marma community sustainably. It also suggests implementing large-scale cultivation programs of various medicinal plant species in the study area to conserve rare, endangered, and vulnerable medicinal plant species.

In conclusion, this study aimed to enumerate and document the medicinal plant species and their traditional uses by the Marma community in Wagga Union, Kaptai Upazila, Rangamati Hill District of Bangladesh. The study revealed that traditional treatment systems using medicinal plants are still prevalent. The findings indicate that modern scientific studies must be carried out on those plants for their rational scientific use, and steps should be taken to train local herbal healers (*baiddyas*). New compounds can be discovered to treat diseases through proper scientific investigation. Knowledge of traditional plant-based medicine in the Marma community has rapidly declined due to modern medical services, thereby depleting traditional knowledge and cultural diversity. Urgent initiatives must be taken to preserve the heritage of Marma community's plant-based medical practices. Moreover, the study should extend to other parts of the hill district of Bangladesh to discover unknown potential uses of medicinal plant species. Further research is needed to scientifically protect, preserve, and manage medicinal plant



resources and document Indigenous Traditional Knowledge.

During the study, collaborations and synergies with the local leaders and relevant stakeholders were performed to develop strategies for conserving medicinal plant species. Training and workshops were organized to inform the community about the significance of preserving traditional knowledge and issues about sustainable practices. The accomplishment of fruitful training programs on documenting and preserving traditional knowledge regarding medicinal plant utilization confirmed that future generations would benefit from these valuable resources.

The following recommendations were generated after revising the key findings of this explanatory study: (i) Indigenous Traditional Knowledge regarding medicinal plant collection and sustainable utilization should be thoroughly documented to ensure the reversion of plant-based medical practices in the study area. (ii) Regular motivational and awareness-raising programs regarding ethnomedicinal plant species and their benefits would be organized, involving local herbal healers and religious leaders of the ethnic communities. (iii) Protection and preservation of various medicinal plant species should be prioritized for sustainable management of natural resources in the study area. (iv) Large-scale plantation programs of medicinal plant species and sustainable nature management through community involvement should be considered as effective ways to improve the phyto-diversity in the study area.

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