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The Garo Tribe's Ethnobotanical Knowledge about Medicinal Plants

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Abstract: Ethnic communities have primarily relied on forest resources to fulfil their demands of food, nutrition, and medicinal requirements since the time of immemorial. The Garos are one of the few remaining matrilineal societies in the world. An investigation was conducted to understand the knowledge the ethnic Garo peoples of Bangladesh have about the medicinal plants (MPs). The present study was done through structured questionnaires in consultations with the tribal herbal practitioners. A total of eighty-eight species belonging to fifty-one families and eighty-two genera were collected and recorded for their use against 104 ailments by the Garo people. Some diseases, e.g., fever, cough, diarrhea, skin diseases, constipation, catarrh, etc., were very common and could be treated with more than one plant. Six, out of ten, of the world top deadliest diseases, *viz*. heart diseases, bronchitis, diabetes, diarrheal diseases, tuberculosis, and cirrhosis, were treated by the ethnic Garo people with the help of medicinal plants. The major growth habits of these MPs include herbs (43; 49%), trees (26; 30%), shrubs (11; 13%) and climbers (8; 9%). Individually the fruits of the MPs were found to be leading the plant parts most used in the treatments followed by leaves, bark; however, combining more than one part *viz*. root, stem, leaf, fruit, and seeds or using the whole plant, occupies the lion share (54%) of the plant parts used for therapeutic purposes. The study confirms that the present information on MPs can be used in the field of botanical, pharmacological, and conservation research and for new drug discoveries in the future.

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Introduction

Plants, especially medicinal plants (MPs), which produce secondary metabolites and essential oils, are a source for numerous medicinal compounds, as the diversity of their multidimensional chemical structures has made them superior to treat serious diseases. Plant-synthesized secondary metabolites have also been prioritized focusing on the effectiveness of plant-originated therapeutics for the treatment of COVID-19 due to the adverse effects of synthetic drugs (Bhuiyan *et al*., 2020). Since ancient times, people have tried to search for treatments to alleviate pain and cure different illnesses. In every period and over the successive centuries through the advancement of civilizations, the therapeutic properties of certain MPs were identified, noted, and conveyed to the successive generations. The documentation of traditional knowledge on ethnomedicinal plants has been considered as a high priority to support the discoveries of medications for benefiting mankind (Rana *et al*., 2010).

The usages of MPs and their history were recently reviewed by Petrovoska (2012). The oldest written evidence of MPs usage for the preparation of medicine has been found on a Sumerian clay slab from Nagpur, approximately 5,000 years ago. It is comprised of twleve recipes for drug preparation bearing on over 250 various plants, including alkaloids such as poppy, henbane, and mandrake (Kelly, 2009). The Rig Veda (4,500–1,600

BC) also noted that the Indo-Aryans used the Soma plant (*Amanita muscaria* (L.) Lam.), a narcotic and hallucinogenic mushroom, as a medicinal agent. MPs can be useful in medications against the recent COVID-19 pandemic (Jahan and Onay, 2020). They also create a tremendous opportunity for developing "green" integrative medicine (Vandebroek *et al*., 2020). Very recently, the WHO's Expert panel has endorsed a protocol for COVID-19 herbal medicine clinical trials (https://www.afro.who.int/news/expert-panel-endorses-protocol-covid-19-herbal-medicine-clinical-trials).

Bangladesh, as a part of the ancient Indian sub-continent, has a long history in the use of MPs in traditional medicine. Herbal medicines and MPs constitute an important part in treatment in indigenous medicine systems such as Ayurveda, Unani, Siddha, Traditional Chinese Medicine, Tibetan Medicine, Iranian, Julu, etc. Although Bangladesh is a tropical country with its small geographic area, it enjoys a very rich diversity of plant species in a wide range of ecosystems. A total of 1208 species of MPs are recorded from Bangladesh (Uddin and Lee, 2020). Bangladesh is also rich in ethnic biodiversity with about forty-five different ethnic communities widely spread over forested areas from hills to the plainland Sal forests in the central, northern, and north-western parts of the country (Anon., 2002; Sarwar, 2019). The Chakmas, Marmas, Tripuras, Tanchangya, Mros, Garos, Manipuri, Santals and Khasi are important communities both in population and their cultural heritage.

The Garos are an indigenous Tibeto-Burman ethnos from the Indian subcontinent, notably found in the Indian states of Meghalaya, Assam, Tripura, Nagaland, and neighboring areas of Bangladesh, notably Mymensingh, Netrokona, Jamalpur, Sherpur and Sylhet, who call themselves *A·chik Mande* (literally "hill people"; *a·chik* "bite soil" + *mande* "people") or simply *A·chik* or *Mande* (https://en.wikipedia.org/wiki/Indigenous_peoples_in_Bangladesh). The Garos are one of the few remaining societies in the world, whose line of descent go from a female ancestor (mother/grandmother) to the descendant. Like all other ethnic communities, Garos generally depend upon forest (plant) resources to fulfil their (primary) demands of food, nutrition and medicinal requirements.

The ethnic people depend on folk herbalist/ medicinal practitioners, known as "*Boiddos*" or "*Kavirajes*", for the healing of any kind of ailments. The following examples show the diversity and richness of their ethnobotanical knowledge: thirty-nine species are used by the Mro tribe of Bandarban (Miah and Chowdhury, 2003); thirty-two MPs are utilized by the Manipuri tribe in Bangladesh (Rana *et al*., 2010); seventy plant species are used by the Bwam, the Marma, the Murang and also the Tanchangya communities of the Bandarban hill district (Mohiuddin *et al*., 2012); fifty plant species are used by the Chakma traditional healers (Uddin *et al*., 2015a): eighty-two MP species are utilized by the Lusai tribe of the Bandarban (Uddin *et al*., 2015b); fifty-two MPs are used by the Khasia tribes of Maulvibazar (Bhatta and Datta, 2018). 117 plant species are used by the Pangkhua indigenous community of Bangladesh (Faruque *et al*., 2019); and 105 MPs by the Santal tribal people of Nawabganj Upazila of Dinajpur district (Khatun and Rahman, 2019) in Bangladesh. *Boiddos* rely almost solely on various MPs for the treatment of diverse ailments.

However, it seems that nowadays they are leaving their traditional occupation/ practices due to the following reasons: i. the decline in population and/or the merging with the mainstream Bangla-speaking population, ii. depletion/ scarcity of MP genetic resources, and iii. the availability of low-cost allopathic medicines. Moreover, the younger generation has very different ambitions. Accordingly, the traditional knowledge associated with ethnomedicine/MPs, is perhaps doomed to be lost. Some literature on the usage of MPs by the various ethnic groups and the common people as well is also available (Rahman, 1999; Uddin, 2006; Yusuf *et al*., 2009; Uddin *et al*., 2016). Most of the ethnobotanical literature published is concerned only with MPs used by ethnic people of the Chittagong

Hill Tracts areas and/or Sylhet region. Hitherto, no study has been conducted on the traditional healthcare practices of the Garo tribe (living at Nalitabari Upazila of Sherpur district). Hence, it becomes necessary to explore the perception and the indigenous healthcare practice of this tribe using MPs. The present study has therefore, been carried out for the sake of the documentation of plants of ethnomedicinal importance, the plant part(s) used, and the traditional formularies and doses employed by the Garos.

Materials and Methods

This research is focused on the investigation and documentation of indigenous knowledge and techniques, and the use of MPs by the Garo community inhabiting Nalitabari Upazila in the Sherpur district. The geographical location of the study area (*ca*. 327.61 sq. km) is between 25°01' to 25°13' N and 90°04' to 90°19' E (Figure 1). It is bounded by the Meghalaya state of India on the north, Sherpur Sadar and Nakla Upazilas on the south, Haluaghat Upazila on the east, and by Jhenaigati Upazila on the west. Ethnic communities such as Garo, Hajong, Hodi, Mandai and Koch belong to this Upazila (http://en.banglapedia.org/index.php?title=Nalitabari_Upazila); among them, Garo is the prominent tribe. The present study was carried out on the ethnic communities across different seasons – spring, (rainy) summer, autumn and winter, over the period from 2018 to 2019. The identification of key informants in the treatment of various diseases was based on the information obtained from the ethnic (Garo) people. Only five ethnic *Boiddos*, namely Mr Nirbasonmara, Mr Prithisonmara, Mr Bipinmara, Mr Anthonymara and Mr Sotanmara, were available for the interviews (address detail available upon request). Plants were collected from the forest with the help of the ethnic people; the healers allowed for the confirmations of the MPs they use for the treatment of various diseases. Data were collected during four survey trips in different seasons, and the voucher specimens were collected following the standard method of Martin (1995).

Voucher specimens and ethnomedicinal information were collected from the field during the flowering and fruiting periods. Traditional healers and knowledgeable persons were interviewed. While noting ethnomedicinal information, every care was taken to record the local names of the plants, the parts used, and the method of drug preparation and usage. Photographs were taken for each specimen not only to confirm the taxonomic identification, but also for future specimen record. The collected fresh (or dried) specimens were identified in the field through expert consultation, or by comparing them with herbarium specimens and/or published literature (Uddin, 2006; Yusuf *et al*., 2009; Uddin *et al*., 2016). The botanical names of MPs were updated using "The Plant List" database <http://www.theplantlist.org/>. The local names and medicinal uses were documented critically. The herbarium specimens were made accordingly (Jain and Rao, 1997). Voucher specimens were deposited at Prof. Dr Arshad Ali Herbarium at the Botanical Garden, Department of Crop Botany, Bangladesh Agricultural University. Some living plant collections were conserved in the MPs Garden at the same botanical garden. The gathered data were represented systematically in tabular form. Information such as botanical name, family, local name, habit, parts used, ethnomedicinal uses, and prescribed formulations were provided for each species (Tables 1 and 2).

Results

The present research reveals the ethnobotanical use of eighty-eight MP species belonging to fifty-one families and eighty-two genera to cure 104 human ailments among the Garo people (Tables 1 and 2). Herbs are among the foremost important components of ethnomedicine, sometimes called Herbal medicine. Within the present study, the growth habits of these MPs include herbs (43; 49%), trees (26; 30%), shrubs (11; 13%) and climbers (8; 9%) (Figure 2).

The Garo people commonly use plants and their parts including roots, rhizomes, tubers, leaves, stem, wood, bark, flowers, seeds, latex, pseudo-bulb, cone, or the whole plant and fruits for various purposes in their way of life (Table 1; Figure 3). More than one plant part *viz*. root, stem, leaf, fruit, seed, or the whole plant, were commonly used combinedly (more than 54% cases) for the medicinal preparation.

Out of fifty families, nineteen families possess more than one species and thirty-one families possess one species each (Table 1). Leguminosae represented the highest number of medicinal plants (8 species 9%), to be followed by Zingiberaceae (5 species 5.7%), and Apocynaceae (4 species 4.5%) (Figure 4).

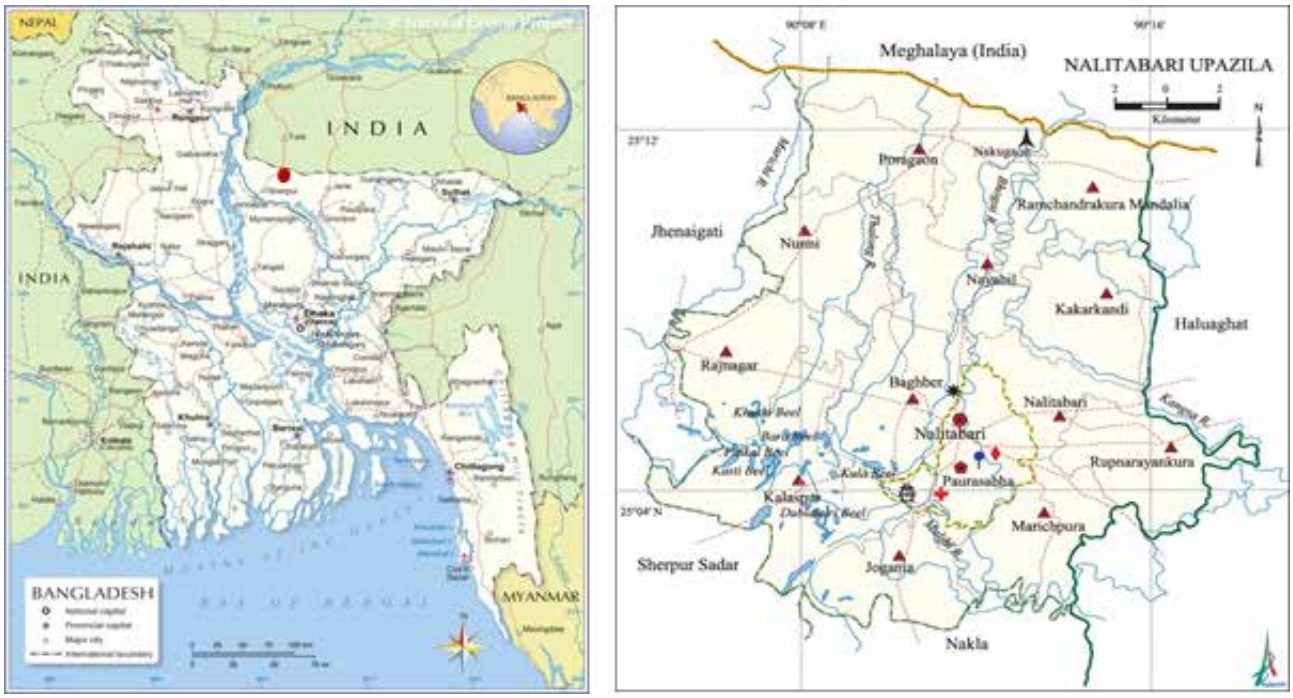

Figure 1. Map showing the location of Nalitabari Upazila, Sherpur (red spot on Bangladesh map). Source: (http://en.banglapedia.org/index.php?title=Nalitabari_Upazila)

Table 1. Scientific information of medicinal plants and the parts used by the Garo tribal community in the Nalitabari Upazila of the Sherpur District, Bangladesh

Sl. No.	Scientific Name	Family	Local name	Habit	Part(s) used
1	*Abroma augusta* (L.) L.f.	Sterculiaceae	Olotkambal	Shrub	Root, Bark, Leaf
2	*Abrus precatorius* L.	Leguminosae	Kunch	Woody Herb	Fruit, Seed, Root
3	*Acacia arabica* (Lam.) Willd.	Leguminosae	Arobi gach	Tree	Leaf, stem extract
4	*Aegle marmelos* (L.) Corrêa	Rutaceae	Bel	Tree	Leaf, Fruit
5	*Allium cepa* L.	Amaryllidaceae	Piyanj	Herb	Leaf, Bulb, Root
6	*Allium sativum* L.	Amaryllidaceae	Roshun	Herb	Leaf, Bulb, Root
7	*Aloe vera* (L.) Burm.f.	Asphodelaceae	Gritakumari	Herb	Leaf
8	*Alpinia galanga* (L.) Willd.	Zingiberaceae	Bach gach	Herb	Root, stem
9	*Alstonia scholaris* (L.) R.Br.	Apocynaceae	Satim	Tree	Bark
10	*Amomum subulatum* Roxb.	Zingiberaceae	Elachi	Tree	Fruit with seeds
11	*Ananas comosus* (L.) Merr.	Bromeliaceae	Pineapple	Herb	Fruit, Young leaf
12	*Andrographis paniculata* (Burm.f.) Nees	Acanthaceae	Kalomegh	Herb	Leaf, Roots

13	*Artocarpus heterophyllus* Lam.	Moraceae	Kanthal gach	Tree	Fruit, seed
14	*Asarum europaeum* L.	Aristolochiaceae	Shugandhabala	Herb	Leaf
15	*Asparagus racemosus* Willd.	Asparagaceae	Satamuil	Climber	Root, stem, Leaf
16	*Azadirachta indica* A. Juss.	Meliaceae	Nim	Tree	Leaf, Bark
17	*Bacopa moniera* (L.) Wettst.	Scrophulariaceae	Brammi	Herb	Leaf, whole plant
18	*Bauhinia purpurea* L.	Leguminosae	Rakta kanchan	Tree	Leaf
19	*Berberis aristata* DC.	Berberidaceae	Daruhoridra	Tree	Roots, Stems
20	*Boerhaavia repens* Brand.	Nyctaginaceae	Punornova	Herb	Roots, stems, Leaf
21	*Borago Officinalis* L.	Boraginaneae	Jabani gach	Herb	Leaf
22	*Calotropis gigantea* (L.) Dryand.	Asclepiadaceae	Akanda	Shrub	Stems, Leaf
23	*Centella asiatica* (L.) Urb.	Apiaceae	Thankuni	Herb	Leaf, Young stems
24	*Cinnamomum zeylanicum* Blume	Lauraceae	Daruchni	Tree	Bark
25	*Citrus aurantifolia* (Christm.) Swingle	Rutaceae	Lebu	Herb	Juice
26	*Clitoria ternatea* L.	Leguminosae	Aporajita	Herb	Flower, Leaf
27	*Coccinia grandis* (L.) Voigt	Cucurbitaceae	Telakucha	Climber	Leaf, Root
28	*Cochlospermum religiosum* (L.) Alston	Bixaceae	Katira gach	Tree	Leaf, Stem
29	*Cordia dichotoma* G.Forst.	Boraginaceae	Sapesh gach	Tree	Leaf, sometime roots
30	*Coriandrum sativum* L.	Umbelliferae	Dhonia pata	Herb	Leaf, Seed
31	*Corymbia citriodora* (Hook.) Hill and Johnson	Myrtaceae	Euaclyptus tree	Tree	oil or Extracts
32	*Crocus sativus* L.	Iridaceae	Jafran gach	Herb	Leaf, stem
33	*Cuminum cyminum* L.	Apiaceae	Zira	Herb	Fruit
34	*Curcuma longa* L.	Zingiberaceae	Holud	Herb	Rhizome
35	*Cuscuta reflexa* Roxb.	Convolvulaceae	Sonaloti gach	Herb	Leaf with young stems, Fruit with seed
36	*Cynodon dactylon* (L) Pers.	Poaceae	Durba	herb	Whole plant
37	*Cyperus rotundus* L.	Cyperaceae	Nagori gach	Herb	Leaf, Fruit, Rhizome
38	*Datura metel* L.	Solanaceae	Dhutura	Herb	Seed, Leaf
39	*Daucus carota* L.	Umbelliferae	Gajar	Herb	Root
40	*Dillenia indica* L.	Dilleniaceae	chalta	Tree	Flower, fruits
41	*Eclipta prostrata* (L.) L.	Asteraceae	Vingu gach	Herb	Leaf extract
42	*Elettaria cardamomum* (L.) Maton	Zingiberaceae	Elachi gach (small)	Herb	Fruit, Seed
43	*Foeniculum vulgare* Mill.	Apiaceae	Mouri	Herb	Roots, Seeds
44	*Gloriosa superba* L.	Colchicaceae	Olatchandal	Herb	Leaf, Flower, Bark
45	*Glycyrrhiza glabra* L.	Leguminosae	Josthi modhu	Herb	Leaf, Stem, Root
46	*Hiptage madablota* Gaertn.	Malpighiaceae	Madhobilata	Climber	Flower
47	*Holarrhena pubescens* Wall. *ex* G. Don	Apocynaceae	Kurchi gach/ Indrojab	Shrub/small tree	Bark
48	*Ipomoea alba* L.	Convolvulaceae	Dudhi kalmi	Herb	Leaf, Twig
49	*Ipomoea mauritiana* Jacq.	Convolvulaceae	Bhuikumra	climber	Fruit, Root, Tuber
50	*Justicia adhatoda* L.	Acanthaceae	Bashok	Shrub	Leaf
51	*Lagenaria siceraria* (Molina) Standl.	Cucurbitaceae	Lau	Climber	Fruit

52	*Malva sylvestris* L.	Malvaceae	Khabba gach	Shrub	Seed
53	*Mangifera indica* L.	Anacardiaceae	Aam	Tree	Leaf, Bark, Fruit
54	*Mentha arvensis* L.	Lamiaceae	Pudina pata	Herb	Leaf
55	*Mentha viridis* (L.) L.	Lamiaceae	Pahari Pudina	Herb	Leaf
56	*Momordica charantia* L.	Cucurbitaceae	Corolla	Herb	Fruit, Twig, Leaf
57	*Moringa oleifera* Lam.	Moringaceae	Sajna gachh	Tree	Leaf, fruit
58	*Musa sapientum* L.	Musaceae	Kola gach	Herb	Fruit
59	*Nymphaea nouchali* Burm.f.	Nymphaeaceae	Shapla	Herb	Flowers
60	*Ocimum tenuiflorum* L.	Labiatae	Tuishi	Sub shrub	Leaf, Stem
61	*Pandanus tectorius* Parkinson *ex* Du Roi	Pandanaceae	Keura	Tree	Anther, Root, Leaf extract, Seed
62	*Phyllanthus emblica* L.	Euphorbiaceae	Amloki	Tree	Fruit
63	*Piper betle* L.	Piperaceae	pan	Climber	Leaf
64	*Piper cubeba* L.f.	Piperaceae	Kabab sugar	Climber	Seeds, Fruit
65	*Piper nigrum* L.	Piperaceae	Golmorich	Climber	Fruit
66	*Plantago ovata* Forssk.	Plantaginaceae	Ispaghol	Herb	Seed, Husk
67	*Portulaca oleracea* L.	Portulacaceae	Nune shak	Herb	Leaf, Young stems
68	*Prunus amygdalus* (Mill.) Webb	Rosaceae	Kagozi badam	Tree	Seed
69	*Psidium guajava* L.	Myrtaceae	Peyara	Small tree	Fruit
70	*Pterocarpus santalinus* L.f.	Leguminosae	Rakta chandan	Tree	Stem, Leaf
71	*Rauvolfia serpentina* (L.) Benth. *ex* Kurz	Apocynaceae	Sharpagandha	Herb	Bark of roots
72	*Rosa damascene* Herrm.	Rosaceae	Golap Gach	Shrub	Flowers extract
73	*Salvia plebeian* R.Br.	Labiatae	Bhui tuisi	Herb	Leaf, seed
74	*Saraca asoca* (Roxb.) Willd.	Leguminosae	Ashok gach	Tree	Bark, Seed
75	*Senna alata* (L.) Roxb.	Leguminosae	Datmardan	Shrub	Leaf
76	*Sesamum indicum* L.	Pedaliaceae	Tilgach	Herb	Seeds, Fruit
77	*Sida acuta* Burm.f.	Malvaceae	Urusia / Bon methi	Shrub	Areal parts, Seed, Root
78	*Syzygium cumini* (L.) Skeels	Myrtaceae	Jam	Tree	Bark, Fruit, Seeds
79	*Tabernaemontana divaricata* R.Br. *ex* Roem. and Schult.	Apocynaceae	Tagar	Herb	Flower
80	*Tagetes patula* L.	Asteraceae	Gada	Herb	Flowers
81	*Tamarix dioica* Roxb. *ex* Roth	Tamaricaceae	Jhau gach	Shrub	Leaf, root, young
82	*Terminalia arjuna* (Roxb. *ex* DC.) Wight and Arn.	Combretaceae	Arjun	Tree	Bark
83	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Bohera	Tree	Fruit
84	*Terminalia chebula* Retz.	Combretaceae	Hortoki	Tree	Fruit
85	*Tinospora sinensis* (Lour.) Merr.	Menispermaceae	Goloncha	Climber	Root, Leaf
86	*Tribulus terrestris* L.	Zygophyllaceae	Gokhra gach	Herb	Plant extract
87	*Vitex negundo* L.	Verbenaceae	Nishinda	Shrub	Leaf
88	*Zingiber offcinale* L.	Zingiberaceae	Aada	Herb	Rhizome

Table 2. Medicinal plant species and their traditional uses and formulations by the Garo tribal community in the Nalitabari Upazila of the Sherpur District, Bangladesh

Sl. No.	Scientific Name	Diseases to be treated	Traditional Formulation and Dosage
1	*Abroma augusta*	Used against many gynaecology diseases – irregular and/or painful menstrual cycle, leucorrhoea, etc., diabetes, plies	Liquid extract of the bark, leaf, and juvenile roots to be used 3 or 4 times daily
2	*Abrus precatorius*	Diseases of the gastrointestinal tracts, leucorrhoea	Tablets are made from the powder of dried fruits and seeds. 3 tablets per day.
3	*Acacia arabica*	Cough, catarrh caused by smoking	Extract of leaves and stems to be used 3 times daily with honey and water.
4	*Aegle marmelos*	Diarrhea, stomach disorders, vomiting tendency and thirst	Juice of fruits to be used 3 times daily. Ripe and unripe fruits to be used for constipation.
5	*Allium cepa*	Catarrh, cough, weariness and fatigue, dandruff	Liquid extract of the roots to be used daily.
6	*Allium sativum*	Wounds, antiseptic, hypertension, diabetes, increases the power of heart	Burned rashun is used daily 2 times before meal
7	*Aloe vera*	Wounds, skin problems, constipation, physical weakness, gout and pain, sexual stimulant both for male and female	The internal portion of the leaves is separated; it is whitish in color and jelly-like. To be taken as a juice, daily one time before meal for constipation.
8	*Alpinia galanga*	Mental weakness. kidney weakness, maintains heart-beat, for urine problems	Tablets are made from the powder of dried roots or modified stems. 3-4 tablets per day.
9	*Alstonia scholaris*	Fever, diarrhea, dysentery	Tablets are made from the powder of dried barks. 3 tablets per day.
10	*Amomum subulatum*	Gastric, stomach disorder, bad smell of mouth, cleans the throat, increases appetite and the power of stomach	Tablets are made from the powder of dried fruits/ seeds, 4 tablets per day.
11	*Ananas comosus*	Appetite, gastrointestinal disorders, helps to digest, destroys worms	Fruit or fruit juice is directly taken. Young leaf is chewed for helminthiasis and jaundice.
12	*Andrographis paniculata*	Fever, ulcer, hypertension, overweight and high-level cholesterol of the blood	Juice of the whole plant for the treatment of fever and ulcer. Roots and leaves are mashed; tablet is made and then dried. 4 tablets per day.
13	*Artocarpus heterophyllus*	Vitamins and minerals, malnutrition, maintains body temperature	Fruits are directly consumed seeds are fried and consumed.
14	*Asarum europaeum*	Gastrointestinal diseases; increases the power of the stomach and liver	Liquid leave extracts to be used; Tablets are made from dried leaves powder. 4 tablets per day.
15	*Asparagus racemosus*	Epilepsy, stomach ulcer, male sexual diseases, such as lacking sperms, liquidness of semen, sexual instability	Root extract with milk for male sexual diseases and for weakness. Leaves, root and young stem are mashed then dried as tablets to be used 3 or 4 time.
16	*Azadirachta indica*	Allergy diabetes, skin diseases, constipation, rheumatic fever, gastrointestinal disorder, pimpless, piercing.	Liquid extract of leaves to be used. Also leaves are dried and powdered and are taken every morning.
17	*Bacopa moniera*	Nerve and brain diseases, increases the memorizing power	Leaves and the whole plant are mashed and tablets are made from the mashed product. After they become dry, 2 tablets are to be taken per day.

18	*Bauhinia purpurea*	Skin diseases, pimple, and bruises of the skin	Tablets are made from the powder of dried leaves. 3 or 4 tablets per day.
19	*Berberis aristata*	Itching in the anus, constipation, pain during passing stools	Tablets are made from the powder of dried Roots and stems. 3 or 4 tablets per day.
20	*Boerhaavia repens*	Gout, dropsy, irregular urine, kidney disorders	Leaves and juvenile stems, roots are mashed and tablets are made from the mashed product. After they become dry, 3 tablets are to be taken per day.
21	*Borago Officinalis*	Jaundice, inflammation and many other diseases of the uterus in women	Tablets are made from the powder of dried leaves. 4 tablets per day.
22	*Calotropis gigantea*	Anemia, joint-pain, eczema, flexibility of penis, sexual weakness in males, curviness of the penis	Leaves and Young stem are mashed, then dried. Tablets are produced from the mashed product. 3-4 tablets per day. For joint-pain to be used For fomentation by hot leaf.
23	*Centella asiatica*	Dysentery, itching of eye, dry catarrh, bronchitis	Leaf extracts (liquid) to be used in the eye. In other cases, green leaves are mashed; tablet is made, then dried. 4 times per day.
24	*Cinnamomum zeylanicum*	Increases appetite, removes the anorexia, cures the bruises of the mouth, asthma	Dried bark is turned into powder. To be used 6 time daily.
25	*Citrus aurantifolia*	Lacking Vit. C, scurvy, bruises of the mouth and palate, dandruff, facial scars and spots	Juice of the lemon to be used. Fruit juice for facial scars and spot. Fruits increase appetite.
26	*Clitoria ternatea*	Promotes memory and intelligence, treats eye infections, pimples of the face and many skin diseases, and diseases of urinary tracts	Roots, flowers and leaves are mashed and tablets are made from the mashed product. Then After they become dry, 4 tablets are taken per day. Flower extract to be used to treat eye infections.
27	*Coccinia grandis*	Diabetes, skin diseases, urinary tract infection, gonorrhea.	Liquid extract of leaves and roots to be used 2 times.
28	*Cochlospermum religiosum*	Catarrh, cough	Extract of leaves and stems to be used 4 times daily with sugar and water.
29	*Cordia dichotoma*	Asthma, dry catarrh, inflammation of the vocal cords	Leaves and roots are mashed; tablets are made and dried to be taken 4 tablets per day.
30	*Coriandrum sativum*	Increases appetite, provides minerals, cleans the cough from the throat, and removes the anorexia	Mashed leaves with water are to be taken 3 times per day. Take the seed extract 3 times daily.
31	*Corymbia citriodora*	Antiseptic, teeth pain, many skin diseases, stomach disorders, pneumonia	Liquid and oily extract of the tree to be used properly and daily.
32	*Crocus sativus*	Dysentery, blood dysentery, diarrhea, stomach disorders, and cholera	Tablets are made from the powder of dried leaves and young roots, to be used 3-4 times daily.
33	*Cuminum cyminum*	Antioxidant, removes many diseases of the larynx	Tablets are made from the powder of dried fruits. 2 tablets per day.
34	*Curcuma longa*	Removes many skin disorders and bruises	Mashed products are directly applied on the skins.
35	*Cuscuta reflexa*	Bilious disorders, jaundice, hepatitis, inflammation of liver, mental illness and constipation.	Leaves, fruit with seed and juvenile stems are mashed, then dried. Powders are produced from the dry product. Powder to be taken 4/5times daily.
36	*Cynodon dactylon*	Hepato-protective, anti-oxidant activity, heals wounds.	Macerated whole plant is applied to stop bleeding from cuts, whole plants extract for other uses.
37	*Cyperus rotundus*	Diarrhoea, fever, pain in hips, cough, cold and breathing problems	Tablets are made from the powder of dried leaves and stems. 3 tablets per day.

38	*Datura metel*	Joint pain, breathing problems, asthma, bronchitis	Tablets are made from the powder of dried seeds and leaves. To be used 1 time daily.
39	*Daucus carota*	Source for vitamins and minerals, removes weariness and fatigue	Modified root as vegetable.
40	*Dillenia indica*	Scurvy, cleans the urine tract and maintains its regularity, fever.	Fruit juice is directly consumed.
41	*Eclipta prostrata*	Dandruff, hair-loss, to blacken hair, fatigue and weariness excitation, increases the biological demand	Powder of dried leaves or liquid extract of green leaves to be used 4 times daily. For hair treatment mixed with oil in leaf extract.
42	*Elettaria cardamomum*	Storage cough, dry catarrh, asthma, bronchitis, breathing problems, cleans the throat, tonic	Tablets are made from the powder of dried seeds and fruits (dried by fire heat) to be used 4 times daily.
43	*Foeniculum vulgare*	Fever, kidney disorder, maintains the regularity of menstrual cycle	Tablets are made from the powder of dried roots and seeds combinedly. 4 tablets per day.
44	*Gloriosa superba*	Gynaecology diseases – irregular and/or painful menstrual cycle, leucorrhoea, etc., piles	Tablets are made from powder of dried leaves and flower. 3 tablets per day.
45	*Glycyrrhiza glabra*	Bronchitis, gastralgia, Cough, dry catarrh, hopping cough, asthma	Leaves and young stems and root are mashed, then tablets are made and dried. 3 tablets per day.
46	*Hiptage madablota*	Diseases of gastrointestinal tracts	Tablets are made from the powder of dried flowers. 2 tablets per day.
47	*Holarrhena pubescens*	Diarrhea, disorders of stomach	The barks are mashed; tablet is made, and dried. 3 tablets per day.
48	*Ipomoea alba*	Snakebites, scabies or eczema	Leaves are applied to boils and wounds. Leaves and twigs are boiled in water and consumed.
49	*Ipomoea mauritiana*	Tuberculosis, kidney pain and reduces miscarriage.	Tablets are made from the powder of dried fruit, root and tuber. 3 tablets per day.
50	*Justicia adhatoda*	Cough, dry catarrh, asthma, bronchitis	Juvenile leaves are mashed; tablet is made, then dried. 3 tablets per day; Young stems and leaves with boiled water and the extract is to be taken 3 or 4 times per day.
51	*Lagenaria siceraria*	Cholera, disorders of stomach.	Used as vegetable, consumed as a form of curry.
52	*Malva sylvestris*	Asthma, weakness of lung, catarrh caused by smoking	Powders are made from dry seeds, then tablets are made from the powder. 3 tablets per day.
53	*Mangifera indica*	Dental diseases, hypertension, gastric, indigestions, stomach disorder	Juvenile leaves are mashed and dried. Power is produced. 3 times per day. Decoction of bark and flower to prevent graying of hair.
54	*Mentha arvensis*	Skin diseases, pimples, makes skin soft and glorious	Mashed leaves are used directly or the liquid extract of leaves to be used regularly.
55	*Mentha viridis*	Hiccup, bilious vomiting, flatulence, colicky pain and cholera	Mashed leaves are used directly or the liquid extract of leaves juices to be used regularly.
56	*Momordica charantia*	Jaundice, piles, diabetes, antioxidant, gout, heart problems, anticancer agent	Used as Vegetable, consumed as a form of curry.
57	*Moringa oleifera*	Chicken pox, fat control	As a preventive measure against chickenpox 1/2 cup macerated leaves juice is taken. Leaf juice for fat control.
58	*Musa sapientum*	Urinary stones, constipation, stomach disorders, malnutrition, provides vitamins and minerals	Fruits are directly consumed.
59	*Nymphaea nouchali*	Cough, inflammation of the vocal cords, catarrh	Flowers are dried, then a powder is made; tablets are produced from powder. 6 tablets per day.

60	*Ocimum tenuiflorum*	Cough, cold, catarrh, many kinds of skin diseases, pimples, and piercing	Liquid extract of leaves is used about 5 times daily.
61	*Pandanus tectorius*	Leprosy, urinary tract problems, fatigue, weakness	Liquid extract of leaves to be used 4 times daily, or roots are dried and made into a powder to be used 3 times.
62	*Phyllanthus emblica*	Diabetes, dyspepsia, hair loss, to stop vomiting, scurvy, bruise of mouth and leap, dysentery, blood dysentery, diarrhoea	50 g juice obtained from crushed leaves is mixed with 20 g sugar and taken twice daily for 2 weeks.
63	*Piper betle*	Leucorrhoea, otorrhoea, increases the sexual power of the male and makes the penis strong, bad smell of mouth	Juice of the green leaves to be used 3 to 4 times daily.
64	*Piper cubeba*	Storage cough, dry catarrh, asthma, bronchitis and breath problem	Tablets are made from powder of dried seeds and fruits. 4 tablets per day.
65	*Piper nigrum*	Increases appetite, removes the vomiting tendency, Indigestions and many other gastrointestinal disorders	Tablets are produced from mashed product. Then dry. 2 tablets per day.
66	*Plantago ovata*	Constipation , chronic dysentery, gonorrhea	Seed and Husk is collected and dry to be taken it with water night and morning.
67	*Portulaca oleracea*	Pain in belly, increases the activity of stomach, chronic dysentery	Leaves with stems are mashed, tablet is made then dry 3 tablets to be taken per day.
68	*Prunus amygdalus*	Concentrates the semen of the male, removes the constipation and hair growth	Liquid and oily extract of the seeds is collected and use. or Tablets are made from powder of dried seeds, 3 tablets per day.
69	*Psidium guajava*	Diarrhoea, piles, fatigue and weariness, excitation	The Fruits are mashed and tablets are made. Then dry these. 6 tablets per day.
70	*Pterocarpus santalinus*	Gout, pain of gout, many skin disease, piles/hernia	Leaves and stems are mashed; tablets are made from the mashed product. Then dry it. 3 tablets per day.
71	*Rauvolfia serpentina*	Hypertension, insomnia, high-level blood cholesterol	Tablets are made from powder of dried bark of roots. 3 tablets per day.
72	*Rosa damascena*	Inflammation, fatigue, weakness, makes the body charmed	Liquid extract of flowers to be used 4 times daily.
73	*Salvia plebeia*	Gonorrhoea, menorrhagia	Liquid extract of leaves are used taken internally.
74	*Saraca asoca*	Gynaecology diseases e.g., irregular menstrual cycle, painful menstrual cycle, etc, increases the power of the uterus of woman	Liquid extract of the barks; Tablets are made from powder of dried barks. 4 tablets per day.
75	*Senna alata*	Skin disease, bruise	Leaves are mashed and tablets are made from the mashed product. Then dry it. To be used 3 times daily or directly mashed leaves.
76	*Sesamum indicum*	Fistula, burns associated with infection, night pollution, sexual instability, cold cough, catarrh, loss of hair, semen concentration, hair-fall	Liquid and oily extract of seeds is collected and to be used 2-3 times daily according to role.
77	*Sida acuta*	Demulcent and diuretic, rheumatic affections, gonorrhoea, chronic dysentery	Leaves juice are used to treat demulcent and diuretic. Infusion of roots with ginger is given in intermittent fever; chronic boil complaints.
78	*Syzygium cumini*	Bronchitis, vomiting, gargle and mouth wash, pain in bone joint, asthma, gout, infection in throat, hypertension, diabetes	Powder is made from the dry fruits, and then the powder is eaten with water 3 times daily.

79	*Tabernaemontana divaricata*	Weakness	Tablets are made from powder of dried flowers. To be used 4 times daily.
80	*Tagetes patula*	Eczema, antiseptics, stop bleeding, heal wounds	Mashed products are directly applied on the wounded skins.
81	*Tamarix dioica*	Jaundice, disease of urinary tracts	Leaves, root and young stem are mashed, then dried. Tablets are produced from the mashed product. To be used 4-6 times daily.
82	*Terminalia arjuna*	Heart disease, hypertension, ulcer, anemia	Cutting pieces of bark is dipped into water overnight, and then the water is consumed daily.
83	*Terminalia bellirica*	Acidity, constipation and stomach disorders, cough.	Powder are made from dried fruits, the powder is to be used 3 times daily.
84	*Terminalia chebula*	Gastritis, abdominal pain, dysentery, blood dysentery, diarrhea, stomach disorder, increase activity of liver	Powder are made from dried fruits, the powder is to be used 3 times daily.
85	*Tinospora sinensis*	Worm infestations, loss of appetite, liver disorder, disease of urinary tracts, fatigue, physical and mental weakness	Stem, roots and leaves are mashed; tablets are made from the mashed product; then dry it. 3 tablets per day.
86	*Tribulus terrestris*	Complexity of kidney, fever, clean the urine and maintain its regularity	Tablets are made from powder of dried external part of bark, 3 tablets per day.
87	*Vitex negundo*	Arthritis, spleen enlargement, gouts	Leaves are mashed and tablets are made from the mashed product. Then dry it. 4 tablets per day.
88	*Zingiber offcinale*	Cough, pain of belly, gastric, ulcer, indigestion and many other stomach disorders/evil wind	Juvenile zinger, with salt or dried zinger with salt to be taken 4 to 6 times daily.

Discussion

The present investigation provides ample information about the traditional medicinal practice using native MPs within the studied area. The traditional knowledge of the Garo ethnic people of Nalitabari Upazila has tremendous ethnobotanical and ethnomedicinal importance. Khatun and Rahman (2019) reported similar findings, although the tree is the dominant plant group reported by Rana *et al*. (2010). The ethnic group Santal used 105 species as MPs and out of these plant species, 44% belong to herbs, 28% trees, 18% shrubs, 10% climbers. Most of the species are used for the treatment of a few to several diseases; however, a few species are used for a single or very specific disease treatment. As an example, *Terminalia arjuna* is used for the treatment of heart diseases, *Ipomoea alba* for snakebites, *Moringa oleifera* for chickenpox, *Vitex negundo* for Gouts, etc. (Table 2). It was observed through this work that the ethnic groups collected medicinal plants in wild forms which means that the area had a poor cultivation of economically valuable medicinal plants. This situation could, on the long run, lead to the depletion of plant resources or even to their extinction from their natural habitat if the plant specimens were used in huge amounts for medicinal uses and other purposes. There were no permanent storage practices: the villagers collected fresh medicinal plants from the forest as per their requirements. Uddin *et al.* (2015a) identified and provided information on fifty plant species in forty-seven genera under thirty-seven families used to treat twenty-nine different ailments by the Chakma traditional healers. Khatun and Rahman (2019) reported that a total of 105 plant species under ninety-seven genera belonging to fifty-seven families were recorded as plants used by the Santals for the treatment of sixty-seven ailments.

The most frequently used individual plant part for medicinal preparations was the fruits (13; 14.77%) followed by the leaves (11 cases; 12.50%), bark and the flowers (5; 5.68% each) (Fig. 3). The study shows that different plant

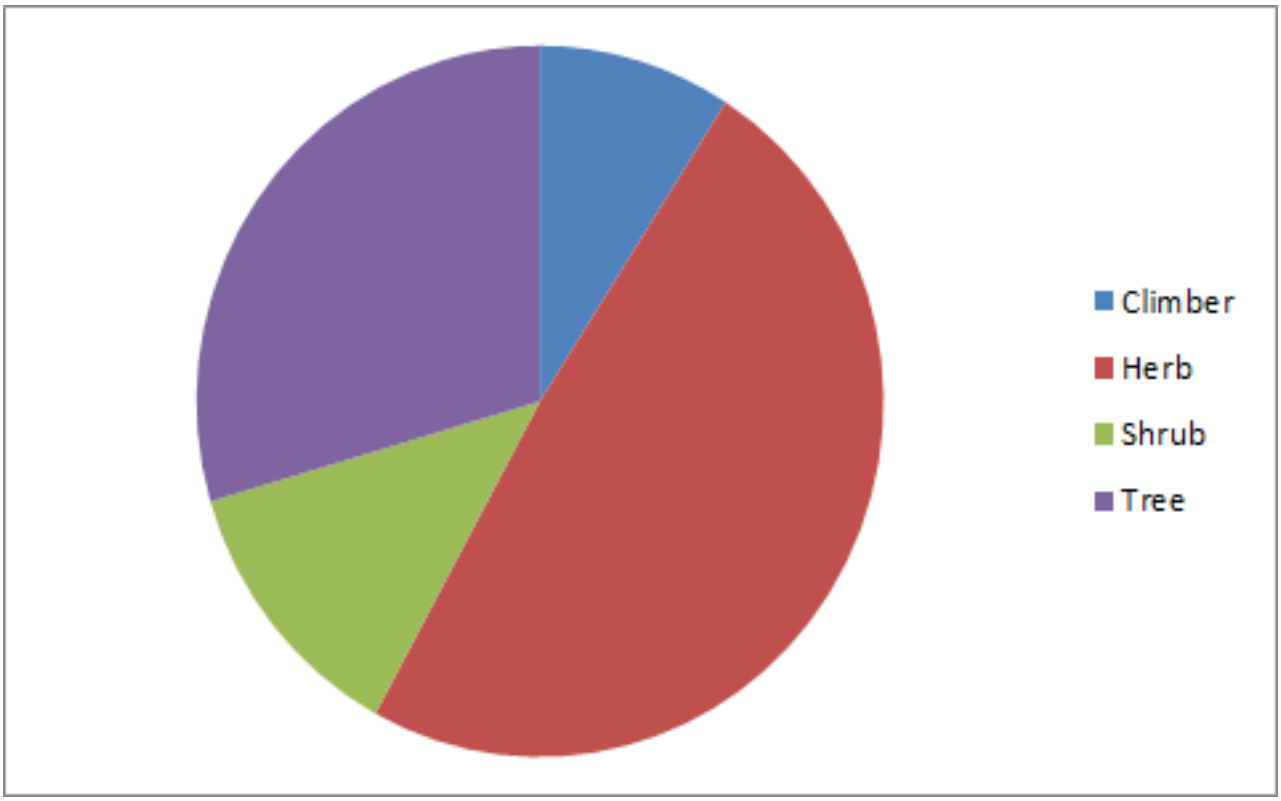

Figure 2. Habit wise distribution of medicinal plants used by the Garo tribal community, Bangladesh

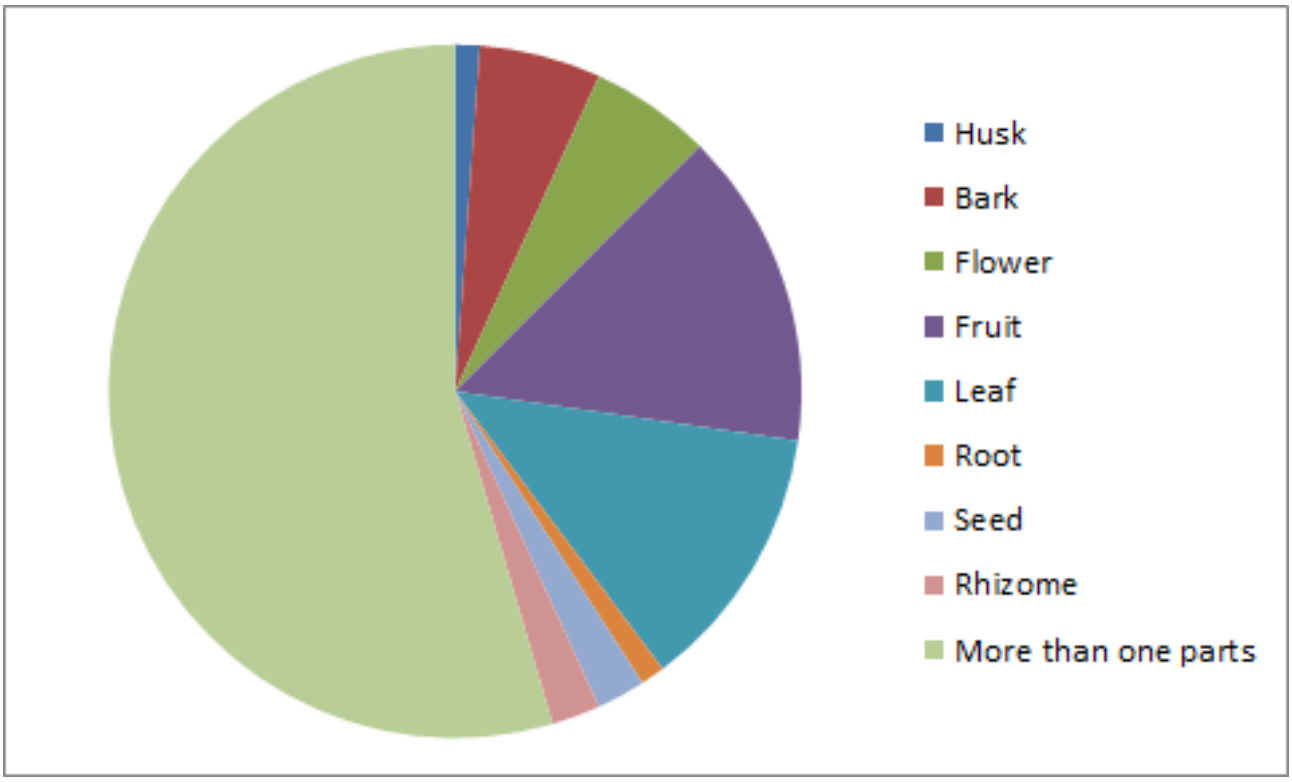

Figure 3. Utilization of plant parts of the medicinal plant species by the Garo tribal community, Bangladesh

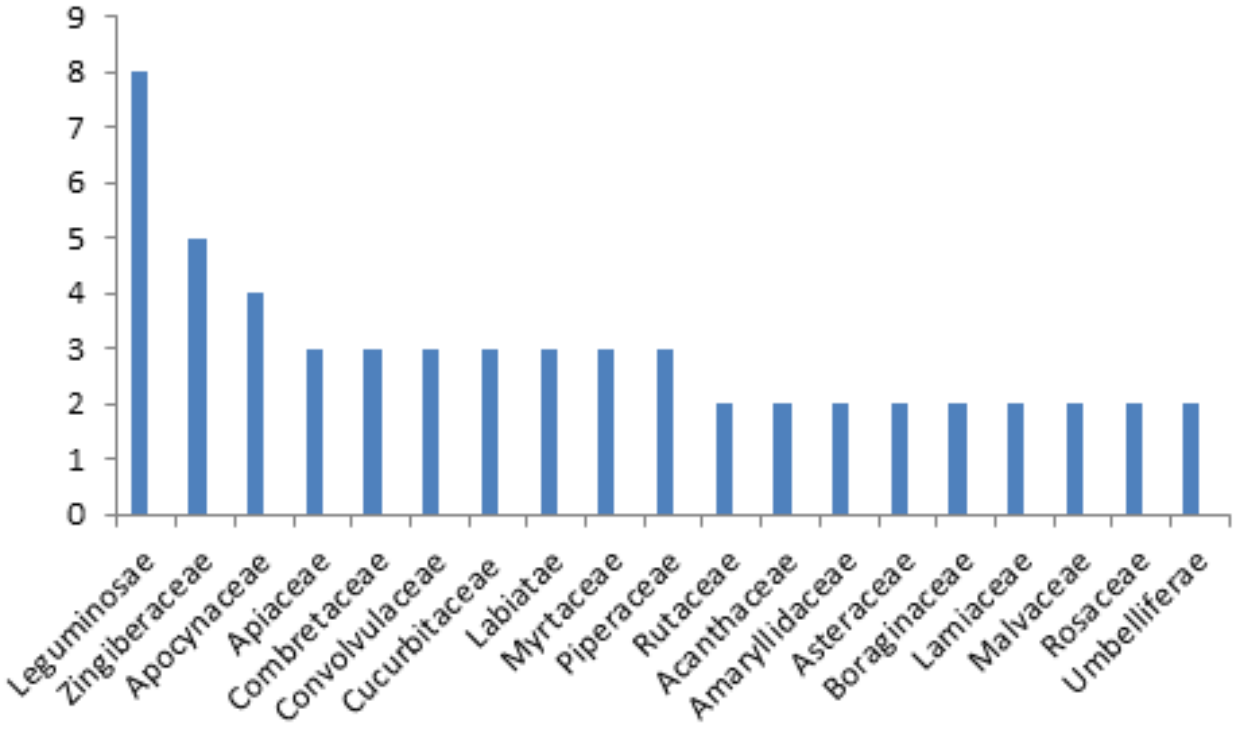

Figure 4. Family-wise distribution of the medicinal plant having more than two species in the Garo tribal community, Bangladesh

parts are used in the preparation of treatments against human ailments and this finding is consistent with previous studies (Malla *et al*., 2015; Uddin *et al*., 2015). The Santal people mostly used leaves (29%) followed by roots (12%), fruits (12%), whole plant (10%), seeds (9%), bark (9%), stems (5%), flowers (4%), latex (2%), rhizomes (2%), petioles (2%), gum (2%), bulb (1%), tubers (1%), pods (1%) and buds (1%) (Khatun and Rahman, 2019).

For Manipuri tribe, Combretaceae appeared as the most prominent family (3 species, 1 genus), followed by Apocynaceae, Piperaceae and Rubiaceae (2 species and 2 genera each), and Meliaceae (2 species, 1 genus). Rests are the family that contains one species each (Rana *et al*., 2010). Uddin *et al.* (2015a) reported that Apocynaceae is the most frequently used family within the context of the number of species used by the Chakma Community. Other important families used for medicinal plants include Caesalpiniaceae, Amaranthaceae, Rutaceae, Araceae, Zingiberaceae, Asteraceae, Liliaceae and Combretaceae, respectively.

Some diseases were reported/observed as very common among the ethnic Garo peoples and these could be treated with more than one plant e.g., fever (9 species), cough (15 species), skin diseases (15 species), constipation (10 species), diarrhea (8 species), catarrh (14 species), etc. (Table 2). According to the World Health Organization (WHO), ten diseases are recognized as the top deadliest, causing the majority of deaths worldwide (https://www.healthline.com/health/top-10-deadliest-diseases). Six of these diseases are treated by the ethnic Garo people with the help of medicinal plants, *viz*. Heart diseases are treated with two species, Bronchitis by seven species, diabetes by seven species, Diarrheal diseases by eight species, tuberculosis by one species and Cirrhosis (/ damage to the liver) by two species (Table 2).

Although the same MP species are used by different ethnic groups, the plant parts used and their prescriptions might be different. For example, the root of *Abroma augusta* is used by Garo ethnic group against many gynaecology diseases – irregular and/or painful menstrual cycle, leucorrhoea, plies, etc. (Table 2). Moreover, the seeds of *A*.

augusta are used by the Chakma tribe in the Khagrachari district for the treatment of neck pain (Yusuf *et al.,* 2009). *Centella asiatica* is used to treat itching in the eye, dry catarrh, bronchitis, etc. according to this paper (Table 2); but Marma has prescribed plant juice with common salt against blood dysentery (Yusuf *et al*., 2009). This MP (*C. asiatica*) is also used against flatulence, dysentery, and the bleeding of piles (Rana *et al*., 2010); and/or is advised by some other ethnic groups against diarrhea, menstrual problems, stomach pain, and as a stimulant, etc. (Mohiuddin *et al*., 2012). These types of variations in the uses of the same plants are described in details in MP books (Uddin, 2006; Yusuf *et al*., 2009; Uddin *et al*., 2016). Therefore, the knowledge of ethnic people on MPs should be well-documented to pave the way for many more life-saving drug discoveries.

Conclusion

The present research has revealed that a total of eighty-eight MP species belonging to fifty-one families and eighty-two genera were collected and recorded for their use against various (104) ailments by the Garo people. Herbs occupy predominantly the major growth habit followed by trees, shrubs, and climbers. The same plant has been used for the treatment of different ailments with different formulations by different ethnic groups. Therefore, the ethnobotanical knowledge on MPs must be rendered useful as it paves the way for further life-saving drugs, 'green' integrative medicine, and new discoveries in the post-COVID-19 era.

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