Herbal Healing: An Old Practice for Healthy Living among Khumi, Marma and Tripura Communities of Thanchi Upazila, Bangladesh

Mohammad Abdul Motaleb¹, M. M. Abdullah-Al-Mamun²*, M. K. Hossain², M. Khairul Alam³ and Marufa Sultana¹

¹IUCN Bangladesh Country Office, House 16, Road 2/3, Banani, Dhaka 1213, Bangladesh.
²Institute of Forestry and Environmental Sciences, University of Chittagong, Bangladesh.
³Bangladesh Forest Research Institute, Sholosahar, Chittagong, Bangladesh.

Authors’ contributions

This work was carried out in collaboration between all authors. Field work was conducted by all authors. Author MAM designed the study and authors MAM and MMAAM wrote the first draft of the manuscript. All authors contributed during the analyses. Authors MAM and MMAAM managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/EJMP/2015/10244

Editor(s):
(1) Marcello Iriti, Plant Biology and Pathology Department of Agricultural and Environmental Sciences Milan State University, Italy.

Reviewers:
(1) Anonymous, Bangladesh Resource Centre, Bangladesh.
(2) Sunday Johnson Ameh, Medicinal Chemistry and Quality Control National Institute for Pharmaceutical Research and Development (NIPRD), Abuja, Nigeria.
(3) Pawan Kumar Rana, Department of Botany, Punjabi University, Patiala, Punjab, India.
(4) Anonymous, University of Oschang, Cameroon.
(5) Anonymous, Federal University of Bahia, Brazil.

Peer review History: http://www.sciencedomain.org/review-history.php?id=648&aid=6163

Original Research Article

ABSTRACT

Background: At present, only a limited amount of documentation exists that shed light on aspects of plants used by Traditional Healers (THs) in Bangladesh for treating general ailments. The current study is concerned with information on medicinal plants (MPs) used in Traditional Medicine (TM) by the Khumi, Marma and Tripura communities of Bangladesh.

Aims: The study attempted to collect, analyze and evaluate Traditional Knowledge (TK) of the healing powers of plants used in TM in Thanchi upazila during August 2011 to January 2013; and to classify as far as possible the plants encountered in the study.

Methodology: Semi-structured questionnaire was used to collect information through Focused Group Discussions (FGD) and one to one discussions with the selected indigenous...
community people.

**Results:** A total of 91 different diseases (faced by the above three communities of the study area) were recognized that were treated by the THs using 116 herbs and shrubs belonging to 50 different families. Scientific name of different plant species, parts used, preparation process including doses, and names of user communities are also mentioned.

**Conclusion:** This documentation will encourage the relevant stakeholders, authorities and conservationists in emphasizing the proper management of TK, including the conservation initiatives.

**Keywords:** Medicinal plants (MPs); Traditional Knowledge (TK); Traditional Healers (THs); Indigenous community (IC); Chittagong Hill Tracts (CHT); Khumi; Marma; Tripura.

1. **INTRODUCTION**

Plants, plant parts and plant products of all descriptions, particularly those with medicinal properties, have been used since time immemorial as principle ingredients of various traditional medicines [1]. The history of use of MPs for alleviating illnesses had its origin in the activities of early humans. Selection of MPs by such humans, without any prior knowledge, was largely based on intuition, guesswork or trial and error. The healing powers (HPs) of some plants were often discovered by accident. Thus, by a combination of these processes there emerged a considerable body of knowledge of MPs that was transmitted from one generation to another. At first, orally; and later, in written form as papyri, baked clay tablets, parchments, manuscripts, and finally as printed herbal, pharmacopoeias and other works [2]. Our ancestors, through trial-and-error, discovered useful natural substance that they came across to ease their discomfort and sufferings caused by various acute and chronic illnesses or injuries. Since ancient times, plants with therapeutic properties have occupied an important niche in the disease treatment practices [3].

Bangladesh a small country, occupying an area of about 147,570 sq. km, is endowed with a very favorable climate for diverse flora. A great variety of plants grow in her forests, agricultural lands, barren lands, waste lands, water bodies, homesteads, and also along the roadsides. Many of these plants are often considered as weeds which contain active substances with medicinal properties. It has been recorded that about 450 to 500 plants growing or available in Bangladesh tend to hold therapeutic values [4]. The rich heritage of indigenous knowledge associated with TMs is considered as the basis of all systems of traditional remedies in Bangladesh. Most of the medicinal plants of Bangladesh are extensively used in the preparation of Unani and Ayurvedic medicines. These plants also serve as important raw materials for many modern medicinal ingredients [3]. Unfortunately, these valuable assets have been depleting rapidly because of unsustainable exploitation and land use changes [5].

Until now, few communities of Bangladesh, especially the indigenous people of CHT, have been traditionally using TMs. It has been unequivocally established that medicinal plants and related knowledge, that represent a part of rich local heritage, play a significant role in the general welfare of the upland communities of CHT [6, 7]. The ICs of this area traditionally rely on TM due to their belief, culture and availability of the plant resources. On top of that, due to the absence of modern treatment facilities, they fully depend upon nature for their regular treatment. But in recent time, availability of medicinal plants and associated TK fell under threat of extinction due to depletion of MPs and THs practice respectively. That is why the need for documentation of these priceless resources is very urgent. Different countries have given emphasis on this documentation namely, Srivastava and Rout [8], Parkash et al. [9], Srivastava and Adi Community [10], Zheng and Xing [11], Telefo et al. [12], Rehecho et al. [13], Ayanar and Ignacimuthu [14], Sargin et al. [15] and Ullah et al. [16].

Documentation process on TK on medicinal plants and related issues in Bangladesh is at its initial stage. Preliminary work of Hasan and Khan [17] in ethnomedical research is regarded as pioneer endeavour in Bangladesh. Since then, Alam [6], Uddin et al. [18, 19, 20], Yusuf et al. [21, 22], Partha and Hossain [23], Rahman et al. [24], Roy et al. [25], Rahmatullah et al. [26, 27, 28], Motaleb [30], Mohiuddin et al. [31], Malek et al. [32], Khisha et al. [33], Sarker et al. [34], Uddin and Mukul [35], Kadir et al. [36, 37], Ocvirk et al. [38] and Rahman [39] have also made significant contribution to our understanding of ethnobotany in Bangladesh. Keeping this in mind, the present attempt has been taken to
document this valuable knowledge and information from the area before its extinction.

2. RESEARCH METHODOLOGY

A team was formed with plant taxonomist, silviculturist, forester, biologist, and local herbal healers. Extensive field surveys were carried out for the last one and half year years (August 2011 to January 2013). Three relevant skilled persons from a local NGO, Bolipara Nari Kalyan Somity (BNKS), were also involved in the team who interpret the local language of the tribal people.

2.1 Study Area

The study was conducted among the Khumi, Marma and Tripura community of Thanchi upazila (longitude 21°78’ and latitude 92°42’) of Bandarban that is situated in the southeastern corner of Bangladesh. Marma is the most dominant IC in this area; other communities included are Khumi, Mro, Bawm, Chak, Tripura etc. Jhum (shifting cultivation or slash and burn cultivation) is the traditional method of crop production in this area. Livestock rearing also makes up a significant proportion of livelihoods of the communities. Numerous traditional, religious and cultural rituals and norms bind these societies together. Compared with the entire country, Thanchi upazila ICs suffer from a high proportion of extreme poverty, with very low food security, low supplies of safe drinking water, inadequate sanitation facilities, extremely low literacy rate.
2.2 Data Collection

Species information was collected using a pretested semi-structured questionnaire (including who, what, how, when, by whom and why the plants are used) through FGD, one to one discussions with the local THs. Simultaneously, more information was gathered from local knowledgeable persons, Buddhist monks, and elderly men and women. During FGD, the informants came on mostly used medicinal herbs and shrubs and then the information of local name, parts use, herbal use, preparation process, local status and measures taken to conserve each species were recorded. A particular plant was picked up and queries were made as to how it emerges to be useful for them. After finishing interview for one particular plant, a second plant was taken up and so on. The investigation was very effective and informative because of the fact that the information were collected and recorded through consultation with various indigenous communities such as Marma, Tripura and Khumi, who use these medicinal plants mostly and finally verified by various informants at different spots. Once the information on a particular plant was considered as reliable after repeated discussions, then its local name and uses were recorded. Most of the species were identified by the taxonomist of the study team. The unidentified species were preserved in the herbarium and identified by the taxonomists of Bangladesh National Herbarium, Department of Botany of Dhaka University, Bangladesh Forest Research Institute (BFRI), Institute of Forestry and Environmental Sciences of Chittagong University. Direct filed visit in the hills, streams and forests were also conducted to gain knowledge in regards to the ecology, habitat and other important issues for all the species. The authenticity of information on each species was confirmed through repeated interviews. Prior Informed Consent (PIC) was taken from the knowledge providers before collecting information. Later, the compiled information was shared with them in their own local language.

3. RESULTS AND DISCUSSION

The herbal healing techniques of Khumi, Marma and Tripura communities of the study area have been presented in Tabular form in Table 1. Diseases are arranged alphabetically by their English names. Then species that are used to treat different diseases, plant parts used for treatment, brief preparation process of the TM and IC users have been arranged in Table 1.

Besides, a short scenario of a number of plants having different pharmacological actions, frequently used plants parts to treat diseases and modes of providing herbal treatment are shown in Fig. 1, Fig. 2 and Fig. 3 respectively.

Present study revealed a total of 91 different diseases that are treated by the THs of three communities by using 116 different herbs and shrubs belonging to 50 families. The findings support the similar studies, e.g., [40] listed 60 species from 40 families used by Chakma, Marma and Tanchunga; [31] found 70 species from 36 families common among Bwam, Marma, Murang and Tanchunga tribes. The current study also found that species under Rubiaceae family (9 species) were mostly used by them; followed by Fabaceae (8 species); Asteraceae, Euphorbiaceae, Lamianieae and Zingiberaceae (6 species each); Araceae, Caesalpiniaceae and Verbenaceae (5 species each); Apocynaceae (4 species), and Amaranthaceae and Menispermaceae (3 species each).

Number of plants having differ pharmacological actions are shown in Fig. 1. It illustrates the diseases which are cured by 3 and above number of plants. It was observed that, to treat disease like headache they use maximum number of plants (12) followed by stomachache and abdominal pain (11) gastritis (9), sore (8) fever for all ages (7), asthma and allergy (6); wound, menstrual problem (irregular menstruation), ear pain, different types of cut, conjunctivitis, and burning (5). From the above results, it could be concluded that indigenous peoples like more options for their regular treatment purposes. For example, headache, stomachache, abdominal pain and gastritis are very common diseases in Bangladesh for which maximum species are used.

Among the plant parts used, leaves (98) were highly utilized followed by root (50); whole plant (41); rhizome (21); flower (14) and young leaves (13) (Fig. 2). Modes of providing treatment fall into fourteen categories. A maximum of 108 formulations were reported to be used in the juice or liquid form; whereas, 61 in paste form; 18 in bath with plants or plant parts boiled water; and 10 in powder form. The other categories were reported less frequently (Fig. 3). Commonly prescribed medicine doses (e.g. Pills, powder etc.) are rarely found for treatment due to lack of well-structured herbal healing. However, the result clearly depicted that at the primary stage these communities are fully dependant on their traditional healing system (e.g. Juice, paste etc).
Table 1. Description of herbal medical treatment process of different diseases provided by the Khumi, Marma and Tripura community of Thanchi upazila of Bandarban district along with their species used to prepare medicine, parts use, preparation process and users

| Sl. No. | Disease name        | Species name                        | Local name  | Parts use | Preparation process                                                                 | User group            |
|---------|---------------------|-------------------------------------|-------------|-----------|-------------------------------------------------------------------------------------|-----------------------|
|         | Abdominal pain      | Alpinia conchigera Griff.           | Padagra     | Rhizome   | Juice, extracted by smashing, is taken orally three times a day for 2-3 days.        | Khumi, Marma and Tripura |
|         |                     | Celosia cristata L.                 | Krawmong Pai| Dried flower | Smashed flower is used over the belly and swollen area, twice a day for a week.       | Marma                |
|         |                     | Emilia sonchifolia (L.) DC.         | Rakheibang  | Root      | Juice, extracted by rubbing roots in the stone, is taken orally two times a day for a week. | Khumi, Marma and Tripura |
|         |                     | Helminthostachys zeylanica (L.) Hook. | Choomakhankre| Rhizome and fronds | Paste mixed with honey is taken orally 2 times a day for 2-3 days. | Khumi and Marma          |
|         |                     | Ixora cuneifolia Roxb.              | Kyamoachie   | Root and leaf | Pills prepared from leaf and root paste are sun dried, and taken thrice a day for 7-10 days. | Marma                |
|         |                     | Jasminum sambac (L.) Ait.           | Kyalungpai  | Root      | Red hot iron is dipped in root juice (extract) and taken during pain.               | Marma and Tripura     |
|         |                     | Premna esculenta Roxb.              | Kramurauh   | Leaf      | Leaf decoction (one cup mixed with honey (1 table spoon) is taken thrice a day for 5-7 days. | Tripura               |
|         |                     | Scoparia dulcis L.                  | Dungangja   | Whole plant | Juice of whole plant is taken thrice a day for a week.                             | Khumi, Marma and Tripura |
|         |                     | Solanum violaceum Ortega           | Kajoishi    | Root      | Root extract obtained by rubbing in stone is mixed with rice water and taken orally twice a day for 4-5 days. | Khumi, Marma and Tripura |
|         |                     | Solena amplexicaulis               | Kamuu       | Leaf      | Leaf boiled with table salt is                                                      | Tripura               |
| Sl. No. | Disease name          | Species name                          | Local name | Parts used | Preparation process                                                                 | User group            |
|--------|-----------------------|---------------------------------------|------------|------------|--------------------------------------------------------------------------------------|-----------------------|
|        |                       | (Lamk.) Gandhi                        | Marma      |           | taken directly twice a day for 3-4 days.                                             |                      |
| 2      | Abdominal pain of children | *Zingiber capitatum* Roxb.            | Phalago    | Blomoshla  | Hot red iron is dipped in rhizome juice and taken orally twice a day for a week.     | Khumi, Marma and Tripura |
|        |                       |                                       | Pennih     | Rhizome    |                                                                                      |                      |
| 3      | Abdominal tumor       | *Clerodendrum viscosum* Vent.         | Khumejaie  | Haronga    | Leaf juice is taken thrice a day for 3-5 days.                                       | Tripura              |
|        |                       |                                       | Khakoh     |            |                                                                                      |                      |
| 4      | Abscess               | *Croton bonplandianus* Baill.         | Painujaw   | Leunke     | Leaf juice, extracted by smashing, is taken orally once a day for 2-3 days.          | Tripura              |
|        |                       |                                       | Khubambam  |            |                                                                                      |                      |
| 5      | Abscess in ear        | *Equisetum ramosissimum* Desf.        | Pinlacha   | Acala      | Pill prepared by grinding the stem is taken 3 times a day for 2 weeks.              | Marma                |
|        |                       |                                       | Shachuri   | Stem       |                                                                                      |                      |
| 6      | All types of pain     | *Atylosia scarabaeoides* (L.) Baker   | Noemuie    | Ajungmuie  | Leaf powder is used in the affected area for 3-5 days.                                | Tripura              |
|        |                       |                                       |            |            |                                                                                      |                      |
|        |                       | *Mimosa pudica* L.                    | Hrapaing   | Ange       | Leaf or whole plant paste is used over the sore.                                     | Khumi, Marma and Tripura |
|        |                       |                                       | Changlachi |            |                                                                                      |                      |
|        |                       |                                       | Leaf and whole plant |            |                                                                                      |                      |
| 7      | Allergy               | *Kaempferia parviflora* Wall. ex Baker| Khimodoh   | Cheilanki  | Juice extract from whole plant is mixed with *Peristylus constrictus* (Lindl.) Lindl. juice and used in ear once a day for a week. | Khumi, Marma and Tripura |
|        |                       |                                       |            |            |                                                                                      |                      |
|        |                       | *Peristylus constrictus* (Lindl.) Lindl. | Chemmodoh | Nantho     | Warm plant paste is used.                                                            |                      |
|        |                       |                                       |            | Kuthmai    |                                                                                      |                      |
|        |                       |                                          | Whole plant |            |                                                                                      |                      |
| 8      | Allergy               | *Lantana camara* L. var. aculeata (L.) Moldenke & Moldenke | Achownai   | Moichiacha | Warmed leaf paste is spread over the pained area.                                    | Khumi                |
|        |                       |                                       |            | Khelakhemows ugnama |                                                                 |                      |
| 9      | Allergy               | *Clerodendrum wallichii* Merr.        | Teratebatholpow | Terateba   | Bath with leaf-boiled water.                                                        | Khumi, Marma and Tripura |
|        |                       |                                       | Terateba   |            |                                                                                      |                      |
|        |                       | *Hedyotis scandens* Roxb.             | Anuwaishowatha | Anwaichi | Warm mash of whole plant is used over the affected area twice a day for a week.     | Khumi, Marma and Tripura |
|        |                       |                                       |            | Whole plant |                                                                                      |                      |
|        |                       | *Mycetia longifolia* (Wall.) O.       | Taow       | Mykanchi   | Bath is taken with the whole marma and                                             |                      |
| Sl. No. | Disease name | Species name | Local name | Parts used | Preparation process | User group |
|--------|--------------|--------------|------------|------------|---------------------|------------|
|        |              |              |            |            |                     |            |
|        |              |              | Marma     | Khumi     | Tripura             |            |
| 29     |              |              | plant     | plant     | plant boiled water for 5-10 days. | Tripura |
|        |              |              |           |           |                     |            |
| 8 Anal tract problem | | | | | | |
| 29     |              |              | plant     | plant     | Leaf is smashed to produce juice which is taken twice a day for a week. | Marma |
|        |              |              |           |           |                     |            |
| 3 Smilax laurifolia L. | | | | | | |
| 29     |              |              | leaf      | leaf      | Taking bath by root boiled water for a week. | Khumi, Marma and Tripura |
|        |              |              |           |           |                     |            |
| 4 Tournefortia roxburghii C.B. Clarke | | | | | | |
| 29     |              |              | leaf      | leaf      | Leaf juice is used over the affected area thrice a day for 5-10 days. | Khumi and Tripura |
| 9 Any disease that creates thirst and reaction | | | | | | |
| 29     |              | Imperata cylindrica (L.) P. Beauv. var. latifolia (Hook. f.) C. E. Hubb. | Tacrimra  | Paditaiung  | Chonjaru  | Rhizome  | Juice, extracted by rubbing rhizome in stone, is taken twice a day for a week. | Khumi, Marma and Tripura |
| 10 Arthritis | | | | | | |
| 29     |              | Angiopteris evecta (Forst) Hoffm. | Chagkathe | Angkskepoi  | Asojaly  | Rhizome  | Rhizome paste is taken with honey twice a day for 2 weeks. | Tripura |
|        |              | Lantana camara L. var. aculeata (L.) Moldenke & Moldenke | Achownai | Moichiach  | Khelakhemows ugnama | Leaf | Warmed leaf paste is spread over the pained area. | Khumi |
|        |              | Parabaena sagittata Miers ex Hook.f. & Thoms. | Gaidiaanowai  | Muipungpou  | Angkala  | Leaf | Leaf vapor is inhaled 3 times a day for 2 weeks. | Tripura |
| Sl. No. | Disease name | Species name | Local name | Parts used | Preparation process | User group |
|--------|--------------|--------------|------------|------------|---------------------|------------|
| 11     | Asthma       | Desmodium triquetrum (L.) DC. subsp. auriculatum (DC.) Prain | Pawlogy | Root | Juice prepared by squeezing roots is mixed with cold water, which is taken twice a day for a week. | Khumi and Marma |
|        |              | *Eupatorium ayapana* Vent. | Chikiina | Leaf | Leaf juice is taken orally a day for a week or two. | Marma |
|        |              | Myxopyrum smilacifolium (Wall.) Blume | Anielabera | Root | Root extract, obtained by stone grinding, is mixed with rice water and taken two times a day after meal for 2 weeks. | Marma |
|        |              | Stahlianthus involucratus (King ex Baker) R. M. Smith | Kyokhiang | Rhizome | Extracted juice is mixed with rice water (1:3) then warmed, which is then taken orally a day till cure. | Khumi |
|        |              | Stephania japonica (Thunb.) Miers | Tuwangnoae | Leaf and root | Dried leaf and root powder is taken with honey thrice a day for 1 or 2 weeks. | Marma |
|        |              | Sida acuta (Burm. f.) Irwin & Barneby | Hankheuw | Root | Half cup extracted root juice is mixed with a table spoon of honey and taken twice a day for a month. | Khumi and Tripura |
| 12     | Bleeding due to cut, bullet wound | Mikania cordata (Burm. f.) Robinson | Mrakhawbow | Young and fresh leaves | Leaf paste is applied over the wounded area to stop haemorrhage. | Khumi, Marma and Tripura |
| 13     | Bleeding from nose | Mukia maderaspatana (L.) M. Roem. | Na Khongbu Nuai | Leaf | Paste, prepared by smashing the leaf, applied in nose directly. | Khumi, Marma and Tripura |
|        |              | Sida acuta Burm. f. | Woakhipini | Leaf | Inhaling smell of squeezed leaf. | Marma |
| 14     | Blood dysentery | Centella asiatica (L.) Urban | Mrangkuikhoa | Leaf | Juice is extracted by smashing leaf of this plant and *Psidium guajava* and then taken orally 3 times a day. | Khumi and Tripura |

30
| Sl. No. | Disease name | Species name | Local name | Parts used | Preparation process | User group         |
|--------|--------------|--------------|------------|------------|---------------------|--------------------|
| 15     | Blood purification | *Senna hirsuta* (L.) Irwin and Barneby | Painbowa | Puikaacha | Marma                | 7-10 days          |
| 16     | Body pain | *Aidia pseudospicata* Ridsdale | Chiesangda Afrue | Dikyakaling | Marma | 3 days          |
|        |              | *Gouania tiliaeolia* Lamk. | Lananowngnamya | Ayupuwin | Khumi | 7-10 days          |
|        |              | *Pedilanthus tithymaloides* Poit. | Murunah | Kiokonaoki | Marma | 3 days          |
| 17     | Body swelling | *Celosia cristata* L. | Krawmong Pal | Saiwang | Marma | 7 days          |
|        |              | *Spatholobus acuminatus* Benth. | Pownowai | Atowaaguin | Khumi | 7 days          |
| 18     | Boils | *Persicaria hydropiper* (L.)Spach | Mracheai | Achakachu | Marma | 7 days          |
| 19     | Bronchial asthma | *Myxopyrum smilacifolium* (Wall.) Blume | Anueilabera | Keuncherayua | Marma | 2 weeks         |
| 20     | Burn | *Bryophyllum pinnatum* (Lamk.) Oken | Rowkyapanpow | Naproking | Khumi | 2 weeks         |
|        |              | *Evolvulus nummularius* (L.) L. | Tamonai Kemonai | Dkyajuli Saiju | Khumi | 2 weeks         |
|        |              | *Hedyotis thomsoni* Hook.f. | Tasowpangpai | Angbow King | Khumi | 2 weeks         |
|        |              | *Mycetia longifolia* (Wall.) O. Kuntze | Taow | Mykanchi | Khumi | 3-5 times a day |

- Preparations are done by mixing the parts of the plants with water or honey.
- Dosages are typically for 7-10 days, depending on the condition.
- Plants are used both topically and orally.
- Some preparations involve boiling water with the plants.
- The table includes a mix of treatments for various ailments.
| Sl. No. | Disease name                     | Species name                                      | Local name               | Parts used | Preparation process                                                                 | User group               |
|--------|----------------------------------|---------------------------------------------------|--------------------------|------------|-------------------------------------------------------------------------------------|--------------------------|
|        |                                  | *Ocimum americanum* L.                            | Nuwboiw                  | Whole plant | Ash mixed with starch (starch extracted from rice) is used on sore.                   | Khumi and Marma          |
| 21     | Chest pain                       | *Trevesia palmata* (Roxb.) *Vis.*                 | Foba                     | Leaf       | Leaf paste is used externally during pain.                                            | Marma                    |
| 22     | Cold and cough (all ages)        | *Alpinia conchigera* Griff.                       | Padagra                  | Whole plant | Powder, produced from dried plant, is inhaled for 3-5 days.                          | Khumi and Tripura        |
|        |                                  | *Eupatorium ayapana* Vent.                        | Painhuni                 | Leaf       | Leaf juice is taken orally thrice a day for a week or two.                           | Marma                    |
|        |                                  | *Stahlianthus involucratus* (King ex Baker) R. M. Smith | Kyokhiang                | Whole plant | Juice extracted by rubbing in stone is mixed with water and taken orally thrice a day up to cure. | Marma                    |
|        |                                  | *Ocimum suave* Willd.                             | Mromahumbang             | Leaf       | Leaf juice, extracted by rubbing in stone, is taken twice a day for 3-5 days.       | Marma                    |
| 23     | Cold and cough of Children       | *Acorus calamus* L.                               | Langhi                   | Rhizome    | Rhizome powder is kept on head to inhale twice a day for 3-5 days.                   | Khumi, Marma and Tripura |
| 24     | Conjunctivitis                    | *Centella asiatica* (L.) *Urban*                 | Mrangkuikhoa            | Leaf       | Extracted leaf juice is filtered and then applied (3 drops) in the eye before sleep. | Khumi and Tripura        |
|        |                                  | *Leucas aspera* (Willd.) *Link*                   | Pai Thung Sa             | Whole plant | Juice extracted by boiling with water is applied in the eye thrice a day.             | Marma and Tripura        |
|        |                                  | *Thunbergia grandiflora* (Roxb. ex Rottler) *Roxb.* | Lawchowanowai           | Stem       | Stem sap drop is given in eyes twice a day                                           | Khumi, Marma and Tripura |
|        |                                  | *Solena amplexicaulis* (Lamk.) *Gandhi*           | Kumuuu                   | Leaf       | Leaf juice is used directly.                                                        | Khumi and Marma          |
|        |                                  | *Spermacoce latifolia* *Aublet*                   | Rowna                    | Leaf       | Affected eye is washed with the leaf juice for 2-3 times a day.                      | Tripura                  |
| 25     | Constipati                       | *Musa paradisiaca* L.                             | Maldinapiow             | Spathe     | Juice, extracted by smashing                                                          | Marma                    |
| Sl. No. | Disease name | Species name | Local name | Parts used | Preparation process | User group |
|---|---|---|---|---|---|---|
| 23 | Marma Khumi Tripura | *Rauvolfia serpentina* (L.) Benth. *ex Kurz* | Abomaraja | Root and leaf | Root: Juice, extracted by rubbing in stone is taken directly three times a day for 2 weeks; Leaf: Juice is extracted by smashing and taken directly as above dose. | Khumi |
| 24 | | | Mahaga | | |
| 25 | | | Khungchak | | |
| 26 | Cough | *Bryophyllum pinnatum* (Lamk.) Oken | Rowkyapanpow | Naproking Naproking | Leaf | Marma |
| 27 | | | Naproking | | |
| 28 | Any type of cut | *Clerodendrum indicum* (L.) O. Kuntze | Taratoba | Leaf and root | Roots and leaves are pasted separately and then taken with honey for 3 days. | Khumi, Marma and Tripura |
| 29 | | | Taratoba | | |
| 30 | | | Taratoba | | |
| 31 | | *Curcuma longa* L. | Nanhuo | Amchi | Extracted juice is mixed with salt, and then heated by dipping heated iron which is taken once a day up to cure. | Khumi, Marma and Tripura |
| 32 | | | Amchi | Sotowi | |
| 33 | | | Sotowi | Rhizome | |
| 34 | | *Leucas aspera* (Willd.) Link | Pai Thung Sa | Whole plant | Boiled juice mixed with salt and taken 3-4 times a day up to cure | Marma and Tripura |
| 35 | | | Whole plant | | |
| 36 | | | | | |
| 37 | | *Centella asiatica* (L.) Urban | Mrangkuikhoa | Achingkra | Heated leaf juice is mixed with salt and applied over the cut area in every 3-5 minutes. | Marma and Tripura |
| 38 | | | Achingkra | Sangsota | |
| 39 | | *Chromolaena odorata* (L.) King & Robinson | Pachi | Oila | Leaf paste is used over the cut area. | Khumi, Marma and Tripura |
| 40 | | | Oila | Khelaki | |
| 41 | | | Khelaki | Young leaf | |
| 42 | | *Combretum ternatum* (Wall. | Kyawnglongbai | Tancachupa | Leaf paste is used in the | Khumi, Marma and Tripura |
| 43 | | | Tancachupa | Mali | |
| 44 | | | Leaf | | |
| 45 | | | | | |
| Sl. No. | Disease name | Species name | Local name | Parts used | Preparation process | User group |
|--------|--------------|--------------|------------|------------|---------------------|------------|
| 28     | Cut in vein  | *Ficus hederacea* Roxb. | Atrosarchi | Leaf       | Leaf paste is applied over the cut area. | Marma      |
| 29     | Dandruff     | *Equisetum ramosissimum* Desf. | Piniacha | Acala      | Leaf paste is applied over the cut area. | Tripura    |
| 30     | Dehydration  | *Stahlianthus involucratus* (King *ex* Baker) R. M. Smith | Kyokhiang | Thithiksink | Juice extracted by rubbing in stone is mixed with water and taken orally thrice a day up to cure. | Marma      |
| 31     | Delivery problem | *Musa paradisiacal* L. | Maldinapiow | Kotikiw | Nigella sativa paste is applied on the forehead and then blow is given by mouth by the warm leaf blade in case of headache during delivery. | Khumi      |
|        |              | *Sida acuta* Burm. f. | Woakhipini | Chowkhodi | Paste rubbed on belly for early delivery. | Khumi      |
|        |              | *Curcuma longa* L. | Nanhuo | Amchi | Rhizome paste is applied over the whole body once a day for a week for early delivery. | Khumi, Marma and Tripura |
| 32     | Diarrhoea    | *Ixora cuneifolia* Roxb. | Kyamoachuie | Chi Shing Da Keu | Juice is mixed with water and taken orally twice a day for 3 days. | Marma      |
|        |              | *Mussaenda roxburghii* Hook. f. | Sungphaifla | Nakaling | For pain in teeth and mouth, root paste is used and/or chewing the root directly for 2-3 days. Root juice is taken twice a day for 2-3 days to treat diarrhoea. | Khumi, Marma and Tripura |
| Sl. No. | Disease name | Species name | Local name | Parts used | Preparation process | User group |
|--------|--------------|--------------|------------|------------|---------------------|------------|
| 33     | Dizziness of mothers after child birth | *Maesa indica* (Roxb.) A. DC. | Kramafruem Apang | Whole plant | After child birth, vapor-bath of the whole plant is taken for 2-3 days. | Khumi and Marma |
| 34     | Dog bite | *Pedilanthus tithymaloides* Poit. | Murunah | Leaf | Smashed leaf is used over the bite area. | Khumi |
| 35     | Dysentery | *Clerodendrum wallichii* Merr. | Teratebatholpow | Root | Juice extracted by rubbing root in stone is taken thrice a day until cure. | Khumi, Marma and Tripura |
|        |              | *Homalomena aromatica* (Roxb. ex Sim.) Schott | Sarangkang | Petiole | Petiole is burnt with chili and eaten with rice for 3-5 days. | Khumi |
|        |              | *Homalomena aromatica* (Roxb. ex Sim.) Schott | Sarangkang | Whole plant | Plant decoction is taken orally twice a day for a week. | Marma |
| 36     | Ear pain | *Campsis radicans* (L.) Seem. | Egro | Leaf | Warm leaf juice is given to the ear. | Khumi, Marma and Tripura |
|        |              | *Costus speciosus* (Koenig ex Retz.) Smith | Kraingtombol | Whole plant | Extracted juice is used in the ear twice a day for 2-3 days. | Khumi, Marma and Tripura |
|        |              | *Hoya parasitica* (Roxb.) Wall. ex Wight | Anuimeba | Leaf | Leaf juice is used in ear once a day during night for 7-10 days. | Khumi, Marma and Tripura |
|        |              | *Sida rhombifolia* L. | Owakhipena | Leaf | Juice extracted from warm leaf is put in ear during pain. | Marma |
|        |              | *Solanum torvum* Swartz | Kajaswe | Leaf | Leaf juice is put directly in the ear thrice a day for a week. | Khumi, Marma and Tripura |
| 37     | Eczema | *Pavetta tomentosa* Roxb. ex Smith | Waipoichipang | Leaf | Leaf paste is used over the affected area three times a day for a month. | Khumi, Marma and Tripura |
|        |              | *Senna alata* (L.) Roxb. | Pou Chi Bang | Leaf | Leaf paste is applied externally on the affected area. | Khumi, Marma and Tripura |
| 38     | Fever (all ages) | *Acacia farnesiana* (L.) Wild. | Waiya | Flower, leaf and root | Bath with leaf, flower and root boiled water for a week. | Khumi and Marma |
| Sl. No. | Disease name | Species name | Local name | Parts used | Preparation process | User group |
|--------|--------------|--------------|------------|------------|---------------------|------------|
|        |              | **Marma**    | **Khumí**  | **Tripura**|                     |            |
|        |              | Taratoba     | Taratoba   | Taratoba   | Roots and leaves are pasted separately and then taken with honey for 3 days. | Khumi, Marma and Tripura |
|        |              | Clerodendrum indicum (L.) O. Kuntze | | | | |
|        |              | Teratebathoipow | Terateba | Terateba | Bath with leaf-boiled water. | Khumi, Marma and Tripura |
|        |              | Curcuma longa L. | Nanhuo | Amchi | Dried rhizome is powdered and mixed with kerosene oil which is massaged in the hand and feet. | Khumi, Marma and Tripura |
|        |              | Musa paradisiacal L. | Maldinapiow | Kotikiw | Juice of this plant root and that of Papaya is mixed and given with rice- water to children three times a day for 3-5 days. | Khumi and Tripura |
|        |              | Mussaenda roxburghii Hook. f. | Sungphaifla | Nakaling | The Marma people rub the plant on body during Fever. The Khumi people use the boiled water with the plant for bathing to reduce body temperature. | Khumi and Marma |
|        |              | Sansevieria roxburghiana Schult.f. | Neingsha | Neingsha | Affected person should have a bath with boiled water of whole plant. | Khumi, Marma and Tripura |
|        | Fever (Child) | Clausena suffruticosa (Roxb.) Wight & Arn. | Sagrauchong | Ouichiking | Juice, extracted by rubbing in stone, is sponged by cotton and applied over the forehead. | Khumi and Marma |
|        |              | Flemingia stricta Roxb. | Krangdunaduepay | Tamatamaking | Bath with whole plant boiled water. | Marma |
|        |              | Flemingia stricta Roxb. | Krangdunaduepay | Tamatamaking | Leaf-boiled water is used for shower. | Khumi |
|        | Fever blister | Premna esculenta Roxb. | Kramurauh | Ankungna | Leaf paste prepared by rubbing in stone is given over the sore. | Khumi and Marma |
|        | Food | Blumea balsamifera DC. | Sarakodung | Predangpul | Leaf ash, prepared by | Khumi, |
| Sl. No. | Disease name | Species name | Local name | Parts used | Preparation process | User group |
|---------|--------------|--------------|------------|------------|---------------------|------------|
|         |              |              | Marma      |            |                     |            |
|         |              |              | Khumi      |            |                     |            |
|         |              |              | Tripura    |            |                     |            |
|         | poisoning    | Diplazium esculentum (Retz.) Sw. | Graigadow | Angskay | Moikhondoi | Leaf decoction is taken thrice a day for 2-3 days. | Khumi, Marma and Tripura |
| 42  | Foot tumor   | Angiopteris evecta (Forst) Hoffm. | Chagkathe | Angskkepoi | Asojaly | Rhizome paste is used over the tumor 3 times a day for 3-5 days. | Khumi and Marma |
| 43  | Foot wound   | Angiopteris evecta (Forst) Hoffm. | Chagkathe | Angskkepoi | Asojaly | Rhizome juice, extracted by stone grinding, is used over the wounded area. | Khumi and Marma |
| 44  | Fungal infection | Hedyotis scandens Roxb. | Anuwaishoweatha | Anwaichi | Whole plant | Warm mash of whole plant is used over the affected area twice a day for a week. | Khumi, Marma and Tripura |
| 45  | Gastric      | Breynia retusa (Dennst.) Alston | Rownee | Aghkamchi | Satamsakatoma | Whole plant | Juice prepared by rubbing in stone is taken directly. | Tripura |
| 46  |             | Blumea balsamifera DC. | Sarakodung | Predangpul | Khunnama | Leaf | Leaf ash, prepared by burning is mixed with lemon and table salt, and is taken orally thrice a day for a week. | Khumi, Marma and Tripura |
| 47  |             | Croton bonplandianus Baill. | Painujaw | Leunke | Khubambam | Root | Root juice, extracted by rubbing in stone, is taken once a day for a week. | Khumi and Marma |
| 48  |             | Ocimum tenuilorum L. | Chaprang | Leongkede | Zeipra | Young leaf | Juice of young leaves and shoots is taken directly twice a day for 3-5 days. | Khumi, Marma and Tripura |
| 49  |             | Scoparia dulcis L. | Dungangja | Daesikhlu | Samthangso | Whole plant | Juice of whole plant is taken thrice a day for a week. | Khumi, Marma and Tripura |
| 50  |             | Solanum violaceum Ortega | Kajoishi | Empaithai | Khankha | Root | Root extract obtained by rubbing in stone is mixed with rice water and taken orally twice a day for 4-5 days. | Khumi, Marma and Tripura |
| Sl. No. | Disease name | Species name  | Local name | Parts used | Preparation process | User group               |
|--------|--------------|---------------|------------|------------|---------------------|--------------------------|
|        |              | *Tinospora cordifolia* (Willd.) Hook. f. & Thoms. | Marma: Sikri; Khumi: Ajunkanumbe; Tripura: Sikri | Root | Pill prepared by smashing root is dried and taken orally thrice a day up to cure. | Khumi and Marma          |
|        |              | *Zingiber capitatum* Roxb. | Marma: Phalago; Khumi: Pennih; Tripura: Blomoshla | Rhizome | Hot red iron is dipped in rhizome juice and taken orally twice a day for a week. | Khumi, Marma and Tripura |
|        |              | *Combretum ternatum* (Wall. ex Clarke) O. Lecompte | Marma: Kyawnglongbai; Khumi: Tancachupa; Tripura: Mali | Leaf | Leaf infusion, extracted by boiling, is taken orally twice a day for a week. | Khumi, Marma and Tripura |
| 46     | Gonorrhea    | *Peristylus constrictus* (Lindl.) Lindl. | Marma: Chemmodoh; Khumi: Nantho; Tripura: Kuthmai | Whole plant | One cup of whole-plant boiled water is taken once a day after dinner for 7-10 days. | Khumi, Marma and Tripura |
| 47     | Gum problem | *Breynia retusa* (Dennst.) Alston | Marma: Rownee; Khumi: Aghkamchi; Tripura: Satamsakatoma | Whole plant | Gurgle by the whole-plant boiled water. | Khumi and Marma          |
| 48     | Headache    | *Musa paradisiaca* L. | Marma: Maldinapiow; Khumi: Kotikiw; Tripura: Thaileenow | Leaf | Nigella sativa paste is applied on the forehead and then blow is given by mouth by the warm leaf blade in case of headache during delivery. | Khumi                     |
|        | Headache    | *Ageratum conyzoides* L. | Marma: Achowneshhi; Khumi: Khulaacha; Tripura: Channama | Whole plant | Plant paste mixed with zinger is applied over the forehead. | Khumi                     |
|        | Headache    | *Alpinia conchigera* Griff. | Marma: Padagra; Khumi: Daichikachoy; Tripura: Padagra | Rhizome | Juice, extracted by smashing, is used in eye during headache. | Marma                     |
|        | Headache    | *Bryophyllum pinnatum* (Lamk.) Oken | Marma: Rowkyapanpow; Khumi: Naproking; Tripura: Naproking | Leaf | Leaf paste applied over forehead. | Marma                     |
|        | Headache    | *Campsis radicans* (L.) Seem. | Marma: Egro; Khumi: Achama; Tripura: Achachuloi | Leaf | Leaf paste is applied externally over forehead. | Marma                     |
|        | Headache    | *Cyathula prostrata* (L.) Blume | Marma: Nairang; Khumi: Acharpue; Tripura: Chakka | Root | Root paste is used over forehead. | Marma                     |
|        | Headache    | *Helminthostachys zeylanica* (L.) Hook. | Marma: Choimakhankre; Khumi: Achakhungpui; Tripura: Singraiajong | Rhizome and fronds | Paste mixed with honey is taken orally 2 times a day for 2-3 days. | Khumi and Marma |
|        | Headache    | *Lantana camara* L. var. | Marma: Achownai; Khumi: Moichiacha; Tripura: Khelakhemows | Leaf | Leaf paste is used in the | Marma                     |
| Sl. No. | Disease name                           | Species name                          | Local name    | Parts used | Preparation process                                                                 | User group                  |
|--------|---------------------------------------|---------------------------------------|---------------|------------|-------------------------------------------------------------------------------------|-----------------------------|
|        |                                       | Marma                                 | Khumi         | Tripura    |                                                                                      |                             |
| 39     | Marma Khumi Tripura                   | *Leucas aspera* (Willd.) Link          | Pai Thung Sa  | Whole plant| Decoction of whole plant is taken orally thrice a day for three days.                | Khumi and Marma             |
| 49     | Increase in pancreas                  | *Lygodium altum* (Clarke) v. A. v. R. | Miaumakia     | Kolomboi   | Mukhratala | Frond extract or the raw juice prepared by smashing is taken orally during headache. | Khumi and Tripura           |
| 50     | Indigestion                           | *Maesa indica* (Roxb.) A. DC.         | Kramafruem Apang | Dikyanang | Balai Whole plant | After child birth, vapor-bath of the whole plant is taken for 2-3 days. | Khumi and Marma             |
| 51     | Insect bite                           | *Amorphophallus bulbifer* (Roxb.) Blume | Gongkhanpang  | Ineki     | Batyma Bulbil | Bulbil slice is used over the affected area.                                      | Khumi and Marma             |
| 52     | Insomnia                              | *Leucas zeylanica* (L.) R. Br.        | Paishumchawg  | Achasutang | Khun | Leaf and flower boil extract is used over the forehead. Drinking green leaf juice is good for sleep. | Khumi, Marma and Tripura   |

*Leucas aspera* (Willd.) Link, *Leucas zeylanica* (L.) R. Br., *Lygodium altum* (Clarke) v. A. v. R., *Maesa indica* (Roxb.) A. DC., *Typhonium trilobatum* (L.) Schott, *Blumea balsamifera* DC., *Centella asiatica* (L.) Urban, *Amorphophallus bulbifer* (Roxb.) Blume, *Zephyranthes grandiflora* Lindl.
| Sl. No. | Disease name | Species name | Local name | Parts used | Preparation process | User group |
|--------|--------------|--------------|------------|------------|---------------------|------------|
| 53 | Itching | Attylosia scarabaeoides (L.) Baker | Noemuie | Leaf | Leaf boiled water is used for bathing for a week. | Khumi and Marma |
| | | Clerodendrum viscosum Vent. | Khumejaie | Whole plant and root | Bath with plant and root boiled water. | Khumi and Marma |
| | Persicaria hydropiper (L.)Spach | Mracheai | Achakachu | Sathaimcho | Leaf | Marma |
| | Scoparia dulcis L. | Dungangja | Daesikhlu | Samthangso | Whole plant | Paste, prepared by smashing, is used over the itching area. | Khumi and Marma |
| 54 | Jaundice | Begonia silhetensis (A. DC.) C. B. Clarke | Kiowkhai | Leaf | Extracted leaf juice is taken orally twice a day for a week or leaf is cooked with hill crab and then taken. | Khumi, Marma and Tripura |
| | | Cissus repens Lamk. | Waronkoi | Arori | Mukhopape | Young shoot | Young tender shoot is used to make soup with hill crab. | Khumi, Marma and Tripura |
| | | Desmodium triquetrum (L.) DC. subsp. auriculatum (DC.) Prain | Pawlogy | Chiakiniacha | Blongmykongda | Root | Juice prepared by squeezing roots is mixed with cold water, which is taken twice a day for a week. | Khumi and Marma |
| 55 | Joint pain | Equisetum ramosissimum Desf. | Pinlacha | Acala | Shachuri | Stem | Heated stem is bound over the joint. | Khumi, Marma and Tripura |
| | Persicaria hydropiper (L.)Spach | Mracheai | Achakachu | Sathaimcho | Leaf | Marma |
| | | | | | Leaf is smashed to produce juice which is taken twice a day for a week. | Marma |
| 56 | Large spleen | Drynaria quercifolia (L.) J. Sm. | Fulunobah | Chee Fulu | Nao Oi | Rhizome | Pills made from rhizome powder and sugar is taken twice a day for seven days. | Khumi and Marma |
| 57 | Less sleep | Centella asiatica (L.) Urban | Mrangkuikhoa | Achingkra | Sangsota | Leaf | Leaf juice, mixed with water | Marma |
| Sl. No. | Disease name                          | Species name                            | Local name               | Parts used | Preparation process                                                                 | User group                     |
|--------|--------------------------------------|-----------------------------------------|--------------------------|------------|-------------------------------------------------------------------------------------|--------------------------------|
| 58     | Lice in hair                          | Scoparia dulcis L.                      | Dungangja               | Whole plant | Juice of whole plant is taken thrice a day.                                          | Marma, Khumi, and Tripura     |
| 59     | Liver diseases                        | Clerodendrum viscosum Vent.             | Khumejaie               | Leaf       | Hair washes with leaf boiled water.                                                  | Khumi                          |
| 59     | Liver diseases                        | Flemingia stricta Roxb.                 | Krangdunaduepay         | Root       | Paste prepared by smashing roots is used over chest for half an hour. This is practiced for 2-3 times a day for a month. | Tripura                       |
| 60     | Menstrual problem (Excessive menstruation) | Gouania tiliifolia Lamk.               | Lananowngnamya          | Whole plant | Plant juice is taken with water (before meal) twice a day for 5-7 days.              | Marma, Khumi, and Tripura     |
| 61     | Menstrual problem (Irregular menstruation) | Bauhinia acuminata L.                  | Thankhrapru             | Root and flower | Juice, prepared by smashing root and flower, is taken before menstruation, once a day for a week. | Khumi, Marma and Tripura     |
|        |                                      | Celosia cristata L.                    | Krawmong Pai            | Root       | Paste or juice, extracted by rubbing the root in stones, is taken orally thrice a day for a week. | Tripura                       |
|        |                                      | Flemingia macrophylla (Willd.) O. Kuntze ex Merr. | Sangnemro               | Root       | Root extract obtained by grinding in stone is taken orally thrice a day for 5-7 days. | Marma, Khumi, and Tripura     |
|        |                                      | Ixora cuneifolia Roxb.                 | Kyamoachuie             | Root       | Extracted root juice is taken directly twice a day for a week.                      | Marma                          |
|        |                                      | Pentapetes phoencea L.                 | Moide khowra            | Root       | Root juice, extracted through rubbing in stone, is taken twice a day for a week.    | Marma                          |
| 62     | Paralysis                             | Ageratum conyzoides L.                 | Achowneshhi             | Whole      | Pouillice with warm plant over Khumi                                                | Khumi                          |
| Sl. No. | Disease name    | Species name                                      | Local name | Parts used | Preparation process                                           | User group               |
|--------|-----------------|---------------------------------------------------|------------|------------|--------------------------------------------------------------|--------------------------|
| 63     | Rheumatic pain  | Aidia pseudospicata Ridsdale                      | Chiesangda Aфрue Dikyakaling | Leaf       | Heated leaf is used over the pained area during pain.       | Tripura                  |
|        |                 | Clerodendrum indicum (L.) O. Kuntze               | Taratoba    | Taratoba   | Taratoba Leaf and root extracts are taken directly thrice a day for 5-7 days. | Khumi, Marma and Tripura |
|        |                 | Lantana camara L. var. aculeata (L.) Moldenke & Moldenke | Achownai    | Moichiacha | Khelakhemows ugnama Leaf                                     | Khumi                    |
|        |                 | Merremia umbelliate (L.) Hallier f.               | Thamangnoway Apheajong | Bangphenophu | Flower                                        | Marma                    |
| 64     | Ringworm        | Acacia farnesiana (L.)Willd.                      | Waiya       | Hoiaki     | Awaia Flower, leaf and root                                | Khumi and Marma          |
|        |                 | Hedyotis scandens Roxb.                           | Anuwaishoweatha | Anwaichi | Whole plant Warm mash of whole plant is used over the affected area twice a day for a week. | Khumi, Marma and Tripura |
|        |                 | Smilax laurifolia L.                              | Khraikodow  | Angwajong  | Sowgsowgra Root Taking bath by root boiled water for a week. | Khumi, Marma and Tripura |
| 65     | Scanty urination| Drynaria quercifolia (L.) J. Sm.                  | Fulunobah   | Chee Fulu  | Nao Oi Rhizome Peeled rhizome is chewed with sugar three times a day for 3-5 days. | Marma                    |
| 66     | Senseless       | Lygodium altum (Clarke) v.A.V.R.                 | Miaumakla   | Kolomboi   | Mukhratala Root Used as ingredients in another composition mixed with turmeric juice @ I:I and spray over the face. | Marma                    |
| 67     | Snake bite      | Maesa ramentacea (Roxb.) A. DC.                   | Chupru      | Taiokatti  | Kotoma Leaf Affected area is covered with leaves that will remove venom. | Khumi, Marma and Tripura |
|        |                 | Ophiorrhiza mungos L.                             | Chiesaida-anie | Chiesaida- kamchi | Chiesaida-anie Leaf                                        | Marma                    |
| 68     | Sore            | Celosia cristata L.                              | Krawmong Pal Saiwang | Khongcha | Dried flower Smashed flower is used over the belly and swollen area. | Marma                    |
| Sl. No. | Disease name | Species name | Local name | Parts used | Preparation process | User group |
|--------|--------------|--------------|------------|------------|---------------------|------------|
|        |              | Dalbergia stipulacea Roxb. | Nuwhrei | Youngyonking | Dulela | Fruit and leaf is used to make paste, and that is used over the affected area. | Khumi, Marma and Tripura |
|        |              | Geodorum citrinum Jack. | Chemro | Doamia | Khulairu | Extracted juice, by rubbing bulb in stone, is applied over the affected area for a week. | Khumi, Marma and Tripura |
|        |              | Leea aequata L. | Dow | Akley Thai | Changklenma | Root and leaf paste is applied in the affected area | Khumi, Marma and Tripura |
|        | Parabaena sagittata Mierse Hook.f. & Thoms. | Gaidiaanowai | Muipungpou | Angkala | Leaf | Leaf paste is applied over the affected area. | Marma |
|        | Sida acuta Burm. f. | Woakhipini | Chowkhodi | Mrang | Young plant | Paste applied over the sore. | Tripura |
|        | Tournefortia roxburghii C.B. Clarke | Kraushow | Asaphaiacha | Kalasona | Leaf | The dried leaf is thrashed and used directly. | Marma |
|        | Cyathula prostrata (L.) Blume | Nairang | Achapruce | Chakka | Leaf/young shoot | Paste of leaf or shoot is applied over the sore. | Khumi and Tripura |
| 69     | Spermatorrhеa | Drynaria quercifolia (L.) J. Sm. | Fulunobah | Chee Fulu | Nao Oi | Peeled rhizome is chewed with sugar three times a day for 3-5 days. | Marma |
| 70     | Stomachache | Aglaonema hookerianum Schott | Cshekhow | Lykho | Hathankhiethok | Extracted spathe juice (two table spoon) taken orally twice a day for 2-3 days. | Khumi, Marma and Tripura |
|        |               | Clausena suffruticosa (Roxb.) Wight & Arn. | Sagrauchong | Ouichiking | Sangtakkhing | Rice water mixed with root juice is taken orally thrice a day up to cure. | Khumi and Marma |
|        |               | Curcuma longa L. | Nanhuo | Amchi | Sotowi | A mixture is prepared with the rhizome paste, lime and ash, which is taken orally thrice a day during pain. | Khumi, Marma and Tripura |
|        |               | Leucas aspera (Willd.) Link | Pai Thung Sa | Whole plant | Decoction of whole plant is taken orally thrice a day for three days. | Khumi and Marma |
|        |               | Ocimum tenuillorum L. | Chaprang | Leongkede | Zeipra | Juice of young leaves and shoots is taken directly twice | Khumi, Marma and Tripura |
| Sl. No. | Disease name | Species name | Local name | Parts used | Preparation process | User group |
|--------|--------------|--------------|------------|------------|---------------------|------------|
|        |              | Ophiorrhiza mungos L. | Chiesaida-anie | Root | a day for 3-5 days. | Tripura |
|        |              | Phyllanthus niruri L. | Maginoai | Root | Root paste is taken thrice a day for 3 days. | Khumi |
|        |              | Rauvolfia serpentina (L.) Benth. ex Kurz | Abomaraja | Root, leaf and flower | Pill, prepared by smashing the root and garlic, is taken orally once a day up to cure. | Marma and Tripura |
|        |              | Scoparia dulcis L. | Dungangja | Leaf | Leaf juice is taken directly twice a day for 3 days. | Tripura |
|        |              | Tinospora cordifolia (Willd.) Hook. f. & Thoms. | Sikri | Root | Pill prepared by smashing root is dried and taken orally thrice a day up to cure. | Khumi and Marma |
|        |              | Zingiber montanum (Koen.) Dietr. | Pele | Rhizome | Rhizome juice mixed with hot water and salt is taken orally once a day for 2-3 days. | Marma and Tripura |
| 71     | Stone in urinary gland | Jasminum sambac (L.) Ait. | Kyalungpai | Root | Root juice (1/2 cup) mixed with honey taken twice a day for a month for stone formation. | Khumi |
| 72     | Stone in gall bladder, kidney, urinary gland | Evolvulus nummularius (L.) Aublet | Tamonai Kemonai | Whole plant | Plant portions boiled with water and taken as drink twice a day for 1-2 weeks. | Khumi, Marma and Tripura |
| 73     | Stop excess bleeding after child birth | Adiantum caudatum L. | Jogemuchoi | Leaf | Leaf juice (Half cup) extracted by smashing is given to mother thrice a day for 2-3 days. | Khumi, Marma and Tripura |
| 74     | Swelling | Spermacoce latifolia Aublet | Rowna | Young leaf | Smashed leaf is used in the | Khumi |

44
| Sl. No. | Disease name                      | Species name                        | Local name       | Parts used        | Preparation process                                                                 | User group                      |
|--------|-----------------------------------|-------------------------------------|------------------|-------------------|--------------------------------------------------------------------------------------|---------------------------------|
| 75     | Swollen legs and ankles           | *Mimosa pudica* L.                  | Hrapaing Ange    | Changlachi Leaf, root and flower          | Boiled water with leaf, root and flower is used for bathing for 3-5 days.               | Marma                           |
| 76     | Swollen vein                      | *Leea aequata* L.                   | Dow Akley Thai   | Changklenma Root and young leaf           | Root and leaf paste is applied in the affected area                                   | Khumi, Marma and Tripura        |
| 77     | Syphilis                          | *Peristylus constrictus* (Lindl.) Lindl. | Chemmodoh Nantho | Kuthmai Whole plant              | One cup of whole-plant boiled water is taken once a day after dinner for 7-10 days.    | Khumi, Marma and Tripura        |
| 78     | Taste disorder                    | *Commelina diffusa* Burm. f.        | Wakrewakrai Andeochi Moikhnai Young leaf | Boiled tender leaves are taken as an appetiser.                  |                                                                                     | Khumi, Marma and Tripura        |
| 79     | Throat pain due to cold           | *Senna obtusifolia* (L.) Irwin & Barneby | Hankheuw Puikache Muiktoima Root | Root Juice, extracted by rubbing in stone, is taken thrice a day for a week.  |                                                                                     | Marma                           |
|        |                                   | *Tabernaemontana divaricata* (L.) R. Br. ex Roem. & Schult. | Tachhowro Ayungkew Chuantoi Root | Root is kept in mouth during pain.          |                                                                                     | Marma                           |
|        |                                   | *Tabernaemontana divaricata* (L.) R. Br. ex Roem. & Schult. | Tachhowro Ayungkew Chuantoi Root | Leaf Leaf is kept in mouth during pain.      |                                                                                     | Khumi and Tripura               |
|        |                                   | *Tabernaemontana recurva* Roxb.     | Tasaru Ambuace Lamacha Root | Root Root is kept in mouth during pain.          |                                                                                     | Khumi and Tripura               |
| 80     | To avoid pregnancy                | *Crotalaria pallida* Ait.           | Cholloi Acha Akling Rui Chowly Root | Root Root is tied with the naval of the female during sex. |                                                                                     | Khumi, Marma and Tripura        |
| 81     | To gain sense                     | *Clausena suffruticosa* (Roxb.) Wight & Arn. | Sagrauchong Ouichiking Sangtakkhing Whole plant | Powder of the dried whole plant is mixed with water, and that is sprayed over the face to get sense. |                                                                                     | Khumi and Marma                 |
| 82     | To increase breast milk           | *Ichnocarpus frutescens* (L.) R. Br. | Suotalangning Katnayong Duabotai Leaf and shoot | Chicken soup prepared with leaf and shoot as ingredients is taken twice a day for 3-5 days. |                                                                                     | Khumi and Tripura               |
| Sl. No. | Disease name          | Species name                        | Local name           | Parts used | Preparation process                              | User group             |
|--------|-----------------------|-------------------------------------|----------------------|------------|--------------------------------------------------|------------------------|
| 83     | Tonsillitis           | *Ixora cuneifolia* Roxb.            | Kyamoachuie          | Root       | Root paste is spread over the area for 7 days.   | Khumi                  |
| 84     | Tooth and mouth pain | *Mussaenda roxburghii* Hook. f.     | Sungphaifa           | Root       | Root paste is used and/or chewing the root directly for 2-3 days. | Khumi, Marma and Tripura |
|        |                       | *Breynia retusa* (Dennst.) Alston   | Rownee               | Samuimu    | Gurgle by the whole plant boiled water.          | Khumi and Marma        |
| 85     | Under arm sore        | *Melastoma malabathricum* L.        | Sayme                | Root paste is used and/or chewing the root directly for 2-3 days. | Khumi and Marma |
| 86     | Urine infection       | *Jasminum sambac* (L.) Ait.         | Kyalungpai           | Malikum    | Root paste is used over the wound area for 3-4 days. | Khumi                  |
|        |                       | *Maranta arundinacea* L.            | Fawraiou             | Thalairu   | Rhizome juice extract by smashing is taken by mixing with root extract of mango and banana tree. | Khumi, Marma and Tripura |
| 87     | Vomiting              | *Ixora cuneifolia* Roxb.            | Kyamoachuie          | Root       | Root juice is taken orally after vomiting.       | Tripura                |
|        |                       | *Amaranthus spinosus* L.            | Hankhala             | Moinchu    | Root juice, extracted by rubbing in stone, is mixed with rice water and taken orally after vomiting. | Khumi, Marma and Tripura |
| 88     | Weakness              | *Desmodium triquetrum* (L.) DC, subsp. auriculatum (DC.) Prain | Pawlogy              | Blongmykongda | Root is used with tea. | Tripura |
| 89     | Wound                 | *Centella asiatica* (L.) Urban      | Mrangkuikhoa         | Achingkra  | Heated leaf juice is mixed with salt and applied over the wound area in every 3-5 minutes. | Marma and Tripura |
|        |                       | *Chromolaena odorata* (L.) King & Robinson | Pachi               | Khelaki    | Leaf paste is used over the wounded area.        | Khumi, Marma and Tripura |
|        |                       | *Dalbergia stipulacea* Roxb.        | Nuwhrei              | Youngyonking | Fruit and leaf is used to make paste, and that is used over the affected area. | Khumi, Marma and Tripura |
|        |                       | *Gouania tiliatifolia* Lamk.        | Lananowngnamya       | Ayupuwin   | Paste prepared by smashing                       | Khumi                  |
| Sl. No. | Disease name      | Species name       | Local name         | Parts used          | Preparation process                                                                 | User group               |
|--------|-------------------|--------------------|--------------------|---------------------|-------------------------------------------------------------------------------------|--------------------------|
|        |                   | *Hedyotis thomsoni* Hook.f. | Tasowpangpai         | Leaf, root and stem | Leaf juice is used to wash eyes.                                                      | Tripura                  |
|        |                   |                     | Angbow King          |                     |                                                                                      |                          |
|        |                   |                     | Mawblaikrwma         |                     |                                                                                      |                          |
| 90     | Wound on eye      | *Hedyotis thomsoni* Hook.f. | Tasowpangpai         | Leaf                | Leaf juice is taken orally thrice a day for a week.                                  | Khumi, Marma and Tripura |
|        |                   |                     | Angbow King          |                     |                                                                                      |                          |
|        |                   |                     | Mawblaikrwma         |                     |                                                                                      |                          |
|        |                   | *Staurogyne argentea* Wall. | Rowmbong             | Leaf                |                                                                                      |                          |
| 91     | Wounds in hands and legs |                     | Pawmoui             |                     |                                                                                      |                          |
|        |                   |                     | Towmaorai           |                     |                                                                                      |                          |
|        |                   |                    |                     |                     | the whole plant is used over the wounded area.                                       | Marma and Tripura        |
It was exposed that out of 116 species, Marma community used the highest number of species (98), followed by Khumi (84) and Tripura (67) to treat different diseases, though some species were used by more than one community. It was also revealed that the above mentioned three communities commonly used 52 species (Fig. 4).
4. CONCLUSION

It is very unfortunate that limited work has been done so far by the natural scientists to document the TK of the THs about their healing practices of Bangladesh and hence we need to take some measures for protection of this knowledge. Conservation of rare and important medicinal plants through ex-situ and in-situ conservation might be the best mode of protection. Organized motivational and awareness raising campaign for local people should be conducted. On the other hand, training should be provided to the local farmers about nursery and plantation techniques on medicinal plants to get good results. Formation of a social-knowledge-service-network between the THs and other stakeholders will help to protect the TK related to medicinal plants.
CONSENT
Not applicable.

ETHICAL APPROVAL
Not applicable.

ACKNOWLEDGEMENT
Authors would like to thank the knowledge providers of Bolipara for sharing valuable information. All-out support of the colleagues of Bolipara Nari Kalyan Somity (BNKS), Bandarban during the field survey is acknowledged. Special note of thanks are due to Keidanren Nature Conservation Fund (KNCF) for funding this activity under their supported project titled, “Conservation through Practice: conservation of medicinal plants and TK by involving ethnic communities”. Thanks are also due to IUCN for its support in conducting the study. The views expressed here are the authors’ own, and not necessarily reflect that of IUCN or BNKS or KNCF.

COMPETING INTERESTS
Authors have declared that no competing interests exist.

REFERENCES
1. Motaleb MA, Hossain MK, Alam MK, Mamun MMAA, Sultana M. Commonly used Medicinal Herbs and Shrubs by Traditional Herbal Practitioners: Glimpses from Thanchi upazila of Bandarban. IUCN (International Union for Conservation of Nature), Dhaka, Bangladesh. 2013:i-xii + 294.
2. Ghani A. Medicinal Plants of Bangladesh: Chemical Constituents and Uses. Asiatic Society of Bangladesh, Dhaka. 1998:460.
3. Khan MSI, Mannan MA, Chowdhury MTI. Medicinal Plants Conservation through Community Participation. IUCN Bangladesh Country Office, Dhaka, Bangladesh. 2005:x+46.
4. Yusuf M, Chowdhury JU, Wahab MA, Begum J. Medicinal Plants of Bangladesh. Bangladesh Council of Scientific and Industrial Research, Dhaka 1205, Bangladesh. 1994:340.
5. Motaleb MA. Approaches to Conservation of Medicinal Plants and Traditional Knowledge: A Focus on the Chittagong Hill Tracts. IUCN (International Union for Conservation of Nature), Bangladesh Country Office, Dhaka, Bangladesh. 2010:viii+30.
6. Alam MK. Medical Ethnobotany of the Marma Tribe of Bangladesh. Economic Botany. 1992;46(3):330-335.
7. Khan NA, Alam MK, Khisha SK (eds.). Farming Practices and Sustainable Development in the Chittagong Hill Tracts. Chittagong Hill Tracts Development Board, Government of Bangladesh, Village Farm Forestry Project, Intercoperation. 2002:272.
8. Srivastava SC, Rout N. Some Plants of Ethno-pediatric Importance in Koraput Orissa. Bull. Bot. Surv. Ind. 1994;36(1-4):166-168.
9. Parkash JW, Raja RDA, Anderson NA, Williams C, Regini GS, Bensar K, Rajeev R, Kiruba S, Jeeva S, Das SMS. Ethnomedicinal Plants used by Kani Tribes of Agasthiyarmalai Biosphere Reserve, Southern Western Ghats. Indian Journal of Traditional Knowledge. 2008;7(3):410-413.
10. Srivastava RC, Adi Community. Traditional Knowledge of Adi Tribe of Arunachal Pradesh on Plants. Indian Journal of Traditional Knowledge. 2009;8(2):146-153.
11. Zheng XL, Xing FW. Ethnobotanical study on medicinal plants around Mt. Yinggeling, Hainan Island, China. Journal of Ethnopharmacology. 2009;124:197-210.
12. Telefo PB, Lienou LL, Yemele MD, Lemfack MC, Mouokeu C, Goka CS, Tagné SR, Moundipa FP. Ethnopharmacological survey of plants used for the treatment of female infertility in Baham, Cameroon. Journal of Ethnopharmacology. 2011;136:178-187.
13. Rehecho S, Uriarte-Pueyo I, Calvo J, Vivas LA, Calvo MI. Ethnopharmacological survey of medicinal plants in Nor-Yauyos, a part of the Landscape Reserve Nor-Yauyos-Cochas, Peru. Journal of Ethnopharmacology. 2011;133:75-85.
14. Ayanar M, Ignacimuthu S. Ethnobotanical survey of medicinal plants commonly used by Kani tribes in Tirunelveli hills of Western Ghats, India. Journal of Ethnopharmacology. 2011;102:243-255.
15. Sargin SA, Akiocek E, Selvi S. An ethnobotanical study of medicinal plants used by the local people of Alaşehir (Manisa) in Turkey. Journal of Ethnopharmacology. 2013;150(3):860-874.
16. Ullah M, Khan MU, Mahmood A, Malik RN, Hussain M, Wazir SM, Daud M, Shinwari ZK. An ethnobotanical survey of indigenous medicinal plants in Wana district south Waziristan agency, Pakistan. Journal of Ethnopharmacology. 2013;150(3):918-924.

17. Hasan MA, Khan MS. Ethnobotanical records in Bangladesh-1. Plants used for healing fractured bones. J. Asiatic Soc. Bangladesh (Sci). 1986;12(1-2):33-39.

18. Uddin MG, Mirza MM, Pasha MK. The Medicinal Uses of Pteridophytes of Bangladesh. Bangladesh Journal of Plant Taxonomy. 1998;5(2):29-41.

19. Uddin MZ, Hasan MA, Sultana M. Ethnobotanical Survey of Medicinal Plants in Phulbari Upazila of Dinajpur District, Bangladesh. Bangladesh Journal of Plant Taxonomy. 2006;13(1):63-68.

20. Uddin MZ, Hassan MA, Rahman M, Arefin K. Ethno-Medicobotanical Study in Lawachara National Park, Bangladesh. Bangladesh Journal of Botany. 2012;41(1):97-104.

21. Yusuf M, Wahab MA, Chowdhury JU, Begum J. Ethno-medico-botanical Knowledge from Kaukhal Proper and Betbunia of Rangamati District, Bangladesh. Bangladesh Journal of Plant Taxonomy. 2006;13(1):55-61.

22. Yusuf M, Wahab MA, Chowdhury JU, Begum J. Some Tribal Medicinal Plants of Chittagong Hill Tracts. Bangladesh Journal of Plant Taxonomy. 2007;14(2):117-128.

23. Partha P, Hussain ABME. Ethnobotanical Investigation into the Mandi Ethnic Community in Bangladesh. Bangladesh Journal of Plant Taxonomy. 2007;14(2):129-145.

24. Rahman MA, Uddin SB, Wilcock CC. Medicinal Plants used by Chakma Tribe in Hill Tracts Districts of Bangladesh. Indian Journal of Traditional Knowledge. 2007;6(3):508-517.

25. Roy S, Uddin MZ, Hassan MA, Rahman MM. Medico-Botanical Report on the Chakma Community of Bangladesh. Bangladesh Journal of Plant Taxonomy. 2008;15(1):67-72.

26. Rahmatullah M, Ferdausi D, Mollik AH, Jahan R, Chowdhury MH, Haque WM. A survey of medicinal plants used by Kavirajes of Chalna area, Khulna district, Bangladesh. African Journal of Traditional, Complementary and Alternative Medicine. 2010;7:91-97.

27. Rahmatullah M, Mollik AH, Rahman S, Hasan N, Agarwala B, Jahan R. A medicinal plant study of the Santal tribe in Rangpur district, Bangladesh. African Journal of Traditional, Complementary and Alternative Medicine. 2010a;16:419-425.

28. Rahmatullah M, Chakma P, Paul AK, Nasrin D, Ahmed R, Jamal F, Ferdausi D, Akber M, Nahar N, Ahsan S, Jahan R. A survey of preventive medicinal plants used by the Chakma residents of Hatimara (south) village of Rangamati district, Bangladesh. American-Eurasian Journal of Sustainable Agriculture. 2011;5(1):92-96.

29. Rahmatullah M, Khutun Z, Hasan A, Parvin W, Moniruzzaman M, Khutun A, Mahal MJ, Bhuiyan MSA, Mou SM, Jahan R. A survey and scientific evaluation of medicinal plants used by the Pahan and Teli tribes of Natore district, Bangladesh. African Journal of Traditional, Complementary and Alternative Medicines. 2012;9(3):366-373.

30. Motaleb MA. Selected Medicinal Plants of Chittagong Hill Tracts. IUCN (International Union for Conservation of Nature), Dhaka Bangladesh. 2011:xii+116.

31. Mohiuddin M, Alam MK, Basak SR, Hossain MK. Ethno-medico Botanical Study among Four Indigenous Communities of Bandarban, Bangladesh. Bangladesh Journal of Plant Taxonomy. 2012;19(1):45-53.

32. Malek I, Hasan E, Akter S, Rana M, Das PR, Samarrai W, Rahmatullah M. Medicinal Plants Used by the Mandais - A Little Known Tribe of Bangladesh. African Journal of Traditional, Complementary and Alternative Medicine. 2012;9(4):536-541.

33. Khisha T, Karim R, Chowdhury SR, Banoo R. Ethnomedical Studies of Chakma Communities of Chittagong Hill Tracts, Bangladesh. Bangladesh Pharmaceutical Journal. 2012;15(1):59-67.

34. Sarker B, Akther F, Ayman U, Sifa R, Jahan I, Sarker M, Chakma SK, Podder PK, Khutun Z, Rahmatullah M. Ethnomedicinal investigations among the Sigibe clan of the Khumi tribe of Thanchi sub-district in Bandarban district of Bangladesh. American-Eurasian Journal of Sustainable Agriculture. 2012;6(4):378-386.
36. Kadir MF, Sayeed MSB, Mia MMK. Ethnopharmacological survey of medicinal plants used by indigenous and tribal people in Rangamati, Bangladesh. Journal of Ethnopharmacology. 2012;144(3):627-637.

37. Kadir MF, Sayeed MSB, Shams T, Mia MMK. Ethnobotanical survey of medicinal plants used by Bangladeshi traditional health practitioners in the management of diabetes mellitus. Journal of Ethnopharmacology. 2012a;144:605-611.

38. Ocvirk S, Kistler M, Khan S, Talukder SM, Hauner H. Traditional medicinal plants used for the treatment of diabetes in rural and urban areas of Dhaka, Bangladesh—an ethnobotanical survey. Journal of Ethnobiology and Ethnomedicine. 2013;9(43):1-8.

39. Rahman MAHM. Ethno-medicinal investigation on ethnic community in the northern region of Bangladesh. American Journal of Life Sciences. 2013;1(2):77-81.

40. Rahman, M. A. Indigenous Knowledge of Herbal Medicines in Bangladesh. Treatment of Skin Diseases by Tribal Communities of the Hill Tracts Districts. Bangladesh Journal of Botany. 2010;39(2):169-177.

© 2015 Motaleb et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history.php?id=648&id=13&aid=6163