

## ORIGINAL ARTICLES

### Medicinal plants used by tribal medicinal practitioners of three clans of the Chakma tribe residing in Rangamati district, Bangladesh

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#### ABSTRACT

The Chakmas are the largest tribe inhabiting the forested hilly regions in the Chittagong Hill Tracts, which lies in the southeastern part of Bangladesh. Although they are scattered in all four districts of the Chittagong Hill Tracts, they are mostly concentrated in the districts of Rangamati and Khagrachari. The tribal population is currently estimated at around 300,000. The Chakmas are distinguished by having their own language with alphabets and their own distinctive culture, which includes their own rituals and own tribal medicinal practitioners. More than 30 clans (which are further sub-divided into over 50 sects) exist within the tribe. It was the objective of the present study to conduct an ethnomedicinal survey among the tribal medicinal practitioners of Baburo, Haduga, and Larma clans of the Chakma tribe inhabiting the Rangamati district of Bangladesh as to their traditional formulations for treatment of various ailments. The survey was conducted with the help of a semi-structured questionnaire and the guided field-walk method. One practitioner from each clan was interviewed. It was observed that the three tribal practitioners, among themselves, used a total of 73 plants distributed into 42 families for treatment of ailments. The Rubiaceae family contributed 7 plants followed by the Apocynaceae, Euphorbiaceae and Lamiaceae families with four plants each. Leaves constituted the major plant part used, forming 60.2% of total uses. Leaves were followed by barks, roots, fruits and stems, which respectively, formed 12.9, 8.6, 7.5 and 5.4% of total uses. Respiratory disorders (coughs, mucus), skin diseases, gastrointestinal disorders, hemorrhoids, fever, eye disorders, urinary tract disorders, helminthiasis, stomach and kidney stones, paralysis, pain, rheumatism and jaundice were ailments treated by the tribal medicinal practitioners. However, the practitioners also recognized and claimed to treat successfully diseases like diabetes, cancer, and hypertension. Diabetes was treated with 9 different plants and hypertension with 5 different plants. The practitioners treated two types of cancer, namely skin cancer and throat cancer. Chittagong Hill Tracts is widely known for the existence of a diverse variety of medicinal plants, most of which are yet to be studied scientifically. It is expected that the present survey can provide insights into the ancient medicinal practices of the Chakma tribe, which in turn can lead to successful discoveries of efficacious medicines against difficult to cure diseases like cancer, hypertension, diabetes, and rheumatism.

**Key words:** Medicinal plants, tribal medicine, Chakma, Rangamati, Bangladesh

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#### Introduction

Human beings probably recognized the value of plants for treatment of various ailments around 3,000 B.P. (Sofowara, 1982). Various indigenous communities or tribes throughout the world still are dependent on their own tribal medicinal practitioners (TMPs) for treatment of both human and livestock diseases. Since the advent of allopathic medicine, these "traditional" medicinal systems and practices continually started to lose ground and often became a subject of neglect by allopathic doctors and modern scientists. In recent years, attention has been re-focusing on the medicinal practices of the indigenous people (Cotton, 1996). Balick and Cox (1996) observed that a number of important modern pharmaceuticals have been derived from, or are plants used by indigenous people. Modern drugs like aspirin, atropine, ephedrine, digoxin, morphine, quinine, reserpine and tubocurarine are examples, which were originally discovered through observations of traditional cure methods

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of indigenous peoples (Gilani and Rahman, 2005). The huge number of floral species of the world, according to recent thinking, can be the future sources of newer and more efficacious drugs against emerging diseases, vector-resistant diseases, and diseases like diabetes, rheumatism or cancer, which cannot be effectively treated with allopathic medicine or where treatment may be accompanied with serious side-effects.

The Chakmas are the largest tribal group residing in the Chittagong Hill Tracts region in the southeastern part of Bangladesh. Although their habitat is in all four districts of the region, they are mainly concentrated in the districts of Rangamati and Khagrachari (Chakma, 2010). Anthropologists believe them to belong to the Mongoloid group of people, and they have facial similarities to the people of Myanmar, Thailand, Cambodia and Laos. They call themselves 'Changma', while the mainstream Bengali-speaking population of Bangladesh refers to them as 'Chakma'. Various other tribes reside along with the Chakmas. The Tripura tribe call the Chakmas as 'Chaungma'; the Mro group refer to them as 'Achak', the Khiangs call the Chakmas as 'Sak', and the Lusai tribe calls the Chakmas as 'Takam'. According to the last population census of the Chakmas carried out in 1991, there were 239,417 Chakma people. Recent estimates put them around 300,000. The tribe is known to have over 30 clans and each clan is again sub-divided into sects, the total number of sects being over 50. For instance, the Boga clan has sects named Dhurja, Ninanda, Kattoga, Ramdalika, Mulikhaja, Boa, etc. The Larma clan has sects named Pirabhanga, Charga, Bhuba, and Todega. The Baburo clan has sects named Baburo, Gozalyo, Maloiya and Lohakodda.

The Chakma society is patriarchal. The predominant religion is Buddhism although they are to a great extent influenced by animistic and Hindu beliefs. An ancient religious text is present called Aghortara. As animists, they worship ghosts, deities and other forces, who they believe to possess supernatural powers. Their main festivals include 'hal palni', celebrated on the 7<sup>th</sup> day of the Bengali month of Ashar and which includes worship of the Hindu goddess 'Laxmi'. On the occasion of birth of a child, they celebrate 'bhat mojhi dena'. Their biggest festival is the 'biju', celebrated on the last two days of the Bengali calendar year and the first day of the new Bengali calendar year. The Chakmas have their own language with alphabets. The language belongs to the Indo-Aryan group of languages. Most words have Sanskrit, Pali or Prakrit language roots, the three languages being fore-runners of both the modern Bengali, as well as the Chakma language. The main diet of the Chakmas is rice taken with vegetables, fish or meat. 'Uchya' is boiled vegetables; 'sikya' contains grilled meat with salt, turmeric and pepper, while 'korbo' consists of dried fish with pepper and onion.

The Chakmas used to cultivate by the 'jhum' method, where a forest tract used to be cleared by burning followed by cultivation on the cleared land. After several years, they would move to a new spot and the whole process started again. In recent times, because of the increase in population and decreased forest habitat, jhum cultivation is making way to settled cultivation. However, most Chakmas are poor and work as agricultural laborer within the workforce of the Government Forest Division. Nevertheless, quite a number of Chakma families have quite extensive holdings, are educated, and hold some of the highest degrees of the land.

The Chakmas still frequent their own TMPs, especially for treatment of common ailments. The surrounding forest area is a rich source of diverse floral species, many of which have medicinal values known to the Chakma TMPs through centuries-long uses of these plants for medicinal purposes. Much of these Chakma knowledge remains to be adequately documented and scientifically tested. We had been conducting ethnomedicinal surveys among various tribal medicinal practitioners and mainstream traditional medicinal practitioners (Kavirajes) for a number of years (Nawaz *et al.*, 2009; Rahmatullah *et al.*, 2009a-c; Hasan *et al.*, 2010; Hossan *et al.*, 2010; Mollik *et al.*, 2010a,b; Rahmatullah *et al.*, 2010a-g; Haque *et al.*, 2011; Jahan *et al.*, 2011; Rahmatullah *et al.*, 2012a-d). The objective of the present study was to conduct an ethnomedicinal survey among the TMPs of the Baburo, Haduga and Larma clans of the Chakma tribe residing in Rangamati area, Bangladesh to document their use of medicinal plants for treatment of diverse ailments.

## Materials and Methods

The present survey was carried out from June 2011 till December 2011. An initial survey was conducted among the Chakma people in the general area surrounding the town of Rangamati in Rangamati district of Bangladesh. Three Chakma clans were located in the area, namely the Baburo, Haduga and Larma clans. Each clan had one practicing TMP. Shukro Kumar Chakma belonged to the Baburo clan. He mentioned his age as 53 years old and religion to be Buddhism. Ramani Mohan Chakma, age 49 years, belonged to the Haduga clan, and he was also a Buddhist. Shanto Kaviraj belonged to the Larma clan. His age was 40 years and religion Buddhism. All three Kavirajes had been practicing at least for the last 15 years and each maintained an extensive medicinal plant garden and nursery adjacent to their homes. The three TMPs practiced, respectively, in the Bonorupa, Kanthaltoli and Rangapani area of Rangamati.

Informed consent was initially obtained from the TMPs to publish their names and any information provided both nationally as well as internationally. A consent form was signed individually by all TMPs. Actual interviews were conducted with the help of a semi-structured questionnaire and the guided field-walk method of Martin (1995) and Maundu (1995). In this method, the TMPs took the interviewers in guided field-walks

through forest areas or their own medicinal plants garden from where they collected their medicinal plants, pointed out the plants, and described their uses. Plants were photographed and plant samples collected and dried and brought back to Bangladesh National Herbarium at Dhaka for proper identification. Interviews were conducted of the TMPs in Bengali, the language being spoken by the interviewers as well as the TMPs. Voucher specimens were deposited at both the Bangladesh National Herbarium and the Medicinal Plant Collection Wing of the University of Development Alternative.

## Results and Discussion

It was observed that the three TMPs interviewed used a total of 73 plants distributed into 42 plants for treatment of a diverse variety of ailments. The Rubiaceae family contributed the highest number of species at 7, while the Apocynaceae, Euphorbiaceae, and the Lamiaceae family contributed 4 species each. The various ailments treated included respiratory disorders, skin diseases, hemorrhoids, cancer, hypertension, diabetes, fever, gastrointestinal disorders, eye diseases, urinary tract disorders, helminthiasis, stomach and kidney stones, paralysis, pain, rheumatism, and jaundice. The results are shown in Table 1.

**Table 1:** Medicinal plants used for treatment of various ailments by traditional medicinal practitioners of three clans of the Chakma tribe inhabiting the Rangamati area of Bangladesh.

Serial Number	Scientific Name	Family Name	Local Name	Utilized Part	Ailment(s) and formulation(s)
1	<i>Adhatoda zeylanica</i> Medik.	Acanthaceae	Ludi bashok	Leaf	Coughs, mucus, hemorrhoids. Juice obtained from macerated leaves is taken orally. Rheumatic pain. The underside of a leaf is warmed over a fire and then applied to painful areas.
2	<i>Lepidagathis incurva</i> Buch.-Ham. ex D.Don	Acanthaceae	Aarae uri nolakkher	Leaf, bark, root	Skin cancer. Leaves are softened by crushing with hand and then applied as poultice to affected area. At the same time juice obtained from crushed bark or root is topically applied to the same area.
3	<i>Celosia argentea</i> L.	Amaranthaceae	Kheyang marek	Leaf	Impotency, skin infections. Juice obtained from macerated leaves is orally administered for impotency. Same juice is topically applied to skin infections.
4	<i>Polyalthia longifolia</i> (Sonn.) Thwaites (PL)	Annonaceae	Debdaru	Bark	Burning sensations, fever, diabetes. Bark is dried in the sun and powdered. Powdered bark is mixed with milk. 2-3 glasses of milk are taken daily.
5	<i>Alstonia scholaris</i> (L.) R.Br.	Apocynaceae	Sechsena gach	Leaf, stem, root	Lack of milk in mother following childbirth. For one month the mother is fed a mixture of boiled powdered rice mixed with bark with a slight amount of sugar and salt (1/2 spoonful daily). Following one month, the mother is fed 1/2 spoonfuls of boiled leaves and stems 3-4 times daily.
6	<i>Catharanthus roseus</i> (L.) G.Don	Apocynaceae	Badam boot	Leaf, bark, stem	Hypertension. A little amount of leaf is chewed (if excess leaf is chewed, it will lead to vomiting) and swallowed. Alternately bark or leaf with stems may be chewed and swallowed. Hypertension. Macerated rhizome of <i>Curcuma longa</i> is mixed with juice obtained from macerated leaves of <i>Catharanthus roseus</i> . 3-4 spoonfuls are taken daily.
7	<i>Rauwolfia serpentina</i> (L.) Benth. ex Kurz	Apocynaceae	Churmang	Leaf, stem, root	Hypertension, stomach pain. Juice obtained from a combination of macerated

					leaves, stems and roots is orally taken.
8	<i>Tabernaemontana divaricata</i> (L.) R. Br. ex Roem. & Schult.	Apocynaceae	Kathal khatya	Leaf	Redness in eyes, conjunctivitis. One to two drops of clear juice coming out from a freshly plucked leaf stalk is applied to eyes 1-2 times daily.
9	<i>Alocasia cucullata</i> (Lour.) G. Don.	Araceae	Bilae kochu	Leaf	Infections from being cut by thorns, snake bite. Sap obtained from torn leaves is applied.
10	<i>Calotropis gigantea</i> (L.) Ait.f.	Asclepiadaceae	Akkon shak, Akon shak	Leaf	Whitish discharge in urine, hypertension, helminthiasis (hook worm). Two spoonfuls of juice obtained from macerated leaves are taken 2-3 times daily.
11	<i>Chromolaena odorata</i> (L.) R. M. King & H. Rob.	Asteraceae	Mojakkher	Young leaf at top of stem	Bleeding from external cuts and wounds. Four, five or seven young leaves are plucked from top of stem, slightly crushed and applied to cuts and wounds to stop bleeding.
12	<i>Tagetes erecta</i> L.	Asteraceae	Ganda gach	Leaf	Hemorrhoids. Juice obtained from macerated leaves of <i>Tagetes erecta</i> is mixed with juice obtained from fruits of <i>Phyllanthus emblica</i> , <i>Terminalia belerica</i> and <i>Terminalia chebula</i> . 1-2 large spoonfuls of the mixture is taken daily for 20-21 days.
13	<i>Terminalia belerica</i> (Gaertn.) Roxb.	Combretaceae	Bora gach	Leaf, fruit	Abscess, burning sensations on skin. Juice obtained from macerated leaves is taken with sugar. Hemorrhoids. Juice obtained from macerated leaves of <i>Tagetes erecta</i> is mixed with juice obtained from fruits of <i>Phyllanthus emblica</i> , <i>Terminalia belerica</i> and <i>Terminalia chebula</i> . 1-2 large spoonfuls of the mixture is taken daily for 20-21 days.
14	<i>Terminalia chebula</i> Retz.	Combretaceae	Uoal	Leaf, fruit	Hemorrhoids. Juice obtained from macerated leaves of <i>Tagetes erecta</i> is mixed with juice obtained from fruits of <i>Phyllanthus emblica</i> , <i>Terminalia belerica</i> and <i>Terminalia chebula</i> . 1-2 large spoonfuls of the mixture is taken daily for 20-21 days. Diabetes. Juice obtained from macerated leaves is mixed with a little amount of salt and taken twice daily.
15	<i>Ipomoea aquatica</i> Forssk.	Convolvulaceae	Hormoma shak	Leaf	Constipation. Boiled leaves are taken.
16	<i>Ipomoea triloba</i> L.	Convolvulaceae	Del lodi	Leaf	Facial distortion. Juice obtained from macerated leaves is applied to distorted areas.
17	<i>Costus speciosus</i> (J. König.) Sm.	Costaceae	Ghedgi	Leaf	Hydrocele. Boiled leaves are macerated and applied to scrotum.
18	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Crassulaceae	Jeus	Whole plant	Constipation, diabetes, stomach or kidney stones. Whole plants (leaves, barks, stems, roots) are boiled with a little amount of sugar. Two to two and a half spoonful of the decoction is orally administered to children and three teaspoonfuls to adults 2-3 times daily after meals.
19	<i>Coccinia cordifolia</i> (L.) Cogn.	Cucurbitaceae	Ludi ishwarmuli	Root	Menstrual problems like burning sensations during

					menstruation. One spoonful of juice obtained from macerated root is taken 1-2 times daily.
20	<i>Coccinia grandis</i> (L.) J. Voigt	Cucurbitaceae	Eranga bacha, Hela hujur	Leaf	Frequent urination, diabetes. Juice obtained from macerated leaves is taken. Note that sugar cannot be used.
21	<i>Momordica charantia</i> L.	Cucurbitaceae	Tita pullo shak	Leaf	Diabetes, frequent urination. One spoonful of juice obtained from macerated leaves is taken 3-4 times daily.
22	<i>Tectaria heterosora</i> (Baker) Ching	Dryopteridaceae	Baidya nath	Root	Diarrhea in infant. One spoonful of water is fed in which roots have been boiled.
23	<i>Antidesma roxburghii</i> Wall.	Euphorbiaceae	Chung chung fejang, Sung sunga prejang	Leaf, bark	Paralysis of hand or leg. Leaves or barks are crushed with hand to obtain juice, which is then massaged onto paralyzed areas.
24	<i>Jatropha curcas</i> L.	Euphorbiaceae	Khegoon gach	Bark	Irregular menstruation. Bark is macerated followed by drying in the sun. It is then taken with cold water.
25	<i>Phyllanthus emblica</i> L.	Euphorbiaceae	Hadamala gach	Fruit	Hemorrhoids. Juice obtained from macerated leaves of <i>Tagetes erecta</i> is mixed with juice obtained from fruits of <i>Phyllanthus emblica</i> , <i>Terminalia bellerica</i> and <i>Terminalia chebula</i> . 1-2 large spoonfuls of the mixture is taken daily for 20-21 days. Gastrointestinal disorders, ulcer, gastric pain. Fruits are taken on an empty stomach in the morning. Alternately dried and powdered fruits of <i>Phyllanthus emblica</i> , <i>Terminalia bellerica</i> and <i>Terminalia chebula</i> are taken on an empty stomach in the morning.
26	<i>Phyllanthus niruri</i> L.	Euphorbiaceae	Bauli banga her	Leaf	Skin rash, skin diseases. Macerated leaves are topically applied.
27	<i>Mimosa pudica</i> L.	Fabaceae	Lojjaboti	Root	Passing of blood during urination, burning sensations in urinary tract. 2-3 teaspoonfuls of juice obtained from macerated roots is mixed with water and taken daily.
28	<i>Senna alata</i> (L.) Roxb.	Fabaceae	Dao long	Leaf, seed	Skin diseases. Juice obtained from macerated leaves or seeds is mixed with coconut oil and applied to affected areas following bathing. Note that leaves or seeds should not be taken orally.
29	<i>Senna tora</i> (L.) Roxb.	Fabaceae	Ijibiji gach	Leaf	Sleeplessness, leech bite. Leaves are chewed and the juice swallowed for sleeplessness. At the same time leaves are smelled. Note that leaves should be chewed without water. Leaves are massaged to leech-bitten areas.
30	<i>Swertia chirata</i> (Roxb. ex Fleming) H. Karst.	Gentianaceae	Chirota	Fruit	Gastrointestinal disorders, helminthiasis. Fruits are soaked in a glass of water overnight followed by drinking the water the following morning on an empty stomach.
31	<i>Dicranopteris linearis</i> (Burman f.) Underwood	Gleicheniaceae	Horang veher	Leaf	Blood clotting on bones or muscle. Leaves are boiled and made into a paste, which is applied to affected areas.
32	<i>Leucas aspera</i> (Willd.)	Lamiaceae	Gousha	Leaf	Lesions/infections within

	Link		khongor		nostril. Leaves are crushed by beating with hand and then kept for some time on the infection/lesion.
33	<i>Ocimum basilicum</i> L.	Lamiaceae	Sabarung gach	Leaf, bark	Coughs, respiratory difficulties, fever, diabetes, skin diseases. Young leaves are slightly crushed in hand and kept in the mouth for coughs, respiratory difficulties, and fever. Juice obtained from macerated leaves is taken for diabetes. Macerated leaves or barks are applied to affected areas in skin diseases.
34	<i>Ocimum sanctum</i> L.	Lamiaceae	Tuloshi	Leaf, bark	Coughs, respiratory difficulties, fever, diabetes, skin diseases. For coughs, fever, respiratory difficulties, and diabetes, leaves or bark is boiled in water. For children less than 1 year old, dosage is ½ spoonful of the water; for age 1-2 years, dose is 1 spoonful; for age more than 2 years, dose is 3-4 spoonful. For treatment of skin diseases, leaves or bark is macerated to obtain juice. One spoonful of the juice is mixed with coconut oil and applied to affected areas.
35	<i>Ocimum tenuiflorum</i> L.	Lamiaceae	Khargi shukchand	Leaf	Coughs, respiratory difficulties. Leaves are heated over a fire followed by extraction of leaf juice. The juice is then taken with honey 3-4 times daily.
36	<i>Cinnamomum tamala</i> (Buch.-Ham.) Nees & Eberm.	Lauraceae	Tejpata	Leaf	Infections on skin. Macerated young leaves are applied to affected areas.
37	<i>Litsea glutinosa</i> (Lour.) C.D.Robins.	Lauraceae	Mewa pata	Leaf	Mucus, respiratory difficulties due to mucus. Leaves are boiled in water and then the juice taken orally.
38	<i>Leea umbraculifera</i> C.B. Clarke	Leeaceae	Aash ura gach	Leaf	Abscess, infections arising out from wounds due to being hit with a sharp iron utensil. Edges of leaves are boiled, macerated and applied to affected areas.
39	<i>Hibiscus rosa sinensis</i> L.	Malvaceae	Rokto joba	Flower	Diarrhea, infections on palm of hand. Juice obtained from macerated flower petals is taken with water for diarrhea. Crushed flower petals are topically applied to palm infections.
40	<i>Sida rhombifolia</i> L.	Malvaceae	Bilbili gach	Leaf	Scabies, eczema, abscess. Leaves are slightly crushed in hand and then mixed with saliva and slightly pressed onto affected areas.
41	<i>Angiopteris evecta</i> (J. R. Forst.) Hoffm.	Marattiaceae	Adib	Leaf	Joint pain. Juice obtained from macerated leaf is massaged onto joints as well as taken orally.
42	<i>Melastoma malabathricum</i> L.	Melastomataceae	Moha purti	Leaf	Red color of urine, burning sensations during urination. 1-2 spoonfuls of juice obtained from macerated leaves is taken twice daily.
43	<i>Anamirta cocculus</i> (L.) Wight & Arn.	Menispermaceae	Ludi chibang	Leaf	Spots on new-born baby's skin. Macerated leaves are applied to spots.
44	<i>Stephania japonica</i> (Thunb.) Miers	Menispermaceae	Fadarpur	Leaf	Pain on an empty stomach, menstrual pain. Juice obtained from macerated leaves is taken.
45	<i>Ficus hirta</i> Vahl.	Moraceae	Thammang gach	Leaf, root	Insanity, mental disorders, memory loss. Juice obtained from macerated leaves or roots

					is orally administered.
46	<i>Ficus hispida</i> L.f.	Moraceae	Debida sura gach	Fruit	Diabetes. Fruits are cooked and eaten as vegetable with regular meals.
47	<i>Ficus religiosa</i> L.	Moraceae	Ashwoth	Fruit	Hypertension. Dried and powdered fruits are taken with water.
48	<i>Psidium guajava</i> L.	Myrtaceae	Goian	Leaf, bark	Flatulence, gastrointestinal disorders. Leaves or barks are boiled in water followed by drinking the water.
49	<i>Polygonum chinensis</i> L.	Polygonaceae	Mon ijadar, Mone jojada	Leaf	Paralysis of hand or leg, wasting away of hands or legs. Juice obtained from macerated leaves is massaged once daily to affected areas.
50	<i>Cheilanthes belangeri</i> (Bory in Belang.) C. Chr.	Pteridaceae	Ching fuchi, Sil fushi	Leaf	Headache, feeling of hotness in head. Crushed leaves are applied to forehead and scalp.
51	<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae	Kul	Leaf, bark	Fever, flatulence, diarrhea. Macerated leaves or barks are mixed with a small amount of water and applied to head during fever. Juice obtained from macerated leaves is taken twice daily for flatulence or diarrhea.
52	<i>Hedyotis thomsonii</i> Hook.f.	Rubiaceae	Gou o jhil her	Leaf	Excessive itching in the eyes. Two drops of juice obtained from squeezed leaves is applied to corner of eye.
53	<i>Hedyotis verticillata</i> (L.) Lam.	Rubiaceae	Boithita	Leaf	Bursting of abscess followed by oozing of pus and reddish colored substance. Juice obtained from macerated leaf is applied to the area.
54	<i>Hymenodictyon orixense</i> (Roxb.) Mabblerley	Rubiaceae	Dela gamari	Top of stem	Hemorrhoids. Top of stems are softened over a fire and then orally taken.
55	<i>Ixora athroantha</i> Bremek.	Rubiaceae	Ludi choulla, Ludi choilla	Bark	Diarrhea. Macerated bark is dried in the sun and then taken with cold water.
56	<i>Mussaenda roxburghii</i> Hook. f.	Rubiaceae	Rani thak	Leaf	Burning sensations in hands or legs, rheumatism, abscess. Macerated leaves are topically applied to affected areas.
57	<i>Paederia foetida</i> L.	Rubiaceae	Gondo madok	Leaf	Rheumatic pain, burning sensations during urination. Juice obtained from macerated leaves is taken with sugar.
58	<i>Psychotria calocarpa</i> Kurz.	Rubiaceae	Shudoma	Leaf	Paralysis of hands or legs. Juice obtained from macerated leaves is massaged onto paralyzed area.
59	<i>Aegle marmelos</i> (L.) Corr.	Rutaceae	Urik phang	Fruit	Gastrointestinal disorders like flatulence, constipation, stomach pain. Soft pulp within the fruit is dried in the sun and then powdered. Powder is taken with water.
60	<i>Santalum album</i> L.	Santalaceae	Shet chondon	Wood	To remove scar marks or marks due to burns, skin diseases. Wood is dried and powdered and then mixed with milk. The mixture is applied to affected areas before bathing.
61	<i>Allophylus cobbe</i> (L.) Raeuschel	Sapindaceae	Jendra ma	Leaf	Pain in hand or leg. Juice obtained from crushed leaf is massaged onto painful areas.
62	<i>Mimusops elengi</i> L.	Sapotaceae	Bokul	Leaf, bark	Skin wounds, skin infections. Macerated leaf or bark is applied to affected area.
63	<i>Scoparia dulcis</i> L.	Scrophulariaceae	Aadam fuchi	Leaf	Pain in chin or throat, tonsillitis, throat cancer, facial redness.

					eczema, skin diseases. Juice obtained from macerated leaves is applied to affected areas. Rest of the leaf is then applied to the area as poultice.
64	<i>Smilax zeylanica</i> L.	Smilacaceae	Kumujja loti, Gumujjej lodi	Leaf	Skin cancer, skin infections. Macerated leaves are applied to affected area followed by a poultice on the area with the bottom of leaves.
65	<i>Datura metel</i> L.	Solanaceae	Dhatur phool	Leaf	To stop bleeding from external wounds. Crushed leaves are applied to wounds. Leaves should not be taken orally.
66	<i>Abronia augusta</i> L.f.	Sterculiaceae	Gach Chula	Leaf, bark, root	Irregular menstruation. Juice obtained from a combination of macerated leaves, barks and roots is mixed with water and taken daily (2-3 teaspoonfuls each time).
67	<i>Aquilaria agallocha</i> Roxb.	Thymeliaceae	Akod	Leaf	Coughs, mucus. A small amount of juice obtained from macerated leaves is orally taken. Rheumatic pain. The underside of a leaf is warmed over a fire and then applied to painful areas.
68	<i>Grewia paniculata</i> Roxb. ex DC.	Tiliaceae	Ashar gach	Leaf	Gastric troubles. Small pills are prepared from crushed leaves and sun-dried. Pills are taken thrice daily.
69	<i>Clerodendrum viscosum</i> Vent.	Verbenaceae	Begh gach	Leaf	Frequent urination, diabetes. Macerated leaves are taken orally.
70	<i>Nyctanthes arbor-tristis</i> L.	Verbenaceae	Shing guri phool gach	Leaf	Skin diseases. Juice obtained from macerated leaves is mixed with coconut oil and applied to affected areas 1-2 times daily. This formulation can be applied if the patient is taking other medications.
71	<i>Curcuma longa</i> L.	Zingiberaceae	Olud	Rhizome	Hypertension. Macerated rhizome of <i>Curcuma longa</i> is mixed with juice obtained from macerated leaves of <i>Catharanthus roseus</i> . 3-4 spoonfuls are taken daily. Abscess. Juice obtained from macerated rhizome is mixed with cow milk and applied to abscess.
72	<i>Curcuma zedoaria</i> (Christm.) Roscoe	Zingiberaceae	Ranga holla	Stem	Jaundice. Macerated stem is taken orally.
73	<i>Zingiber montanum</i> (J. Koenig) Link ex A. Dietr.	Zingiberaceae	Mone ada, Meni ada	Leaf	Swelling of joints, rheumatic pain. Crushed leaves are applied to affected areas.

Overall, the formulations for treatment of ailments were simple. Most often a single plant was used for treatment of a single or multiple diseases. Within a single plant, a single plant part may be used or a combination of several plant parts. Administrations were either oral or topical. The leaves of *Ipomoea aquatica* were used for treatment of constipation. On the other hand, the leaves of *Adhatoda zeylanica* was used for treatment of coughs, mucus or hemorrhoids; the first two ailments being completely different in nature to the third. Similarly, the bark of *Polyalthia longifolia* was used for treatment of diverse ailments like burning sensations, fever or diabetes. The leaves, barks and roots of *Lepidagathis incurva* were used in combination for treatment of skin cancer. The leaves, stems and roots of *Alstonia scholaris* were used for treatment of lack of milk in mother following childbirth.

Despite the simplicity of formulations, there was some uniqueness to the Chakma TMPs selection of medicinal plants for treatment as well as the diseases treated. For instance, the TMPs were observed to use the following plants in their treatment, which has not been observed in our previously conducted more than 100 ethnomedicinal surveys among mainstream and tribal medicinal practitioners. These plants were *Lepidagathis*

*incurva*, *Alocasia cucullata*, *Tectaria heterosora*, *Dicranopteris linearis*, *Leea umbraculifera*, *Anamirta cocculus*, *Cheilanthes belangeri*, *Hedyotis verticillata*, *Hymenodictyon orixense*, *Ixora athroantha*, *Psychotria calocarpa*, and *Allophylus cobbe*. Whether this reflects presence of the plants only in the Chittagong Hill Tracts region, or uniqueness on the part of the Chakma TMPs remain to be determined.

It is also notable that some of the plants used by the Chakma TMPs are in use by other traditional medicinal practitioners in Bangladesh in other regions, but the ailments treated differs between the Chakma TMPs and other traditional medicinal practitioners. For instance, *Rauwolfia serpentina* is a common remedy among the mainstream traditional medicinal practitioners for hypertension; the Chakma TMPs in the present study used it also as a remedy for stomach pain. *Adhatoda zeylanica*, similarly is a common remedy among traditional practitioners for respiratory disorders like coughs, mucus or bronchitis; the Chakma TMPs used the plant also for treatment of hemorrhoids. The leaves of *Tagetes erecta* are mainly used by mainstream traditional medicinal practitioners for stopping bleeding from external cuts and wounds. The Chakma TMPs used the leaves of this plant in conjunction with fruits of *Phyllanthus emblica*, *Terminalia bellerica*, and *Terminalia chebula* for treatment of hemorrhoids. It is noteworthy that the fruits of the latter three plants, in combination, are known as Triphala – a very well-known Ayurvedic preparation used by Ayurvedic practitioners to increase longevity, maintain good health, and as treatment for gout, obesity, nervous disorders, liver disorders, and ocular problems. Scientific studies have demonstrated a number of beneficial effects of Triphala, including anti-bacterial properties (Srinagesh and Pushpanjali, 2011), cytotoxic effects against human prostate cancer LNCap cells (Russell *et al.*, 2011), anti-cataract potential (Wiwaniitkit, 2011), and beneficial effects in experimental gouty arthritis (Sabina and Rasool, 2008). Whether Triphala is good for hemorrhoids, however, remains to be established. However, the use of *Tagetes erecta* leaves can have a controlling effect on bleeding during hemorrhoids, while the polyphenolic anti-oxidant constituents of Triphala may have an overall beneficial effect. *Bryophyllum pinnatum* is used by mainstream traditional practitioners usually for treatment of kidney, stomach or gall bladder stones; the Chakma TMPs used the plant for treatment of diabetes and constipation as well as stomach or kidney stones.

It is noteworthy that nine plants were used by the Chakma TMPs for treatment of diabetes and five plants for the treatment of hypertension. The nine anti-diabetic plants were *Polyalthia longifolia*, *Terminalia chebula*, *Bryophyllum pinnatum*, *Coccinia grandis*, *Momordica charantia*, *Ocimum basilicum*, *Ocimum sanctum*, *Ficus hispida*, and *Clerodendrum viscosum*. The five anti-hypertensive plants were *Catharanthus roseus*, *Rauwolfia serpentina*, *Calotropis gigantea*, *Ficus religiosa*, and *Curcuma longa*. The use of *Catharanthus roseus* and *Rauwolfia serpentina* by the Chakma TMPs for treatment of hypertension has been scientifically validated (Ara *et al.*, 2009; Shamon and Perez, 2009). The Chakma TMPs use of *Coccinia grandis* and *Momordica charantia* for treatment of diabetes have also been similarly scientifically validated (Munasinghe *et al.*, 2011; Chaturvedi, 2012). Anti-diabetic efficacies have also been reported for *Terminalia chebula* (Murali *et al.*, 2007), *Bryophyllum pinnatum* (Ojewole, 2005), and *Ocimum sanctum* (Vats *et al.*, 2002), all three of the latter group of plants being used by the Chakma TMPs for treatment of diabetes.

The Chakma TMPs also described the uses of three plants, namely, *Lepidagathis incurva*, *Scoparia dulcis* and *Smilax zeylanica* for treatment of skin and throat cancers. It is possible that the term cancer has been picked up from interaction with allopathic physicians. It is also possible that since the Chakma TMPs mentioned that they are familiar with Ayurvedic formulations, they may have picked up the cancer term from Ayurvedic texts. While the origin of the term cancer remains uncertain, skin cancer according to them is an unusual nodule on the skin surface or a lesion on the skin surface that will not heal with plants used for treating skin infections. Throat cancer, according to the Chakma TMPs is a swelling on the throat accompanied by a change in the voice. While the symptoms described may or may not be skin and throat cancers, it is interesting that out of the three plants used by them to treat these two types of cancer, *Lepidagathis incurva* reportedly possess cytotoxic activities (Charoenchai *et al.*, 2010), while cytotoxic diterpenes have been isolated from *Scoparia dulcis* (Ahsan *et al.*, 2003).

Overall, the medicinal plants reported by the Chakma TMPs for treatment of diverse ailments merit considerable potential from the scientific community for further studies. The number of plants used by the TMPs and validated by modern scientific research as to their actual uses are several in number. They are also important in the sense that the Chakma TMPs use these plants for incurable or difficult to cure diseases by allopathic medicine like cancer, diabetes and hypertension. Thorough scientific research as to the plant's relevant pharmacological activities can prove to be of immense benefit to patients all throughout the world if new and efficacious drugs can be discovered from the plants. Such discoveries can not only lead to novel drugs but also spur conservation efforts to save these plants, which are rapidly getting lost because of mindless destruction of forest areas through construction of human habitats and turning forest areas into cultivable lands.

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