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ORIGINAL ARTICLE

Medicinal Plants Used by the Folk and Tribal Medicinal Practitioners in Two Villages of Khakiachora and Khasia Palli in Sylhet District, Bangladesh

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ABSTRACT

The inhabitants of Bangladesh are mostly Bengali speaking (about 98% of the population, the other 2% being tribal population). Folk medicinal practitioners play an important role in the Bengali-speaking rural society of Bangladesh, where people still rely on them for provision of health-care. This is not only because the rural population of Bangladesh lacks proper access to modern medical facilities, but also because of tradition, which dates back to centuries ago. The common feature of folk medicinal practitioners is use of single or multiple plants for cure of ailments. The ailments treated vary from simple ailments like coughs or cold to complicated ailments like diabetes, cardiovascular disorders, arthritis, or paralysis. Almost every village of the 86,000 villages of Bangladesh has one or more practicing folk medicinal practitioners, known as Kavirajes. Additionally, Bangladesh has over two dozens of tribes, who have their own tribal medicinal practitioners, and who as a group can be included within the Kavirajes, since both Kavirajes (of the Bengali-speaking majority people) as well as tribal medicinal practitioners rely almost exclusively on medicinal plants for treatment. Since our ongoing studies have shown wide divergences in the selection of medicinal plants selected by any individual Kaviraj for treatment of a particular ailment, it was the objective of the present study to document the medicinal plant uses by the Kavirajes of Khakiachora and Khasia Palli villages, which lie near the Lawachora National Park, a forest region in Sylhet district in northeastern Bangladesh. A unique feature of the villages, which were within 2.5 kilometers of one another was that Khakiachora village was inhabited by Bengali-speaking people, while Khasia Palli was inhabited by the Khasia tribal people. Khakiachora village was serviced by two Bengali Kavirajes, while Khasia Palli was serviced by one Khasia tribal medicinal practitioner. It was observed that the three Kavirajes, in between themselves, used 59 plant species for treatment of various ailments. These plant species were distributed into 40 families. The Combretaceae and the Euphorbiaceae family provided six plants per family, followed by the Lamiaceae family with 5 plants. The various ailments treated included pain, coughs, cuts and wounds, paralysis, sexual disorders, skin disorders, helminthiasis, gastrointestinal disorders, fever, bone fracture, puerperal fever, asthma, tongue lesions, diabetes, jaundice, tumor, and mental disorders. Surprisingly, only a few plants were mentioned by the Khasia tribal medicinal practitioner, suggesting that the majority Bengali culture represented in the medicinal field by the Kavirajes is eroding the tribal medicinal knowledge and practices, as practiced by Khasia tribal medicinal practitioners. It is concluded that (a) proper documentation of Khasia medicinal practices are important before they become totally lost, and (b) documentation of folk medicinal uses of plants by the Kavirajes is similarly important, because the plants present enormous potential for scientific research and new drug discoveries toward treatment of debilitating diseases like diabetes or paralysis. Notably, these two diseases cannot be cured with modern allopathic medicines. Also since drug-resistant microorganisms have developed against a number of allopathic drugs, the plants used by the folk and tribal medicinal practitioners of Khakiachora and Khasia

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Palli villages offer fresh opportunities to develop drugs against possible microbial diseases like coughs, fever, skin disorders or gastrointestinal disorders.

Key words: Medicinal plants, Khasia Palli, Khakiachora, Bangladesh, folk medicine

Introduction

Medicinal plants have been used by human beings from time immemorial for healing different ailments. This practice still continues, even after the advent of modern allopathic medicine, particularly among the indigenous people and the rural population of developing countries. Several systems of medicinal practices co-exist in Bangladesh, which is a developing country with a small size but a large rural population. These are allopathic, homeopathic, Ayurvedic, Unani, and folk medicinal practices. Folk medicine, as practiced by the practitioners, known as Kavirajes, play an important role in the rural society of Bangladesh in providing much needed primary health-care to the rural people. Bangladesh has about 86,000 villages spread throughout the country, and usually each village is serviced by one or more Kavirajes. The rural people, as well as a substantial segment of the urban population relies on the Kavirajes, not only because they may lack access to modern medical facilities or cannot afford the price of modern medicines, but also because over centuries they have depended on the Kavirajes. As a result, a trust or belief has developed in the people on the treatment prescribed by the Kavirajes, which has continued because of the perceived efficacy of Kaviraj or folk medicinal treatment with its low costs and less side-effects.

Scientific interest in indigenous and folk medicinal practices has grown in recent years. Allopathic drugs, once perceived to be cure for all diseases, has failed to cure numerous diseases like diabetes, cardiovascular disorders, arthritis, to name only a few of the debilitating ones. Vector-borne diseases like malaria or microbial diseases have seen emergence of drug-resistant vectors or microorganisms. On top of it, an increasing number of allopathic drugs have side-effects, which negate long-term uses. Under such circumstances, plants have become the hope for the future of discovery of novel drugs, which are more efficacious and have less side-effect. This is not a new concept. Plants traditionally have been the source of many modern drugs, and a number of modern drugs, considered vital to the treatment of human beings have emerged from observing indigenous medical practices (Cotton, 1996). It has further been estimated that the probability of discovery of new drugs from plant sources is about 1 in 125, while the probability ration rises to 1 in 10,000 for synthetic chemicals (Chadwick and Marsh, 1994).

Since folk medicinal practices have existed in Bangladesh from time immemorial, we have been documenting the folk medicinal uses of plants in Bangladesh for some time (Hossan *et al.*, 2010; Mollik *et al.*, 2010; Nawaz *et al.*, 2009; Rahmatullah *et al.*, 2010a-d; Rahmatullah *et al.*, 2009a-c). Folk medicinal practitioners or Kavirajes mainly rely on medicinal plants for treatment. Individual Kavirajes vary considerably in Bangladesh in their choice of medicinal plants for treatment of any specific ailment. In addition, the country has over two dozens of tribal people, whose tribal medicinal practitioners also use widely different plant species for treatment of ailments (Hanif *et al.*, 2009; Hossan *et al.*, 2009; Rahmatullah *et al.*, 2010; Rahmatullah *et al.*, 2009 d,e). Considering the differences in plant use by Kavirajes of different localities or even villages, it is important to do village-based surveys to obtain a comprehensive picture of medicinal plant use by folk and tribal medical practitioners (the latter may also be considered as folk medicinal practitioners based on their almost exclusive use of medicinal plants for treatment).

It was the objective of the present study to conduct a survey among the inhabitants of Khakiachora and Khasia Palli villages in Sylhet district, Bangladesh. The villages, because of their close proximity to Lawachora National Park, have abundant plant resources for non-timber uses, like uses for medicinal purposes. Khakiachora village was settled by Bengali-speaking inhabitants and was serviced by two Bengali-speaking Kavirajes. Khasia Palli village was about 2.5 kilometers from Khakiachora village, was settled by the Khasia tribal people, and was serviced by a Khasia tribal medicinal practitioner. It was of interest to document not only the use of medicinal plants in an area, which has abundant plant resources, but also to see whether the close proximity of Bengali people with their own Kavirajes is eroding the tribal healing practices of the Khasias.

Materials and Methods

Sylhet district falls in the northeastern part of Bangladesh. The district contains forest lands and small hilly areas, and is famous for its tea gardens. Lawachora Forest Reserve, now turned into a National Park also lies within the district. The district is primarily inhabited by Bengali-speaking inhabitants, but also has settlements of Khasia tribal population spread throughout the district. The Khasia population works in the tea gardens, but

also does some betel leaf cultivation on their own. The two villages of Khakiachora and Khasia Palli lie in close proximity to each other (about 2.5 kilometers distant from one another), as well as in close proximity to Lawachora National Park. Khakiachora village is inhabited by Bengali-speaking people, who form the majority of the population of Bangladesh. Khasia Palli was inhabited by the Khasia tribal people. It was observed that the inhabitants of the two villages interacted with each other; however, the inhabitants of the two villages maintained as far as possible, their separate customs and rituals. The Khasias have started to be highly influenced by the majority Bengali culture, and now can speak fluently both the Bengali as well as the Khasia language. Also, a number of rituals and customs of the Khasia people are fast disappearing in modern times.

Khakiachora village was serviced by two Kavirajes, namely Md. Jholfu Miah and Mahendra Naik. Khasia Palli village had only one Kaviraj, namely, Rumpilis Murong, who belonged to the Khasia tribe. Informed consent was obtained from all three Kavirajes prior to the interviews. Interviews were conducted in the Bengali language, which was spoken by all three Kavirajes (note that the Khasia tribal practitioner will also be referred to as Kaviraj in subsequent sections) with the help of a semi-structured questionnaire and the guided field-walk method as described by Martin (1995) and Maundu (1995). In this method, the Kavirajes took the interviewees on guided field-walks during daytime through areas from where they collected their medicinal plants, pointed out the plants, and mentioned their local names and uses. All information was cross-checked with individual Kavirajes in later evening sessions. Plant specimens were collected on the spot, dried, and brought back to be identified at the Bangladesh National Herbarium at Dhaka.

Results and Discussion

It was observed that a total of 59 plants distributed into 40 families were used by the three Kavirajes for treatment of various ailments. The results are shown in Table 1. The Combretaceae and the Euphorbiaceae families provided six plants each, followed by the Lamiaceae family with five plants. Leaves constituted the major plant part used, constituting 34.3% of total uses. Whole plants and barks constituted 19.4% of total uses each. Stems were used 7.5% of the time, while roots and fruits constituted 4.5% of total uses each. Other plant parts used included flowers, seeds, rhizomes, and plant sap. The Herbarium was unable to identify fully 12 plants, providing only the genera. This suggests that the forest areas of Sylhet are still to be studied in details regarding botanical classification of the plant species present in the region.

A total of 22 plants were used for treatment of pain including body ache, waist pain, toothache, and pain in general. Fifteen plants were used for treatment of various forms of gastrointestinal disorders. Seven plants each were used for treatment of puerperal fever or liver dysfunctions, like jaundice. Six plants were used for treatment of diabetes, and three plants were used for treatment of tumors, which was defined as swellings on the external part of the body, and which is occurring without any known cause like injury. Other diseases treated included respiratory tract problems like coughs and asthma, cuts and wounds, paralysis, sexual disorders (including infertility), helminthiasis, infections, leucorrhea, insect bite, fever, bone fracture, debility, tongue lesions, and mental disorders. One plant each was used as an abortifacient, and as an antidote to poison.

Only a few plants or plant parts were used singly for treatment of any specific ailment. The leaves of *Sansevieria hyacinthoides* were used for treatment of ear ache. The leaves of *Aerva sanguinolenta* were used to stop bleeding from cuts and wounds. The stems of *Alocasia macrorrhizos* were used to treat paralysis. A plant may be used to treat multiple ailments. As an instance, the leaves of *Justicia adhatoda* were used for treatment of coughs as well as body ache. In general, treatment followed oral or topical administration of a combination of plants. The use of combination of plants could be for treatment of diverse ailments or a single ailment. A combination of the plants, *Alstonia scholaris*, *Aegle marmelos*, *Moringa oleifera*, and *Azadirachta indica* was used for treatment of diverse ailments like puerperal fever, pain or jaundice. On the other hand, a combination of the plants – *Terminalia bellerica*, *Terminalia chebula*, *Ocimum sanctum*, *Ocimum tenuiflorum*, and *Terminalia arjuna* was used for treatment of a single affliction, namely pain in bones.

Formulations included both direct administration of plant parts or juice from plant parts, or making decoctions, or using plant parts in the dried form. Juice obtained from macerated leaves of *Sansevieria hyacinthoides* was directly applied to ears for treatment of ear ache. Juice obtained from macerated leaves of *Aerva sanguinolenta* were directly applied to stop bleeding from cuts and wounds. On the other hand, the macerated stems of *Alocasia macrorrhizos* were directly applied to affected areas during cases of paralysis. The stems were alternately sliced into small pieces, dried, and tablets prepared from the dried and powdered stems orally administered for treatment of paralysis. A decoction of four plants, namely *Alstonia scholaris*, *Aegle marmelos*, *Moringa oleifera*, and *Azadirachta indica* was used for treatment of puerperal fever, pain or jaundice. In this instance, the decoction was prepared by mixing various parts from the plants and boiling them in water.

Table 1: Medicinal plants used by Khasia and Bengali folk medicinal practitioners of Khakiachora village in Sylhet district, Bangladesh.

Serial Number	Scientific Name	Family Name	Local Name	Utilize Part	Ailment
1	<i>Justicia adhatoda</i> L.	Acanthaceae	Bashok	Leaf	Coughs, body ache. Leaves are boiled in 1 liter water till the volume comes down to ½ liter. The decoction is then divided into 2 glasses and mixed with 2 teaspoonfuls of sugar or mishri (crystalline sugar). Children are given ½ glass to drink for 1-2 days in the morning on an empty stomach, while adults have to take 1 glass.
2	<i>Sansevieria hyacinthoides</i> (L.) Druce	Agavaceae	Lokeshwari	Leaf	Ear ache. 2-3 drops of juice obtained from macerated leaves are applied to ears for 2-3 days.
3	<i>Aerva sanguinolenta</i> (L.) Blume	Amaranthaceae	Laal chita paru	Leaf	To stop bleeding from cuts and wounds. Juice obtained from macerated leaves is applied.
4	<i>Alstonia scholaris</i> (L.) R.Br.	Apocynaceae	Chatni	Bark	Puerperal fever, pain, jaundice. Bark of <i>Alstonia scholaris</i> is mixed with barks of <i>Aegle marmelos</i> , <i>Moringa oleifera</i> , and <i>Azadirachta indica</i> , macerated and boiled in water. The decoction is then orally administered thrice daily in the morning, afternoon, and at night before sleep.
5	<i>Hemidesmus indicus</i> R.Br.	Apocynaceae	Beti gach	Leaf	Waist pain. Leaves are fried in mustard oil and applied to the waist (Khasia Kaviraj).
6	<i>Alocasia macrorrhizos</i> (L.) G. Don.	Araceae	Bish kochu	Stem	Paralysis. Macerated stems are applied to paralyzed areas. Alternately, stems are sliced into small pieces. The pieces are dried in the sun and powdered. Tablets weighing 3g each are made from the powder. One tablet is taken daily for 90 days. Tablets, if taken by non-paralyzed people can cause allergy.
7	<i>Borassus flabellifer</i> L.	Arecaceae	Taal	Sap	Low sperm count. Roots of <i>Bombax ceiba</i> are mixed with talmishri (crystalline sugar obtained from sap of <i>Borassus flabellifer</i>) and jaijol (fruit of <i>Myristica fragrans</i>), macerated and orally administered.
8	<i>Mikania cordata</i> (Burm.f.) B. L. Robinson	Asteraceae	Madhuca, Bish lota	Whole plant	Severe pain. Juice from macerated leaves is applied to painful areas.
9	<i>Bombax ceiba</i> L.	Bombacaceae	Shimul	Root	Low sperm count. Roots of <i>Bombax ceiba</i> are mixed with talmishri (crystalline sugar obtained from sap of <i>Borassus flabellifer</i>) and jaijol (fruit of <i>Myristica fragrans</i>), macerated and orally administered (59).
10	<i>Heliotropium indicum</i> L.	Boraginaceae	Hatishur	Leaf, root, flower	Eczema, leukoderma. 50g macerated juice from a combination of leaves, roots and flowers is mixed with 100g coconut oil and applied to affected areas for 1 month. Alternately, juice from macerated leaves, roots and flowers of <i>Heliotropium indicum</i> is mixed with oil from seeds of <i>Ricinus communis</i> and applied to affected areas.
11	<i>Ananas comosus</i> (L.) Merr.	Bromeliaceae	Anarosh	Young leaf	Hookworm infection. Juice from macerated young leaf is orally administered.
12	<i>Combretum</i> sp.	Combretaceae	Jhingla lota	Young leaf	Infections within fingers of hands or feet. (Usually happens due to contact with flood water. First the places will itch, followed by infections. Then a foul odor will come out of the infected area.) Juice from macerated leaves is applied.
13	<i>Combretum</i> sp.	Combretaceae	Goda jaam	Bark	Stomach ache, helminthiasis. Bark of <i>Combretum</i> sp. is mixed with bark of <i>Aegle marmelos</i> and leaves of <i>Cynodon dactylon</i> , soaked in water and orally administered.
14	<i>Combretum punctatum</i> Steud.	Combretaceae	Jongli kurchi	Bark	Badhok disease (infertility in women due problems in uterus).

Table 1: Continue

15	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Combretaceae	Arjun	Bark	Pain in bones. Bark of <i>Terminalia belerica</i> is mixed with bark of <i>Terminalia chebula</i> , leaves of <i>Ocimum sanctum</i> and <i>Ocimum tenuiflorum</i> , and bark of <i>Terminalia arjuna</i> , macerated and orally administered.
16	<i>Terminalia belerica</i> (Gaertn.) Roxb.	Combretaceae	Bohera	Bark	Waist pain. Macerated leaves and barks of <i>Hydnocarpus kurzii</i> are mixed with bark of <i>Moringa oleifera</i> , and barks of <i>Terminalia belerica</i> and <i>Terminalia chebula</i> and orally administered. Pain in bones. Bark of <i>Terminalia belerica</i> is mixed with bark of <i>Terminalia chebula</i> , leaves of <i>Ocimum sanctum</i> and <i>Ocimum tenuiflorum</i> , and bark of <i>Terminalia arjuna</i> , macerated and orally administered.
17	<i>Terminalia chebula</i> Retz.	Combretaceae	Hortoki	Bark	Waist pain. Macerated leaves and barks of <i>Hydnocarpus kurzii</i> are mixed with bark of <i>Moringa oleifera</i> , and barks of <i>Terminalia belerica</i> and <i>Terminalia chebula</i> and orally administered. Pain in bones. Bark of <i>Terminalia belerica</i> is mixed with bark of <i>Terminalia chebula</i> , leaves of <i>Ocimum sanctum</i> and <i>Ocimum tenuiflorum</i> , and bark of <i>Terminalia arjuna</i> , macerated and orally administered.
18	<i>Ipomoea sp.</i>	Convolvulaceae	Nagfona	Leaf	Leucorrhoea. Salsa, prepared from juice of macerated leaves is taken.
19	<i>Merremia vittifolia</i> (Burm.f.) Hallier.f.	Convolvulaceae	Dudh lota	Whole plant	Insect bite. Macerated whole plant is applied to insect bitten area.
20	<i>Kalanchoe pinnata</i> (Lam.) Pers.	Crassulaceae	Pathorkuchi	Whole plant	Diarrhea, dysentery. Juice from macerated whole plant is taken.
21	<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	Shorno lota	Whole plant	Diabetes. Stems of <i>Curcuma sp.</i> are mixed with whole plant of <i>Cuscuta reflexa</i> , leaves of <i>Lawsonia inermis</i> , leaves of <i>Azadirachta indica</i> , whole plants of <i>Clerodendrum viscosum</i> , and leaves of <i>Psidium guajava</i> , macerated, and taken.
22	<i>Cycas sp.</i>	Cycadaceae	Aklaji	Whole plant	Fever, headache. 100g of whole plant is administered orally with black peppers.
23	<i>Antidesma sp.</i>	Euphorbiaceae	Bon awla	Whole plant	Blood with stool. Whole plants of <i>Antidesma sp.</i> are mixed with young leaves of <i>Aegle marmelos</i> , and leaves of <i>Ocimum sanctum</i> and orally administered.
24	<i>Baliospermum montanum</i> (Willd.) Müll. Arg.	Euphorbiaceae	Jholap	Bark	Constipation, helminthiasis (hook worm and thread worm infections). Pills weighing about 3g are prepared from crushed bark. 1 pill is to be taken by children from 3-9 years, 2 pills by children from 9-15 years and 3 pills are to be taken daily by adults.
25	<i>Euphorbia sp.</i>	Euphorbiaceae	Harjora	Whole plant	Bone fracture. Cleaned whole plants are first macerated and then fried in 100g mustard oil. The mixture is applied to fractured area.
26	<i>Phyllanthus emblica</i> L.	Euphorbiaceae	Amloki	Fruit	Puerperal fever, pain, waist pain, debility. Fruits of <i>Phyllanthus emblica</i> are mixed with barks of <i>Moringa oleifera</i> , barks of <i>Syzygium cumini</i> , and barks of <i>Aegle marmelos</i> and boiled in water. To 500g of the decoction is mixed 50g of juice from leaves of <i>Cynodon dactylon</i> . The mixture is orally administered in the morning and evening after meals.
27	<i>Premna sp.</i>	Euphorbiaceae	Shorpongondha	Whole plant	To keep head cool, to increase memory. Juice from macerated whole plant is taken.
28	<i>Ricinus communis</i> L.	Euphorbiaceae	Venna	Seed	Eczema, leukoderma. Juice from macerated leaves, roots and flowers of <i>Heliotropium indicum</i> is mixed with oil from seeds of <i>Ricinus communis</i> and applied to affected areas.

Table 1: Continue

29	<i>Mimosa pudica</i> L.	Fabaceae	Laal lojjaboti	Whole plant	Jaundice. Whole plants of <i>Mimosa pudica</i> are macerated and administered orally. Toothache. Leaves are boiled in water till the water takes the color of tea liquor. The water is then cooled. Salt is added to the water, which is used for gargling (Khasia Kaviraj).
30	<i>Hydnocarpus kurzii</i> (King) Warb.	Flacourtiaceae	Gupto mul	Leaf, bark	Waist pain. Macerated leaves and barks of <i>Hydnocarpus kurzii</i> are mixed with bark of <i>Moringa oleifera</i> , and barks of <i>Terminalia belerica</i> and <i>Terminalia chebula</i> and orally administered.
31	<i>Swertia chirata</i> (Roxb. ex Fleming) H. Karst.	Gentianaceae	Chirota	Leaf	Waist pain, tongue lesions. Whole plant of <i>Grewia disperma</i> is mixed with leaves of <i>Swertia chirata</i> , macerated and orally administered.
32	<i>Clerodendrum sp.</i>	Lamiaceae	Fenergun	Leaf	Coughs, asthma. Leaves are soaked in water for some time. The soaked leaves are then macerated to obtain juice. Juice is strained and taken with a little sugar. Note that too much taking of the juice can lead to intoxication.
33	<i>Clerodendrum viscosum</i> Vent.	Lamiaceae	Bite	Whole plant	Diabetes. Stems of <i>Curcuma sp.</i> are mixed with whole plant of <i>Cuscuta reflexa</i> , leaves of <i>Lawsonia inermis</i> , leaves of <i>Azadirachta indica</i> , whole plants of <i>Clerodendrum viscosum</i> , and leaves of <i>Psidium guajava</i> , macerated, and taken. Tumor. Whole plants of <i>Persicaria sp.</i> is mixed with ginger (rhizomes of <i>Zingiber officinale</i>) and whole plants of <i>Clerodendrum viscosum</i> , macerated and applied to tumors. Note that it may sometimes induce an allergic reaction. Jaundice. Barks and roots of <i>Clerodendrum viscosum</i> are mixed with 100g ginger (rhizomes of <i>Zingiber officinale</i>), leaves of <i>Lawsonia inermis</i> , and molasses, macerated and administered twice daily in the morning and night.
34	<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	Tokma	Fruit	To clear objects from eyes, stomach problems. Fruits are used to bring out any object that has fallen in the eye. Care should be taken during application of fruit to eyes. Fruits are taken for stomach disorders.
35	<i>Ocimum sanctum</i> L.	Lamiaceae	Tulshi, Shada tulshi	Leaf	Blood with stool. Whole plants of <i>Antidesma sp.</i> are mixed with young leaves of <i>Aegle marmelos</i> , and leaves of <i>Ocimum sanctum</i> and orally administered. Pain in bones. Bark of <i>Terminalia belerica</i> is mixed with bark of <i>Terminalia chebula</i> , leaves of <i>Ocimum sanctum</i> and <i>Ocimum tenuiflorum</i> , and bark of <i>Terminalia arjuna</i> , macerated and orally administered.
36	<i>Ocimum tenuiflorum</i> L.	Lamiaceae	Bon tulshi	Leaf	Pain in bones. Bark of <i>Terminalia belerica</i> is mixed with bark of <i>Terminalia chebula</i> , leaves of <i>Ocimum sanctum</i> and <i>Ocimum tenuiflorum</i> , and bark of <i>Terminalia arjuna</i> , macerated and orally administered.
37	<i>Litsea sp.</i>	Lauraceae	Manda gach	Bark	Sexual diseases. Macerated bark is dried in the sun and powdered. Tablets made from the powder are taken twice daily (two tablets at a time).
38	<i>Lawsonia inermis</i> L.	Lythraceae	Mehedi	Leaf	Diabetes. Stems of <i>Curcuma sp.</i> are mixed with whole plant of <i>Cuscuta reflexa</i> , leaves of <i>Lawsonia inermis</i> , leaves of <i>Azadirachta indica</i> , whole plants of <i>Clerodendrum viscosum</i> , and leaves of <i>Psidium guajava</i> , macerated, and taken. Jaundice. Barks and roots of <i>Clerodendrum viscosum</i> are mixed with 100g ginger (rhizomes of <i>Zingiber officinale</i>), leaves of <i>Lawsonia inermis</i> , and molasses, macerated and administered twice daily in the morning and night.

Table 1: Continue

39	<i>Hibiscus rosa sinensis</i> L.	Malvaceae	Joba	Flower	Boils. Macerated flowers are applied once daily to boils.
40	<i>Azadirachta indica</i> A. Juss.	Meliaceae	Neem	Leaf	Diabetes. Stems of <i>Curcuma</i> sp. are mixed with whole plant of <i>Cuscuta reflexa</i> , leaves of <i>Lawsonia inermis</i> , leaves of <i>Azadirachta indica</i> , whole plants of <i>Clerodendrum viscosum</i> , and leaves of <i>Psidium guajava</i> , macerated, and taken. Puerperal fever, pain, jaundice. Bark of <i>Alstonia scholaris</i> is mixed with barks of <i>Aegle marmelos</i> , <i>Moringa oleifera</i> , and <i>Azadirachta indica</i> , macerated and boiled in water. The decoction is then orally administered thrice daily in the morning, afternoon, and at night before sleep. Stomach ache or blood dysentery in children. Young leaves of <i>Aegle marmelos</i> are mixed with young leaves of <i>Syzygium cumini</i> and <i>Azadirachta indica</i> and orally administered.
41	<i>Moringa oleifera</i> Lam.	Moringaceae	Sojne	Bark	Puerperal fever, pain, jaundice. Bark of <i>Alstonia scholaris</i> is mixed with barks of <i>Aegle marmelos</i> , <i>Moringa oleifera</i> , and <i>Azadirachta indica</i> , macerated and boiled in water. The decoction is then orally administered thrice daily in the morning, afternoon, and at night before sleep. Puerperal fever, pain, waist pain, debility. Fruits of <i>Phyllanthus emblica</i> are mixed with barks of <i>Moringa oleifera</i> , barks of <i>Syzygium cumini</i> , and barks of <i>Aegle marmelos</i> and boiled in water. To 500g of the decoction is mixed 50g of juice from leaves of <i>Cynodon dactylon</i> . The mixture is orally administered in the morning and evening after meals. Waist pain. Macerated leaves and barks of <i>Hydnocarpus kurzii</i> are mixed with bark of <i>Moringa oleifera</i> , and barks of <i>Terminalia bellerica</i> and <i>Terminalia chebula</i> and orally administered.
42	<i>Myristica fragrans</i> Houtt.	Myristicaceae	Jaifol	Fruit	Low sperm count. Roots of <i>Bombax ceiba</i> are mixed with talmishri (crystalline sugar obtained from sap of <i>Borassus flabellifer</i>) and jaifol (fruit of <i>Myristica fragrans</i>), macerated and orally administered.
43	<i>Psidium guajava</i> L.	Myrtaceae	Peyara	Leaf	Diabetes. Stems of <i>Curcuma</i> sp. are mixed with whole plant of <i>Cuscuta reflexa</i> , leaves of <i>Lawsonia inermis</i> , leaves of <i>Azadirachta indica</i> , whole plants of <i>Clerodendrum viscosum</i> , and leaves of <i>Psidium guajava</i> , macerated, and taken. Stomach ache. ½ cup juice obtained from macerated young leaves is taken.
44	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Jaam	Leaf, bark	Puerperal fever, pain, waist pain, debility. Fruits of <i>Phyllanthus emblica</i> are mixed with barks of <i>Moringa oleifera</i> , barks of <i>Syzygium cumini</i> , and barks of <i>Aegle marmelos</i> and boiled in water. To 500g of the decoction is mixed 50g of juice from leaves of <i>Cynodon dactylon</i> . The mixture is orally administered in the morning and evening after meals. Stomach ache or blood dysentery in children. Young leaves of <i>Aegle marmelos</i> are mixed with young leaves of <i>Syzygium cumini</i> and <i>Azadirachta indica</i> and orally administered.
45	<i>Plumbago</i> sp.	Plumbaginaceae	Oporajita, Chita	Sap	Antidote to poison. If anything poisonous is touched by any part of the body, sap is applied to the area.

Table 1: Continue

46	<i>Plumbago zeylanica</i> L.	Plumbaginaceae	Shada chita paru	Root	Abortifacient. Roots are washed thoroughly and the root bark removed. The inner part is macerated with 50g garlic cloves. 250g alcohol or local wine (local name: thatti) is then mixed and the mixture strained. The strained mixture is taken on an empty stomach to induce abortion. Note that the woman who is undergoing abortion cannot eat anything that day. Note also that it is to be applied to women who are 1-3 months pregnant.
47	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Durba ghash	Leaf	Puerperal fever, pain, waist pain, debility. Fruits of <i>Phyllanthus emblica</i> are mixed with barks of <i>Moringa oleifera</i> , barks of <i>Syzygium cumini</i> , and barks of <i>Aegle marmelos</i> and boiled in water. To 500g of the decoction is mixed 50g of juice from leaves of <i>Cynodon dactylon</i> . The mixture is orally administered in the morning and evening after meals. Stomach ache, helminthiasis. Bark of <i>Combretum</i> sp. is mixed with bark of <i>Aegle marmelos</i> and leaves of <i>Cynodon dactylon</i> , soaked in water and orally administered.
48	<i>Persicaria</i> sp.	Polygonaceae	Brisho kathali, Moricha	Whole plant	Tumor. Whole plants of <i>Persicaria</i> sp. is mixed with ginger (rhizomes of <i>Zingiber officinale</i>) and whole plants of <i>Clerodendrum viscosum</i> , macerated and applied to tumors. Note that it may sometimes induce an allergic reaction.
49	<i>Zizyphus oenoplia</i> (L.) Mill.	Rhamnaceae	Jongli haola	Leaf, stem	Blood dysentery, white dysentery (mucus in stool). Macerated leaves and stems are taken with 50g molasses.
50	<i>Randia dumetorum</i> (Retz.) Lam.	Rubiaceae	Pagla mon	Bark	Mental disorders. Juice is collected from macerated bark. It is then dried and turned into powder, which is mixed with sugar. Tablets weighing 5g each are made from the mixture and taken. Note that if a person, who is not suffering from mental disorders take the tablet, the person will have mental disorders.
51	<i>Aegle marmelos</i> (L.) Corr.	Rutaceae	Bel	Bark	Puerperal fever, pain, jaundice. Bark of <i>Alstonia scholaris</i> is mixed with barks of <i>Aegle marmelos</i> , <i>Moringa oleifera</i> , and <i>Azadirachta indica</i> , macerated and boiled in water. The decoction is then orally administered thrice daily in the morning, afternoon, and at night before sleep. Puerperal fever, pain, waist pain, debility. Fruits of <i>Phyllanthus emblica</i> are mixed with barks of <i>Moringa oleifera</i> , barks of <i>Syzygium cumini</i> , and barks of <i>Aegle marmelos</i> and boiled in water. To 500g of the decoction is mixed 50g of juice from leaves of <i>Cynodon dactylon</i> . The mixture is orally administered in the morning and evening after meals. Blood with stool. Whole plants of <i>Antidesma</i> sp. are mixed with young leaves of <i>Aegle marmelos</i> , and leaves of <i>Ocimum sanctum</i> and orally administered. Stomach ache, helminthiasis. Bark of <i>Combretum</i> sp. is mixed with bark of <i>Aegle marmelos</i> and leaves of <i>Cynodon dactylon</i> , soaked in water and orally administered. Stomach ache or blood dysentery in children. Young leaves of <i>Aegle marmelos</i> are mixed with young leaves of <i>Syzygium cumini</i> and <i>Azadirachta indica</i> and orally administered.
52	<i>Scoparia dulcis</i> L.	Scrophulariaceae	Ban kurali, Ulcer gach	Leaf	Ulcer. Juice from macerated leaves is taken once daily for 20-30 days.

Table 1: Continue

53	<i>Datura metel</i> L.	Solanaceae	Dhutura	Leaf, seed	Body ache, to make somebody unconscious. Leaves are soaked in mustard oil, warmed, and applied to painful areas. Seeds are orally administered to make somebody unconscious.
54	<i>Abroma augusta</i> L.f.	Sterculiaceae	Ulot kombol	Leaf, stem	Vitamin source, gastrointestinal disorders, protection against diseases. ½ cup of juice obtained from macerated stem is taken daily.
55	<i>Grewia disperma</i> Rottl. ex Spreng.	Tiliaceae	Joggo dumur	Whole plant	Waist pain, tongue lesions. Whole plant of <i>Grewia disperma</i> is mixed with leaves of <i>Swertia chirata</i> , macerated and orally administered. Acidity, gastritis. Leaves and stems are soaked in water followed by drinking the water (Khasia Kaviraj).
56	<i>Centella asiatica</i> (L.) Urb.	Umbelliferae	Thankuni	Leaf, stem	Gastric or liver troubles. Juice obtained from macerated leaves and stems is orally administered.
57	<i>Cissus quadrangularis</i> L.	Vitaceae	Harjora	Whole plant	Bone fractures, pain due to bone fracture. Macerated whole plant is applied as a poultice to area of fracture.
58	<i>Curcuma sp.</i>	Zingiberaceae	Bon holud	Stem	Diabetes. Stems of <i>Curcuma sp.</i> are mixed with whole plant of <i>Cuscuta reflexa</i> , leaves of <i>Lawsonia inermis</i> , leaves of <i>Azadirachta indica</i> , whole plants of <i>Clerodendrum viscosum</i> , and leaves of <i>Psidium guajava</i> , macerated, and taken.
59	<i>Zingiber officinale</i> Roscoe	Zingiberaceae	Ada	Rhizome	Tumor. Whole plants of <i>Pericaria sp.</i> is mixed with ginger (rhizomes of <i>Zingiber officinale</i>) and whole plants of <i>Clerodendrum viscosum</i> , macerated and applied to tumors. Note that it may sometimes induce an allergic reaction. Jaundice. Barks and roots of <i>Clerodendrum viscosum</i> are mixed with 100g ginger (rhizomes of <i>Zingiber officinale</i>), leaves of <i>Lawsonia inermis</i> , and molasses, macerated and administered twice daily in the morning and night.

Additives were occasionally added to decoctions or juices obtained from macerated plant parts to make it more palatable or add to the therapeutic efficiency. Sugar or mishri (crystalline sugar) was added to boiled leaves of *Justicia adhatoda* to make the decoction more palatable when taken as treatment for coughs or body ache. Crystalline sugar (talmishri) prepared from sap of *Borassus flabellifer* was added to macerated roots of *Bombax ceiba* and fruits of *Myristica fragrans*. In this latter instance, talmishri served to increase the therapeutic efficiency of the other two plants. As treatment for toothache, salt was added to boiled leaves of *Mimosa pudica*, and the water used for gargling. In this instance too, salt would have its own therapeutic effect in reducing pain, as well as possibly produce a synergistic analgesic effect with the decoction prepared from leaves of *Mimosa pudica*.

Surprisingly, the Khasia Kaviraj of Khasia Palli could provide information on only 3 plants out of the total of 59 plants obtained in the present study. These three plants were *Hemidesmus indicus* (used for treatment of waist pain), *Mimosa pudica* (used for treatment of toothache), and *Grewia disperma* (used for treatment of acidity and gastritis). Although only three plant species was provided by the Khasia Kaviraj, interestingly, the uses of these plants or the ailments treated were completely different from those provided by the Bengali Kavirajes of Khakiachora. The Khakiachora Kavirajes used *Grewia disperma* for treatment of waist pain, and *Mimosa pudica* for treatment of jaundice. *Hemidesmus indicus* was not used by the Khakiachora Kavirajes at all. This suggests two things. First, despite the proximity of the two villages, the Kavirajes from two distinct groups of populations – the Bengalis and the Khasias, differed in their selection of medicinal plants for treatment of any specific ailment. Second, the dearth of information obtained from the Khasia Kaviraj suggests a fast disappearance or eroding of the Khasia medicinal knowledge, possibly influenced by Bengali settlers and loss of habitat of the Khasia indigenous population. Although specific inquiries were not made, it was suggested by the Khasia Kaviraj that they, particularly the younger generation, are losing belief in their ancestral customs and rituals.

The plants obtained in the present study offer considerable opportunities for scientific research. The practice of any Kaviraj is based usually on family knowledge gathered through the generations and confined within the immediate family, as observed in our previous studies. As such, Kavirajes have through generations used the same plant for treatment of the same ailment, suggesting the efficacy of the plant. To take just one

example, diabetes is a debilitating disease prevalent throughout the world, including Bangladesh. In Bangladesh, various studies have shown its prevalence rate to be 8.5% in an urbanizing rural community (Rahman *et al.*, 2007), and 7% in the rural population (Rahim *et al.*, 2008). Since the Kavirajes in the present study had plant treatment for diabetes, the disease must be present in the Khaskiachora rural population. The Kavirajes used a mixture of stems of *Curcuma* sp., whole plant of *Cuscuta reflexa*, leaves of *Lawsonia inermis*, leaves of *Azadirachta indica*, whole plant of *Clerodendrum viscosum*, and leaves of *Psidium guajava* to treat this disease. The antidiabetic properties of leaves of *Azadirachta indica* and *Psidium guajava* have been reported (Bhat *et al.*, 2009; Chattopadhyay, 1999; Shen *et al.*, 2008; Wang *et al.*, 2005). *In vitro* hypoglycemic activity has also been reported for methanol extract of *Lawsonia inermis* (Arayne *et al.*, 2007). Overall, at least for diabetes, the plant choices by the Kavirajes indicate scientific merit, even though the Kavirajes are not aware of such scientific reports.

Since the Kavirajes of the present study were observed to treat difficult to treat diseases with allopathic medicine like diabetes, tumor or paralysis, it is important that the plants obtained in the present study be studied for their validity of use, phytochemical constituents, and relevant pharmacological activities. Such scientific research can pave the way for breakthrough discoveries not only in the treatment of the aforementioned diseases, but also in the treatment of common diseases like coughs, fever, skin and gastrointestinal disorders, many types of which are of microbial origin and have developed modern drug-resistant microorganisms.

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