

ORIGINAL ARTICLES

A Survey of Medicinal Plants Used by Kavirajes of Barisal Town in Barisal District, Bangladesh

¹Anita Rani Chowdhury, Farhana Israt Jahan, Syeda Seraj, Zubaida Khatun, Farhana Jamal, Shamima Ahsan, Rownak Jahan, Ishtiaq Ahmad, ²Majeedul H. Chowdhury, Mohammed Rahmatullah

New York City College of Technology, The City University of New York Brooklyn, NY 11201, USA. Faculty of ²Life Sciences, University of Development Alternative, Dhanmondi, Dhaka-1205, Bangladesh.

Anita Rani Chowdhury, Farhana Israt Jahan, Syeda Seraj, Zubaida Khatun, Farhana Jamal, Shamima Ahsan, Rownak Jahan, Ishtiaq Ahmad, Majeedul H. Chowdhury, Mohammed Rahmatullah: A survey of medicinal plants used by Kavirajes of Barisal town in Barisal district, Bangladesh: *Am.-Eurasian J. Sustain. Agric., C(C): CC-CC, 2010*

ABSTRACT

A substantial section of the population of Bangladesh is poor and more than a third of the total population of 150 million people lives below the poverty line (i.e. having a daily income of less than US\$ 1 per day). The poorer section of the population resides mostly in the rural areas and the urban slums. The rural population and population in small towns in addition suffer from proper access to health-care facilities and are not always in a position to afford the costs of allopathic treatment. They therefore rely on folk medicinal practitioners otherwise known as Kavirajes for treatment of their various ailments. The Kavirajes rely on administration of medicinal plants either orally or topically for treatment of diseases. Each Kaviraj has his unique repertoire of medicinal plants, which is closely guarded and usually passed onto an immediate member of the family in the successive generation. The objective of the present study was to conduct a survey on medicinal plant usage among selected Kavirajes of Barisal town in Barisal district, Bangladesh. Interviews were conducted with the help of a semi-structured questionnaire and the guided field-walk method. Information was obtained as to the local name of plants, parts used, formulations and dosages. It was found that the interviewed Kavirajes used 49 plants distributed into 28 families in their treatment of various ailments. The Asteraceae, Fabaceae, Lamiaceae, and Moraceae families contributed 4 plants each, while the Solanaceae and the Verbenaceae family contributed 3 plants per family. The various plant parts used by the Kavirajes in their formulations included whole plant, leaf, stem, root, bark, flower, fruit, seed, and sap. Leaves constituted the major plant part used (34.8% of total uses), followed by roots (15.2%). Gastrointestinal disorders (stomach ache, constipation, dysentery, diarrhea) formed the major group of ailments treated by the Kavirajes and a total of 11 plants were used to treat these ailments. Eight plants were used to treat skin disorders, 7 plants for pain relief, and 6 plants for respiratory tract disorders like coughs and mucus. Other ailments treated by the Kavirajes included urinary tract problems, cuts and wounds, meho (a term used by the Kavirajes to indicate urinary problem arising from endocrinological disorders or diabetes), fever, skin disorders, malaria, rheumatism, dog and snake bites, hepatic disorders (jaundice, enlarged liver), tooth infections, eye problems, heart disorders, diabetes, hydrocele, goiter, helminthiasis, menstrual problems, and fractures. Plants have always formed a rich source of modern drugs. The medicinal plants used by the Kavirajes need to be scientifically studied for phytochemical constituents and pharmacological activities towards discovery of lead compounds and more efficacious newer drugs.

Key words: Folk medicine, medicinal plants, Barisal, Bangladesh

Introduction

Corresponding Author: Dr. Mohammed Rahmatullah, Chancellor University of Development Alternative House No. 78, Road No. 11A (new) Dhanmondi R/A, Dhaka-1205 Bangladesh
Email: rahamatm@hotmail.com Fax: 88-02-8157339

Traditional medicinal practices used to be in vogue prior to the advent of modern allopathic medicine. While allopathic medicine to a certain extent diminished the importance of traditional medicinal practices, the former did not obliterate the latter. In fact traditional medicinal practices have a substantial number of adherents and have continued in practically all countries of the world as of this day. In recent years, traditional medicine is making a comeback because certain realizations have set in – the contribution of indigenous or traditional medicine in the discovery of new drugs (Balick and Cox, 1996.), the failure of modern drugs to cure all diseases, the emergence of modern drug-resistant organisms, the deleterious side-effects of a number of modern drugs, and last but not the least, a growing recognition among both patients and scientists that traditional medicine can also prove to be a successful way in the treatment of a number of diseases.

Folk medicine forms one form of traditional medicinal practices in Bangladesh. Folk medicinal practitioners, known usually as Kavirajes, rely on simple preparations of medicinal plants to treat diseases. More often a single plant or plant part is used for treatment, although occasionally a complex combination of medicinal plants or plant parts are used. However, the preparation mode is usually simple and mainly consists of decoctions, macerations or pastes of whole plant or plant parts, which may be administered either orally or topically. In our ongoing ethnomedicinal surveys among the different tribes and in different regions of Bangladesh (Rahmatullah, *et al* 2010; Mollik, *et al* 2010; Hossan, *et al* 2010; Rahmatullah, *et al* 2010; Nawaz, *et al* 2009; Hanif, *et al* 2009; Hossan, *et al* 2009; Rahmatullah, *et al* 2009), it has been observed that any individual Kavirajes repertoire of medicinal plants vary considerably from another Kaviraj, who may be practicing in an adjoining area. This diversity of medicinal plants used by different Kavirajes makes it imperative to conduct ethnomedicinal surveys in as many areas of Bangladesh as possible to get a comprehensive view of the medicinal plants of Bangladesh. Kavirajes generally practice in the rural areas including small towns of the country. The objective of the present study was to conduct a survey on medicinal plant usage by Kavirajes of Barisal town in Barisal district of Bangladesh.

Materials and Methods

Barisal town is the main urban center of Barisal district. The town lies in the Padma river delta on an offshoot of the Kirtonkhola river. The town was upgraded to City Corporation in 2002. Its suitable position and ease of river traffic has made it an important shipment center for rice, pulses, and hides. There are several industrial units located within the town belonging to bakery, textile, and pharmaceutical sectors. The maximum annual average temperature is 35.1°C, and the minimum is 12.1°C. The annual rainfall is quite heavy and averages about 19.55 cm.

Prior to the actual survey, a preliminary survey of various town residents indicated that two Kavirajes practicing within the town of Barisal were quite reputed for their treatment of various diseases and had a high patient satisfaction report. The two Kavirajes were Kaviraj Sobhan Siddiq and Kaviraj Parimal Chandra Debnath. Permission was sought from the two Kavirajes for interviews; the purpose of the interviews was explained to them and informed consent obtained from both Kavirajes. Interviews were conducted in Bangla, which language was spoken by both Kavirajes and the interviewers. A semi-structured questionnaire was used during the interview process. Plants were collected through the guided field-walk method as described by Martin (Martin, 1995) and Maundu (Maundu, 1995). In this method, the Kavirajes took the interviewers on field-walks through areas from where they collected their medicinal plants, pointed out the plants and described their uses. Plant specimens were collected, dried and brought back for identification to Dhaka. All plant specimens were identified by Mr. Manzur-ul-Kadir Mia, ex-Principal Scientific Officer and Curator of the Bangladesh National Herbarium.

Results

The Kavirajes of Barisal town used 49 plants distributed into 28 families for treatment of various ailments. The Asteraceae, Fabaceae, Lamiaceae, and Moraceae families contributed four plants each followed by the Solanaceae and Verbenaceae families with three plants per family. The results are shown in Table 1. The use of so many Moraceae family plants is a noteworthy feature of the Barisal town Kavirajes. Also noteworthy is that three of the four plants belonged to the *Ficus* genera suggesting that this group can be a useful source of newer medicines.

Various plant parts, besides whole plant, were used in the formulations of the Kavirajes. These included leaf, stem, root, bark, flower, fruit, seed, and sap. Leaves constituted the major plant part used, contributing to 34.8% of total uses. Barks constituted 15.2% of the plant parts used, followed by roots with 12.1%. The results are shown in Table 2.

Table 1: Medicinal plants used by the Kavirajes of Barisal town, Bangladesh.

Serial Number	Scientific Name	Family Name	Local Name	Part utilized	Ailment/Symptoms treated
1	<i>Justicia adhatoda</i> L.	Acanthaceae	Bashok	Leaf	Coughs. 2 tolas (tola is a local measure approximating 12g) leaf juice is orally taken with honey in the morning and evening for 3 days.
2	<i>Amaranthus spinosus</i> L.	Amaranthaceae	Kanta bujri, Khaira kanta	Leaf, stem, root	Rheumatic pain, pain in the bones, blood or pus coming out with urine. The leaves and stems are cooked and eaten as vegetable as remedy for rheumatic pain and pain in the bones. Juice obtained from one crushed root is taken twice daily for 3 days as remedy for blood or pus coming out with urine.
3	<i>Mangifera indica</i> L.	Anacardiaceae	Aam	Leaf, bark	Stomach ache, cuts and wounds, meho (urinary problem arising from endocrinological disorder or diabetes). Juice from 4-5 leaves is taken to cure sudden stomach ache. Note that stomach ache goes away immediately after administration of juice. Leaves are burnt, mixed with grounded mollusks, softened with water and applied to cuts and wounds. 250g bark is soaked in ½ kg water overnight whence it forms a milk-like decoction. Half the water is taken in the morning on an empty stomach and the rest in the afternoon for treatment of meho. Alternately, 2 teaspoonful of dried and powdered bark is mixed with 1 glass of water and taken on an empty stomach. This is continued till cure.
4	<i>Mangifera longipes</i> Griffith	Anacardiaceae	Uri aam	Bark	Loss of sensitivity in skin, chronic mucus, continuous sneezing with running water from nose, small pustules on the skin of children, loss of sensitivity in skin due to allergy. 250g bark of <i>Syzygium cumini</i> is combined with 250g bark from <i>Mangifera longipes</i> , 250g each of fruits of <i>Phyllanthus emblica</i> and <i>Terminalia chebula</i> and 1.5 kg of water. The mixture is boiled till the volume is 3 poas (local measure approximating 750g). 2 teaspoonful of the decoction is taken 4 times daily for 14 days for the above ailments (for children the dose is 1 teaspoonful).
5	<i>Alstonia scholaris</i> (L.) R.Br.	Apocynaceae	Chatim	Bark	Continuous fever, malaria. Bark is soaked in water or alternately, bark is boiled in water for 60-90 minutes (250g bark in ½ kg water). 2 tolas of the resultant decoction is taken thrice daily during morning, afternoon and night for 3-4 days.
6	<i>Thevetia peruviana</i> (Pers.) K. Schum.	Apocynaceae	Mon shila, Yellow flowered-Kolki phool	Fruit	Rheumatism. Fruits are burned till black in color. Equal amounts of burnt fruits and peas are crushed and taken twice daily in the morning and evening for three weeks.
7	<i>Calotropis procera</i> (Ait.) Ait.f.	Asclepiadaceae	Akondo	Leaf, sap	Dog bite, hargila (Kaviraj term for hard swelling in soles of feet), chest and back pain due to cold. Sap is applied to dog bitten area. Sap is also applied to hard swellings in soles; following application of sap a hard matter comes out which is cut off with a blade). Mustard oil is applied to leaves followed by slight warming and application of leaves to chest and back due to cold-induced pain in those areas.
8	<i>Eclipta prostrata</i> L.	Asteraceae	Kalinjiri	Whole plant	Jaundice (Kaviraj term: holud-e-palong). ½ cup amount of juice obtained from crushed whole plant is taken thrice daily for 3 days.
9	<i>Mikania cordata</i> (Burm.f.) B. L.	Asteraceae	Riot lota, Pakistani lota	Leaf	Cuts and wounds, ulcer. 2 tolas of leaf juice are applied to Robinsoncuts and wounds to stop bleeding. 2 tolas of leaf juice are taken in the morning and evening for 7 days for ulcers.
10	<i>Spilanthes paniculata</i> Wall. ex DC.	Asteraceae	Ot phol	Flower	Toothache, tooth infections. Flowers are chewed followed by closing of the mouth for 5 minutes followed by gargling with warm water.
11	<i>Xanthium indicum</i> J. Koenig ex Roxb.	Asteraceae	Hagra	Root	Rheumatism. 2 tolas juice obtained from crushed roots are orally administered.

Table 1: Continue

12	<i>Bombax ceiba</i> L.	Bombacaceae	Shimul tula	Leaf, root, bark	Stoppage of urination and defecation. One tola juice from a combination of leaf, root and bark is taken twice daily for 2-3 days.
13	<i>Heliotropium indicum</i> L.	Boraginaceae	Hatishur	Leaf	Eye infection caused by white mites, itching in eye. 2-3 drops of juice squeezed from leaves are applied to eyes 2-3 times daily.
14	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Combretaceae	Arjun	Bark	Abnormal rhythms of heart. Bark is powdered. 3 teaspoonfuls of the powder are taken with 4 drops of ghee (clarified butter) in the afternoon with warm rice.
15	<i>Terminalia chebula</i> Retz.	Combretaceae	Horitoki	Fruit	Loss of sensitivity in skin, chronic mucus, continuous sneezing with running water from nose, small pustules on the skin of children, loss of sensitivity in skin due to allergy. 250g bark of <i>Syzygium cumini</i> is combined with 250g bark from <i>Mangifera longipes</i> , 250g each of fruits of <i>Phyllanthus emblica</i> and <i>Terminalia chebula</i> and 1.5 kg of water. The mixture is boiled till the volume is 3 poas (local measure approximating 750g). 2 teaspoonful of the decoction is taken 4 times daily for 14 days for the above ailments (for children the dose is 1 teaspoonful).
16	<i>Coccinia grandis</i> (L.) J. Voigt	Cucurbitaceae	Mama kola, Telakucha	Leaf, whole plant	To keep head cool, burning sensations in hands or feet, diabetes. Juice from crushed leaves is applied to head or hands and feet to keep head cool and reduce burning sensations in hands or feet. 2 tolas juice are taken twice daily (once in the morning on an empty stomach and once after meals in the night) to control diabetes. Burning sensations in the scalp, feeling of hotness in head, sweating in soles of hands or feet. Whole plant is crushed and applied to head. Along with that ½ cup whole plant juice is taken twice (thrice if sickness is severe) for 7 days.
17	<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	Shonali lota, Shunyo lota	Stem	Jaundice. 2 tolas of juice obtained from crushed stem are administered orally twice daily for 3-4 days.
18	<i>Dillenia indica</i> L.	Dilleniaceae	Chalta gach	Leaf, root	Hydrocele, contraceptive. A handful of root is tied around the waist for hydrocele. For contraceptive uses, 1 young leaf of the plant is mixed with 1 handful of rice and soaked in water overnight. The following morning rice and leaf is macerated ant pithas (flattened and steamed food item in Bangladesh) made of the mixture. Pithas are taken on an empty stomach. The leaf and rice is to be soaked on the evening of the last day of the menstrual cycle and pithas made the following morning. One pitha each is eaten for the next 3 days. The contraceptive effect lasts for 5 years.
19	<i>Diospyros ebenum</i> J. König	Ebenaceae	Deshi gab	Bark	Lower abdominal pain, diarrhea, cuts and wounds to stop bleeding. ½ kg bark of <i>Erythrina variegata</i> combined with ½ kg bark of <i>Diospyros ebenum</i> is boiled in 2 kg water till the volume is reduced to 1 kg. 3-4 teaspoonfuls of the decoction are taken thrice daily for 15-20 days for lower abdominal pain or diarrhea.
20	<i>Phyllanthus emblica</i> L.	Euphorbiaceae	Amloki	Fruit	Loss of sensitivity in skin, chronic mucus, continuous sneezing with running water from nose, small pustules on the skin of children, loss of sensitivity in skin due to allergy. 250g bark of <i>Syzygium cumini</i> is combined with 250g bark from <i>Mangifera longipes</i> , 250g each of fruits of <i>Phyllanthus emblica</i> and <i>Terminalia chebula</i> and 1.5 kg of water. The mixture is boiled till the volume is 3 poas (local measure approximating 750g). 2 teaspoonful of the decoction is taken 4 times daily for 14 days for the above ailments (for children the dose is 1 teaspoonful).
21	<i>Ricinus communis</i> L.	Euphorbiaceae	Veron	Oil from whole plant	Constipation. 4-8 drops of oil are taken following meals.
22	<i>Cassia fistula</i> L.	Fabaceae	Shonail, Bandor lathi	Top portion of young stems	Purgative. 12-14 top portions of young stems are fried in oil and taken with warm rice during bed time. Note that if this results in diarrhea, then something cold needs to be taken. The Kavirajes advise to take this purgative once a year.

Table 1: Continue

23	<i>Cassia tora</i> L.	Fabaceae	Chanchu kata	Seed	Scabies. Powdered seeds are mixed with kerosene. The scabies area is scratched thoroughly, washed with water, dried with a piece of cloth and then the seed-kerosene mixture is applied on 3 consecutive days during night time.
24	<i>Erythrina variegata</i> L.	Fabaceae	Madar gach	Leaf, bark	Lower abdominal pain, diarrhea, cuts and wounds to stop bleeding. ½ kg bark of <i>Erythrina variegata</i> is combined with ½ kg bark of <i>Diospyros ebenum</i> is boiled in 2 kg water till the volume is reduced to 1 kg. 3-4 teaspoonful of the decoction is taken thrice daily for 15-20 days for lower abdominal pain or diarrhea. To stop bleeding from cuts and wounds, macerated leaves of the plant are applied.
25	<i>Lathyrus sativus</i> L.	Fabaceae	Khesari dal	Seed	Scabies, eczema, allergy. 4-5 leaves of <i>Datura metel</i> are boiled with 1 poa (local measure approximating 250g) khesari dal (seeds of <i>Lathyrus sativus</i>) in water in a vessel till the water dries up. The vessel is then tilted to one side, when juice flows from the dried portion to the tilted side. 4 drops of that juice is taken twice daily in the morning and night time on an empty stomach for 3 weeks
26	<i>Clerodendrum indicum</i> (L.) Kuntze	Lamiaceae	Bain josthi	Top of stem without leaves	Eczema, itches. Top of stems without leaves are chewed 1-2 times daily for 14 days.
27	<i>Leonurus sibiricus</i> L.	Lamiaceae	Jongli bhang	Whole plant	To induce good sleep during night time. 2 tolas juice from crushed whole plant are orally taken.
28	<i>Leucas aspera</i> (Willd.) Link	Lamiaceae	Dondo kolosh	Leaf, stem, root	Pain with accompanied swelling, goiter in women, respiratory difficulties. Juice from squeezed leaves is applied to affected place followed by application of a warm cloth on the painful area. 101 pieces of stems (about 6 inches long) is strung in the form of a garland and worn around the neck for goiter. As the stem pieces dry up, goiter is reduced. Root is worn around the neck as a talisman for respiratory difficulties.
29	<i>Ocimum basilicum</i> L.	Lamiaceae	Babui tulshi	Leaf	Coughs. ½ cup leaf juice is taken in the morning and the evening.
30	<i>Azadirachta indica</i> A. Juss.	Meliaceae	Neem gach	Leaf	Diabetes. 101 leaves are boiled in 1 kg water with 51 black peppers till the volume is reduced to ½ kg. 4 teaspoonfuls of the decoction are taken thrice daily for 2 months.
31	<i>Ficus benghalensis</i> L.	Moraceae	Bot gach	Bark	Meho (urinary problem arising from endocrinological disorder or diabetes). 250g bark is soaked in ½ kg water and taken thrice daily for 2 days. If not cured, it is to be taken for 7 days.
32	<i>Ficus hispida</i> L.f.	Moraceae	Khoskhose goj bukhil	Root	Dysentery. Roots of <i>Ficus hispida</i> (1 chatak, local measure approximating 62.5g) are combined with 1 chatak roots of <i>Musa paradisiaca</i> (banana which has seeds within the fruit), macerated and taken twice daily for 3-7 days. Note that freshly macerated root combinations are to be taken each time before eating.
33	<i>Ficus racemosa</i> L.	Moraceae	Jog dumur, Goj bukhil	Fruit	Diabetes. One teaspoonful of dried and powdered fruits is taken in the morning and evening. Piles, bleeding due to piles. The white sap of the tree when it is cut is taken with biscuits twice daily for 15-20 days. Alternately, 250g sliced fruit is boiled in two and one quarter liter of water and bottled. Three teaspoonful of the decoction is taken twice daily for 15-20 days.
34	<i>Streblus asper</i> Lour.	Moraceae	Shaora gach	Leaf	Rheumatism. ½ cup of leaf juice is taken twice daily.
35	<i>Musa paradisiaca</i> L.	Musaceae	Bichi kola	Root	Dysentery. Roots of <i>Ficus hispida</i> (1 chatak, local measure approximating 62.5g) are combined with 1 chatak roots of <i>Musa paradisiaca</i> (banana which has seeds within the fruit), macerated and taken twice daily for 3-7 days. Note that freshly macerated root combinations are to be taken each time before eating.

Table 1: Continue

36	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Jaam	Seed, bark	Suffering from urination or urinary pressure during taking a bath. 1 teaspoonful of powdered seed is taken with water. Loss of sensitivity in skin, chronic mucus, continuous sneezing with running water from nose, small pustules on the skin of children, loss of sensitivity in skin due to allergy. 250g bark of <i>Syzygium cumini</i> is combined with 250g bark from <i>Mangifera longipes</i> , 250g each of fruits of <i>Phyllanthus emblica</i> and <i>Terminalia chebula</i> and 1.5 kg of water. The mixture is boiled till the volume is 3 poas (local measure approximating 750g). 2 teaspoonful of the decoction is taken 4 times daily for 14 days for the above ailments (for children the dose is 1 teaspoonful).
37	<i>Syzygium malaccense</i> (L.) Merr. & L. M. Perry	Myrtaceae	Jamrul gach	Leaf	Helminthiasis, stomach ache. Juice obtained from crushed 3 leaves of <i>Syzygium malaccense</i> and 3 leaves of <i>Psidium guajava</i> are orally administered.
38	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Durba	Whole plant	Too much blood during menstruation. 2 tolas of whole plant juice are taken twice in 24 hours. Meho (symptoms waist pain, difficulties in sitting, loss of weight, whitish discharge in urine, difficulties during urination, less urination). Juice from 161 whole plants is combined with juice from 1 leaf of <i>Mangifera indica</i> . 3-4 teaspoonfuls of the juice are taken thrice daily on an empty stomach for 7-14 days.
39	<i>Polygonum hydropiper</i> L.	Polygonaceae	Bish katali	Whole plant	Pain, swellings, fractures. Juice from crushed whole plant is applied to pains or swellings (for 10 minutes), to fractures (for 72 hours).
40	<i>Anthocephalus chinensis</i> (Lam.) A. Rich. ex Walp.	Rubiaceae	Kodom gach	Top of stems with young leaves, top of stems without young leaves	Headache. Top of stems with young leaves are rubbed on the head. Not that this remedy applies only to common headache. Young stems without young leaves are also rubbed on the head as remedy for headache. Burns, eczema, itches. Juice from young stems without leaves are mixed with water from 10 coconuts, 1 kg dhup (a type of incense) and 250 g sesame oil and churned till a cream is formed. The cream is applied to burns and to eczema and itches following scratching of the affected areas.
41	<i>Glycosmis pentaphylla</i> (Retz.) Corr.	Rutaceae	Atkhira, Atali gach	Leaf	Enlarged liver (diagnosed by pain in right abdomen). 2 tolas of leaf juice are taken for 3 weeks.
42	<i>Murraya paniculata</i> (L.) Jack	Rutaceae	Kamini	Leaf	Dysentery. Juice obtained from macerated leaves is orally administered (2 tolas leaf juice taken twice daily for 7 days).
43	<i>Scoparia dulcis</i> L.	Scrophulariaceae	Mishri dana, Chini champa	Leaf	Dysentery in children. 2 tolas leaf juice is administered twice daily for 3 days.
44	<i>Datura metel</i> L.	Solanaceae	Shada dhutura	Leaf	Scabies, eczema, allergy. 4-5 leaves are boiled with 1 poa (local measure approximating 250g) khesari dal (seeds of <i>Lathyrus sativus</i>) in water in a vessel till the water dries up. The vessel is then tilted to one side, when juice flows from the dried portion to the tilted side. 4 drops of that juice are taken twice daily in the morning and night time on an empty stomach for 3 weeks.
45	<i>Solanum capsicoides</i> Allioni	Solanaceae	Tit baegun	Seed	Snake bite. 8 seeds are orally administered to snake-bitten patients. Seeds are administered thrice in 24 hours following which the patient vomits and gets cured. The remedy applies to any type of poisonous snake biting.
46	<i>Solanum violaceum</i> Orteg.	Solanaceae	Kontikari	Leaf, root, seed, whole plant	Meho (urinary problem arising from endocrinological disorders or diabetes). Juice from crushed whole plant is orally administered (2 tolas juice are administered twice daily for 3 days to 3 weeks). In absence of whole plant, leaf, root or seed juice is administered.
47	<i>Clerodendrum viscosum</i> Vent.	Verbenaceae	Vait	Leaf	Helminthiasis (gura krimi or hookworm infections). 2 tolas of leaf are taken raw once in the morning on an empty stomach and once in the evening after meals for 3 days.
48	<i>Nyctanthes arbor tristis</i> L.	Verbenaceae	Shefali phool	Leaf	Fever. ½ cup (tea cup) amount of leaf juice is administered 4-5 times daily.

Table 1: Continue

49	<i>Phyla nodiflora</i> (L.) Greene	Verbenaceae	Saitta okra, Okra pata	Leaf, stem, bark	Pain due to working or falling down, pain in back or waist due to rheumatism. 2 tolas (1/2 cup) amount of leaf juice are taken once for pain due to working or falling down. The leaves, stems and barks of <i>Phyla nodiflora</i> is combined with leaves, stems and barks of <i>Solanum capsicoides</i> and crushed to extract the juice. ½ cup amount of juice is taken in the morning and evening on an empty stomach for rheumatic pain.
----	---------------------------------------	-------------	---------------------------	---------------------	---

Table 2: Percent use of various plant parts by the Kavirajes of Barisal town.

Plant part	Percent use
Whole plant	10.6
Leaf	34.8
Stem	10.6
Root	12.1
Bark	15.2
Flower	1.5
Fruit	6.1
Seed	7.6
Sap	1.5

Plants or plant parts were used in diverse ways for treatment of ailments. A single plant part may be used for treatment of a single ailment or multiple ailments; for instance, the leaves of *Justicia adhatoda* were used for treatment of coughs, while the bark of *Alstonia scholaris* was used for treatment of continuous fever as well as malaria. A combination of plant parts from the same plant may be used for treatment of a single or multiple ailments. The leaves, roots and barks of *Bombax ceiba* were used in cases of stoppage of urination and defecation. On the other hand, the leaves and stems of *Amaranthus spinosus* were used for treatment of rheumatic pain as well as pain in the bones. However, a common motif can be observed in these treatments. Fever is also a feature of malaria. Therefore, when the Kavirajes were using *Alstonia scholaris* for treatment of both continuous fever as well as malaria, it is possible that instead of treating malaria, they were treating a common feature of malaria, which is fever. Similarly, treatment of rheumatic pain as well as pain in the bones with *Amaranthus spinosus* suggests presence of an analgesic principle in the plant, which is effective in reducing similar types of pain. Note that the plant was not used for treatment of other types of pain, e.g. headache, stomach ache, tooth ache, or pain resulting from falling down or fractures. Rheumatic pain and pain in the bones are very similar to each other and can often be indistinguishable, suggesting that the active principle of the plant is used for only a specific type of pain.

The Kavirajes referred to a particular diseased condition, which they termed meho, which through parallel allopathic diagnosis was traceable to urinary problems arising out from endocrinological disorders and particularly, diabetes. Other symptoms of meho are waist pain, difficulties in sitting, loss of weight, whitish discharge in urine, difficulties during urination, and less urination, some of which symptoms can be due to diabetic nephropathy. However, it is to be noted that the Kavirajes recognize diabetes and treat it as a different type of disease.

Multiple plants or plant parts were also observed to be used by the Kavirajes. A combination of *Mangifera longipes*, *Syzygium cumini*, *Phyllanthus emblica*, and *Terminalia chebula* was used for treatment of a number of disorders. These included loss of sensitivity in skin, chronic mucus, continuous sneezing with running water from nose, small pustules on the skin of children, and loss of sensitivity in skin due to allergy. The roots of *Ficus hispida* were used in combination with roots of *Musa paradisiaca* for treatment of dysentery.

Administration of the various formulations was in general oral. This even applied sometimes to ailments like pain, in which Kavirajes in other areas of Bangladesh use topical applications. The leaf juice of *Phyla nodiflora* was orally administered for pain due to work or falling down. However, juice from crushed whole plant of *Polygonum hydropiper* was topically applied for treatment of pain. The top of stems with young leaves of *Anthocephalus chinensis* was also rubbed on the head as remedy for headache. Occasionally, plant formulations were taken with other substances. The white sap of *Ficus racemosa* was orally administered with biscuits as treatment for piles and bleeding due to piles. Decoctions and soaking of plant part in water formed a common part of the formulations. The leaves of *Azadirachta indica* were boiled in water with black peppers till the volume was reduced by half; the decoction was taken for diabetes. The bark of *Ficus benghalensis* was soaked in water and then the combination administered orally for meho.

There was one instance of plant parts being cooked and eaten. The leaves and stems of *Amaranthus spinosus* were cooked and eaten as vegetable for treatment of rheumatic pain and pain in the bones. Among the 49 plants used by the Kavirajes, only one plant was used not for actual treatment, but as a preventive measure. The top portion of young stems of *Cassia fistula* was taken as a purgative, which was considered by the Kavirajes to be done at least once a year to maintain healthy bowel movements and prevent accumulation of toxins in the gastrointestinal tract.

Discussion

Bangladesh has over 5,000 floral species. The number of species used in the various traditional medicinal systems of Bangladesh is yet to be accurately determined. Detailed pharmacological activity studies and analysis of phytochemicals present in the various medicinal plants of Bangladesh remain to be conducted. This also applies for the plants used by the Kavirajes of Barisal town. However, scientific literature exists on several of the plants used, which validate their folk medicinal uses. The leaves of *Justicia adhatoda* are used by the Kavirajes for coughs. The plant has been shown to contain alkaloids with positive effects on inflammatory diseases (Chakraborty and Brantner, 2001); extract of the plant also has been shown to have anti-tussive effect (Dhuley, 1999), and a bronchodilator alkaloid (vasicinone) has been isolated from the plant (Amin, and Mehta, 1959). Antinociceptive activity has been reported for the plant, *Amaranthus spinosus* (Zeashan, et al 2009), which was used by the Kavirajes for rheumatic pain and pain in the bones. A preliminary evaluation of *Alstonia scholaris* bark (used by the Kavirajes for malaria treatment) showed a dose-dependent improvement of conditions and delayed mortality in mice infected with *Plasmodium berghei* (Gandhi, and Vinayak, 1990).

The bark of *Terminalia arjuna* was used by the Kavirajes for abnormal rhythms of heart, which is suggestive of possible cardiovascular disorders. Related reports on the effect of the plant or plant parts include protective effects of plant bark against Doxorubicin-induced cardiotoxicity (Singh, et al 2008); significant inotropic and hypotensive effect of bark, also an increase in coronary artery flow and protection of myocardium against ischemic damage, reviewed by Dwivedi (Dwivedi, 2007); protection of rabbit heart by bark against ischemic-reperfusion injury (Gauthaman, et al 2005); cardioprotective effect of alcoholic extract of bark in an *in vivo* model of myocardial ischemic-reperfusion injury (Karthikeyan, et al 2003); efficacy of the plant in chronic stable angina (Dwivedi, and Gupta, 2002; Bharani, et al 2002); beneficial effects of bark of the plant in isolated ischemic-reperfused rat heart (Gauthaman, et al 2001); and beneficial effects in coronary artery disease (significant reductions in anginal frequency) (Dwivedi and Jauhari, 1997).

Coccinia grandis was used by the Kavirajes for treatment of diabetes. Anti-oxidant activity has been reported in hydromethanolic extract of leaves of the plant (Umamaheswari and Chatterjee, 2007), which can be beneficial during diabetes. Antinociceptive activity has been reported for *Leucas aspera* (Rahman, et al 2007), a plant used by the Kavirajes for pain with accompanied swelling. *Azadirachta indica* was used by the Kavirajes for treatment of diabetes. Published relevant reports in the scientific literature include anti-hyperglycemic, anti-hyperlipidemic, and anti-oxidant effects reported in streptozotocin diabetic rats induced by Dihar, a polyherbal Ayurvedic formulation containing plant extract (Patel, Shah, and Goyal, 2009); hypoglycemic and anti-oxidant activity reported in streptozotocin diabetic rats (Chandra, et al 2008); hypoglycemic effect of seeds of the plant reported in Type 2 diabetes mellitus human patients (Waheed, Miana, and Ahmad, 2006); hypoglycemic effect reported in normal and streptozotocin diabetic mice as well as reversal of diabetic complications on administration of Dianex, a polyherbal formulation containing aqueous extract of the plant (Mutalik, et al 2005); report on serum glucose lowering activity in male mice by plant extract (Gholap, and Kar, 2004.); protective effects reported for petroleum ether extracts of kernel and husk of seeds against oxidative stress caused in streptozotocin-induced diabetes in adult male Wistar rats (Gupta, et al 2004); hypoglycemic effects observed with leaf extract and seed oil in alloxan-induced diabetic rabbits (Khosla, et al 2000); anti-hyperglycemic effect of leaf extract possibly caused by blocking of the inhibitory effect of serotonin on insulin secretion mediated by glucose (Chattopadhyay, 1999); hypoglycemic activity reported for leaf extract in rats (Chattopadhyay, 1999); and anti-hyperglycemic effect of leaf extract reported in streptozotocin diabetic rabbits (Chattopadhyay, 1996).

The available scientific literature strongly validates the use of several medicinal plants by the Kavirajes of Barisal town. A number of other plants are used by the Kavirajes on which appropriate scientific studies are yet to be carried out. Some of the promising plants in this regard include *Thevetia peruviana*, *Mikania cordata*, *Xanthium indicum*, *Cuscuta reflexa*, *Streblus asper*, *Glycosmis pentaphylla*, and *Solanum capsicoides*. These plants are especially important because they can serve as potential cures for rheumatism, jaundice, and snake bites. Overall, the plants present considerable potential for further scientific research leading to the discovery of newer and safer drugs.

References

- Amin, A.H., and D.R. Mehta, 1959. A bronchodilator alkaloid (vasicinone) from *Adhatoda vasica* Nees. Nature, 184 (Suppl 17): 1317.
- Balick, J.M. and P.A. Cox, 1996. Plants, People and Culture: the Science of Ethnobotany, Scientific American Library, New York, pp: 228.
- Bharani, A., A. Ganguli, L.K. Mathur, Y. Jamra and P.G. Raman, 2002. Efficacy of *Terminalia arjuna* in chronic stable angina: a double-blind, placebo-controlled, crossover study comparing *Terminalia arjuna* with isosorbide mononitrate. Indian Heart Journal, 54: 170-175.

- Chakraborty, A., and A.H. Brantner, 2001. Study of alkaloids from *Adhatoda vasica* Nees on their anti-inflammatory activity. *Phytotherapy Research*, 15: 532-534.
- Chattopadhyay, R.R., 1999. Possible mechanism of antihyperglycemic effect of *Azadirachta indica* leaf extract: Part V. *Journal of Ethnopharmacology*, 67: 373-376.
- Chattopadhyay, R.R., 1999. A comparative evaluation of some blood sugar lowering agents of plant origin. *Journal of Ethnopharmacology*, 67: 367-372.
- Chattopadhyay, R.R., 1996. Possible mechanism of antihyperglycemic effect of *Azadirachta indica* leaf extract. Part IV. *General Pharmacology*, 27: 431-434.
- Chandra, A., A.A. Mahdi, R.K. Singh, F. Mahdi and R. Chander, 2008. Effect of Indian herbal hypoglycemic agents on antioxidant capacity and trace elements content in diabetic rats. *Journal of Medicinal Food*, 11: 506-512.
- Dwivedi, S., and D. Gupta, 2002. Efficacy of *Terminalia arjuna* in chronic stable angina. *Indian Heart Journal*, 54: 441.
- Dwivedi, S., and R. Jauhari, 1997. Beneficial effects of *Terminalia arjuna* in coronary artery disease. *Indian Heart Journal*, 49: 507-510.
- Dhuley, J.N., 1999. Antitussive effect of *Adhatoda vasica* extract on mechanical or chemical stimulation-induced coughing in animals. *Journal of Ethnopharmacology*, 67: 361-365.
- Dwivedi, S., 2007. *Terminalia arjuna* Wight & Arn. – a useful drug for cardiovascular disorders. *Journal of Ethnopharmacology*, 114: 114-129.
- Gandhi, M., and V.K. Vinayak, 1990. Preliminary evaluation of extracts of *Alstonia scholaris* bark for *in vivo* antimalarial activity in mice. *Journal of Ethnopharmacology*, 29: 51-57.
- Gauthaman, K., S.K. Banerjee, A.K. Dinda, C.C. Ghosh and S.K. Maulik, 2005. *Terminalia arjuna* (Roxb.) protects rabbit heart against ischemic-reperfusion injury: role of antioxidant enzymes and heat shock protein. *Journal of Ethnopharmacology*, 96: 403-409.
- Gauthaman, K., M. Maulik, R. Kumari, S.C. Manchanda, A.K. Dinda and S.K. Maulik, 2001. Effect of chronic treatment with bark of *Terminalia arjuna*: a study on the isolated ischemic-reperfused rat heart. *Journal of Ethnopharmacology*, 75: 197-201.
- Gholap, S., and A. Kar, 2004. Hypoglycaemic effects of some plant extracts are possibly mediated through inhibition in corticosteroid concentration. *Pharmazie*, 59: 876-878.
- Gupta, S., M. Kataria, P.K. Gupta, S. Murganandan and R.C. Yashroy, 2004. Protective role of extracts of neem seeds in diabetes caused by streptozotocin in rats. *Journal of Ethnopharmacology*, 90: 185-189.
- Hanif, A., Md. Shahadat Hossan, Md. Manzurul Kadir Mia, Mohammad Jahirul Islam, Rownak Jahan and Mohammed Rahmatullah, 2009. Ethnobotanical survey of the Rakhain tribe inhabiting the Chittagong Hill Tracts region of Bangladesh. *American Eurasian Journal of Sustainable Agriculture*, 3(2): 172-180.
- Hossan, Md. Shahadat, Abu Hanif, Mujib Khan, Sazzadul Bari, Rownak Jahan and Mohammed Rahmatullah, 2009. Ethnobotanical survey of the Tripura tribe of Bangladesh. *American Eurasian Journal of Sustainable Agriculture*, 3(2): 253-261.
- Hossan, M.S., A. Hanif, B. Agarwala, M.S. Sarwar, M. Karim, M.T. Rahman, R. Jahan and M. Rahmatullah, 2010. Traditional use of medicinal plants in Bangladesh to treat urinary tract infections and sexually transmitted diseases. *Ethnobotany Research and Applications*, 8: 61-74.
- Karthikeyan, K., B.R. Bai, K. Gauthaman, K.S. Sathish and S.N. Devaraj, 2003. cardioprotective effect of the alcoholic extract of *Terminalia arjuna* bark in an *in vivo* model of myocardial ischemic reperfusion injury. *Life Sciences*, 73: 2727-2739.
- Khosla, P., S. Bhanwra, J. Singh, S. Seth and R.K. Srivastava, 2000. A study of hypoglycaemic effects of *Azadirachta indica* (Neem) in normal and alloxan diabetic rabbits. *Indian Journal of Physiology and Pharmacology*, 44: 69-74.
- Martin, G.J., 1995. *Ethnobotany: a 'People and Plants' Conservation Manual*, Chapman and Hall, London, pp: 268.
- Maundu, P., 1995. Methodology for collecting and sharing indigenous knowledge: a case study. *Indigenous Knowledge and Development Monitor*, 3: 3-5.
- Mollik, M.A.H., M.S. Hossan, A.K. Paul, M.T. Rahman, R. Jahan and M. Rahmatullah, 2010. A comparative analysis of medicinal plants used by folk medicinal healers in three districts of Bangladesh and inquiry as to mode of selection of medicinal plants. *Ethnobotany Research and Applications*, 8: 195-218.
- Mutalik, S., M. Chetana, B. Sulochana, P.U. Devi and N. Udupa, 2005. Effect of Dianex, aherbal formulation on experimentally induced diabetes mellitus. *Phytotherapy Research*, 19: 409-415.
- Nawaz, A.H.M.M., M. Hossain, M. Karim, M. Khan, R. Jahan and M. Rahmatullah, 2009. An ethnobotanical survey of Rajshahi district in Rajshahi division, Bangladesh. *American Eurasian Journal of Sustainable Agriculture*, 3(2): 143-150.

- Patel, S.S., R.S. Shah and R.K. Goyal, 2009. Antihyperglycemic, antihyperlipidemic and antioxidant effects of Dihar, a polyherbal ayurvedic formulation in streptozotocin induced diabetic rats. *Indian Journal of Experimental Biology*, 47: 564-570.
- Rahmatullah, M., M.A.H. Mollik, M.S. Rahman, M.N. Hasan, B. Agarwala and R. Jahan, 2010. A Medicinal Plant Study of the Santal tribe in Rangpur District, Bangladesh. *Journal of Alternative and Complementary Medicine*, 16(4): 419-425.
- Rahmatullah, M., D.Ferdausi, M.A.H. Mollik, R. Jahan, M.H. Chowdhury and W.M. Haque, 2010. A Survey of Medicinal Plants used by Kavirajes of Chalna area, Khulna District, Bangladesh. *African Journal of Traditional, Complementary and Alternative Medicines*, 7(2): 91-97.
- Rahmatullah, M., D. Ferdausi, M.A.H. Mollik, M.N.K. Azam, M.T. Rahman and R. Jahan, 2009. Ethnomedicinal Survey of Bheramara Area in Kushtia District, Bangladesh. *American Eurasian Journal of Sustainable Agriculture*, 3(3): 534-541.
- Rahmatullah, M., A. Noman, M.S. Hossan, M.H. Rashid, T. Rahman, M.H. Chowdhury, and R. Jahan, 2009. A survey of medicinal plants in two areas of Dinajpur district, Bangladesh including plants which can be used as functional foods. *American Eurasian Journal of Sustainable Agriculture*, 3(4): 862-876.
- Rahmatullah, M., A.K. Das, M.A.H. Mollik, R. Jahan, M. Khan, T. Rahman and M.H. Chowdhury, 2009. An Ethnomedicinal Survey of Dhamrai Sub-district in Dhaka District, Bangladesh. *American Eurasian Journal of Sustainable Agriculture*, 3(4): 881-888.
- Rahmatullah, M., M.A.H. Mollik, A.T.M.A. Azam, M.R. Islam, M.A.M. Chowdhury, R. Jahan, M.H. Chowdhury and T. Rahman, 2009. Ethnobotanical Survey of the Santal tribe residing in Thakurgaon District, Bangladesh. *American Eurasian Journal of Sustainable Agriculture*, 3(4): 889-898.
- Rahmatullah, M., I.J. Mukti, A.K.M.F. Haque, M.A.H. Mollik, K. Parvin, R. Jahan, M.H. Chowdhury and T. Rahman, 2009. An Ethnobotanical Survey and Pharmacological Evaluation of Medicinal Plants used by the Garo Tribal Community living in Netrakona district, Bangladesh. *Advances in Natural and Applied Sciences*, 3(3): 402-418.
- Rahman, M.S., S.K. Sadhu and C.M. Hasan, 2007. Preliminary antinociceptive, antioxidant and cytotoxic activities of *Leucas aspera* root. *Fitoterapia*, 78: 552-555.
- Singh, G., A.T. Singh, A. Abraham, B. Bhat, A. Mukherjee, R. Verma, S.K. Agarwal, S. Jha, R. Mukherjee, and A.C. Burman, 2008. Protective effects of *Terminalia arjuna* against Doxorubicin-induced cardiotoxicity. *Journal of Ethnopharmacology*, 117: 123-129.
- Umamaheswari, M., and T.K. Chatterjee, 2007. *In vitro* antioxidant activities of the fractions of *Coccinia grandis* L. leaf extract. *African Journal of Traditional, Complementary and Alternative Medicines*, 5: 61-73.
- Waheed, A., G.A. Miana and S.I. Ahmad, 2006. Clinical investigation of hypoglycemic effect of seeds of *Azadirachta indica* in type-2 (NIDDM) diabetes mellitus. *Pakistan Journal of Pharmaceutical Sciences*, 19: 322-325.
- Zeashan, H., G. Amresh, C.V. Rao and S. Singh, 2009. Antinociceptive activity of *Amaranthus spinosus* in experimental animals. *Journal of Ethnopharmacology*, 122: 492-496.