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ORIGINAL ARTICLES

Variations in Disease and Medicinal Plant Selection among Folk Medicinal Practitioners: a Case Study in Jessore District, Bangladesh

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ABSTRACT

Folk medicinal practitioners, otherwise known as Kavirajes perform a central role in providing primary health-care to the rural inhabitants of Bangladesh. They rely chiefly on medicinal plants for treatment of ailments. However, various ethnomedicinal surveys conducted previously among the Kavirajes have pointed out to major differences in the type of ailments treated and the selection of medicinal plant(s) for treatment of a specific ailment among the Kavirajes. The objective of the present study was to conduct a survey among the two practicing Kavirajes of the adjoining villages of Arpara and Munshefpur in Jessore district, Bangladesh to document any differences among the two Kavirajes as to ailments treated and the medicinal plants used for treatment. Kaviraj 1 (of Arpara village) treated 21 types of ailments, while Kaviraj 2 (of Munshefpur village) treated 10 types of ailments. Only 7 types of ailments were treated in common by both Kavirajes. These ailments included skin diseases, hepatic disorders (jaundice), respiratory tract disorders (coughs, mucus), toothache, gastrointestinal disorders, diabetes, and to stop bleeding from cuts and wounds. Even then the medicinal plants selected for treatment of these common ailments differed considerably among the two Kavirajes. While *Azadirachta indica* was used for treatment of skin disorders by Kaviraj 2, Kaviraj 1 used the same plant along with *Curcuma longa* or with *Curcuma longa*, *Vitex negundo*, and *Cynodon dactylon*. For treatment of jaundice, both Kavirajes used a combination of the plants, *Cajanus cajan* and *Saccharum officinarum*. However, the dosage differed among the two Kavirajes. While Kaviraj 1 advised drinking only 2 teaspoonful of juice obtained from macerated leaves of *Cajanus cajan*, Kaviraj 2 advised drinking one glass of juice obtained from macerated leaves of the same plant. The present study highlights several aspects of the folk medicinal method and the treatment offered by the Kavirajes. First, Kavirajes differ considerably as to the ailments treated, which may be due to experience or may be a result of specialization. Second, Kavirajes vary significantly as to medicinal plants chosen for treatment of any specific ailment, a variation which can extend to dosage even when same plants have been used. The surprising feature of these variations is that they exist even among Kavirajes of adjoining villages where the availability of medicinal plants is the same. Taken together, the study highlights the importance of conducting surveys among all individual Kavirajes of Bangladesh if one wants to gather in a comprehensive manner, information on medicinal plants used in the folk medicinal system of the country.

Key words: Medicinal plants, folk medicine, Jessore, Kaviraj, Bangladesh

Introduction

Folk medicinal practitioners, otherwise known as Kavirajes form the primary providers of health care to a considerable segment of the rural and urban population of Bangladesh. It is generally considered that among

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the various forms of traditional medicinal systems of the country, folk medicinal system is the most common, and Kavirajes are the most numerous among the various traditional and modern medicinal practitioners. Almost every village of the 86,000 villages of the country has one or two practicing Kavirajes. The rural people have been accustomed to the Kavirajes for centuries, and since the Kavirajes reside within the villages and form an integral part of the rural population, the rural people feel freer in discussing their medical problems with the Kavirajes. The other advantage of the Kavirajes is that they rely almost exclusively on medicinal plants for treatment. Formulations are simple as a rule with one plant or plant part being used for treatment of an ailment. These plants are commonly found on fallow lands or forested areas around the villages and so easily collectable.

The practice of folk medicine is usually confined within the immediate family members. A Kaviraj would practice for a lifetime, and the knowledge and experience gained through his or her practice would be closely guarded and passed onto a family member of the next generation. Thus over time, a Kaviraj not only gains considerable knowledge on medicinal plants of the area but also treats specific ailments with his or her own unique repertoire of medicinal plants. As such, even though any particular area may have similar medicinal plants, the practicing Kavirajes in the area would differ considerably in the selection of medicinal plants for treatment of the same ailment.

We had been conducting ethnomedicinal surveys among the Kavirajes of the mainstream population, as well as tribal medicinal practitioners for quite some time (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; Jahan *et al*., 2011) in our effort to document the medicinal plants of Bangladesh through actual field surveys of folk medicinal practitioners. In our field surveys, we have noticed considerable variations as to diseases treated as well as medicinal plants used for treatment among the Kavirajes of even adjoining areas (Mollik *et al*., 2010a; Jahan *et al*., 2011). It was evident from our thus far concluded surveys, that to get a comprehensive picture of the folk medicinal plants of Bangladesh, practically every individual Kaviraj has to be interviewed. At the same time, the question arises as to what really causes the differences in any individual Kavirajes' selection of medicinal plants, and so for that matter, the selection of diseases, which he or she treats. These are important questions, for any information gathered on these points can provide a *modus operandi* of the folk medicinal practitioners of the country. The objective of the present study was therefore to analyze the ailments treated, and the medicinal plants selected for treatment of these ailments by two practicing Kavirajes of two adjoining villages of Arpara and Munshefpur in Jessore district, Bangladesh.

Materials and Methods

The present survey was conducted through interviewing two practicing Kavirajes of Arpara and Munshefpur villages in Jessore district, Bangladesh. Moulana Mohammad Ullah (Kaviraj 1) practiced in Arpara village. His age was 50 years, and he had been practicing for 23 years. On an average, he sees about 40-50 patients per day, which clearly indicated that his practice was successful. Ms. Rabeya Khatun practiced in Munshefpur village. Her age was 55 years and she had been practicing for 21 years. She also had a successful practice in her village. Informed consent was first obtained from the Kavirajes prior to interviews.

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 Kavirajes took the interviewers to places from where they collected their medicinal plants, pointed out the plants, and described their uses. Plant specimens as pointed out by the Kavirajes were collected and dried and brought to Dhaka for complete identification. Plant identification was done by Mr. Manjur-Ul-Kadir Mia, ex-Curator and Principal Scientific Officer of the Bangladesh National Herbarium at Dhaka. Interviews were conducted in Bengali, the language being spoken by both interviewers and Kavirajes alike.

Results and Discussion

Kaviraj 1 treated 21 different classes of ailments, which included skin diseases, excessive bleeding during menstruation, fever, liver malfunction, respiratory tract disorders, toothache, helminthiasis, gastrointestinal disorders, reduced eye sight, burning sensations or hot sensation in head, eye infections, decrease in libido, boils, diabetes, cuts and wounds, hoarseness of voice, bone fractures, sprains, goiter, hypertension, and leucorrhea. The results are shown in Table 1. Overall, Kaviraj 1 displayed a practice of treating complex diseases like diabetes or hypertension. In general his formulations were also more complex in the sense that formulations consisting of multiple plants were included in his treatment. Kaviraj 1 further included in his practice different formulations for treatment of similar type of diseases. His treatment method displayed an

Table 1: Ailments treated and medicinal plants used by Kaviraj of Arpara village, Jessore district, Bangladesh.

Serial Number	Ailment with symptoms	Formulation	Local name of ingredients used
1	Skin diseases	Leaves of *Rauwolfia serpentina* (L.) Benth.ex Kurz (Apocynaceae) are fried in oil obtained from seeds of *Brassica campestris* L. (Cruciferae) and applied to affected areas.	*Rauwolfia serpentina*: Choto chondro *Brassica campestris*: Shorisha
2	Skin diseases	Roots of *Rauwolfia serpentina* (L.) Benth. ex Kurz (Apocynaceae) are macerated with seeds of *Piper nigrum* L. (Piperaceae) and rhizomes of *Zingiber officinale* Roscoe (Zingiberaceae). Honey is added to the macerated mix and pills prepared from it. Three pills are to be taken daily for 3 weeks. The pills serve as prophylaxis from inside.	*Rauwolfia serpentina*: Choto chondro *Piper nigrum*: Gol morich *Zingiber officinale*: Ada
3	Skin diseases	Leaves of *Vitex negundo* L. (Verbenaceae) are macerated together with whole plants of *Cynodon dactylon* (L.) Pers. (Poaceae), leaves of *Azadirachta indica* A. Juss. (Meliaceae), and rhizomes of *Curcuma longa* L. (Zingiberaceae) and the juice collected. The juice is taken for skin diseases. The juice is also applied to ghamachis (local term for small eruptions on the skin due to heat and which itches).	*Vitex negundo*: Nishinda *Cynodon dactylon*: Durba *Azadirachta indica*: Neem *Curcuma longa*: Holud
4	Skin diseases	Juice obtained from leaves of *Azaradichta indica* A. Juss. (Meliaceae) are mixed with macerated rhizomes of *Curcuma longa* L. (Zingiberaceae) and applied to skin diseases like scabies, eczema, and itches.	*Azadirachta indica*: Neem *Curcuma longa*: Holud
5	Excessive bleeding during menstruation	Macerated roots of *Ficus benghalensis* L. (Moraceae), are mixed with 20g leaves of *Lawsonia inermis* L. (Lythraceae), 20g de-husked seeds of *Oryza sativa* L. (Poaceae) and sugar and taken three times for 1 day only.	*Ficus benghalensis*: Bot gach *Lawsonia inermis*: Mehedi *Oryza sativa*: Dhan
6	Excessive bleeding during menstruation	Bark of *Mimusops elengi* L. (Sapotaceae) is mixed with 5 fruits of *Elettaria cardamomum* (L.) Maton (Zingiberaceae), 5 fruits of *Syzygium aromaticum* (L.) Merr. & L. M. Perry (Myrtaceae) and sugar. The mixture is boiled in water and cooled. The resultant decoction is taken thrice daily for 7 days.	*Mimusops elengi*: Bokul *Elettaria cardamomum*: Elachi *Syzygium aromaticum*: Lobongo
7	Excessive bleeding during menstruation	Juice obtained from leaves of *Vitis trifolia* L. (Vitaceae) is mixed with honey and fruit of *Carum copticum* (L.) C. B. Clarke (Apiaceae), macerated and taken.	*Vitis trifolia*: Goala Honey: Modhu *Carum copticum*: Joan
8	Fever	Powdered bark of *Swertia chirata* (Roxb. ex Fleming) H. Karst. (Gentianaceae) is soaked in water with powdered fruits of *Phyllanthus emblica* L. (Euphorbiaceae), *Terminalia belerica* (Gaertn.) Roxb. (Combretaceae) and *Terminalia chebula* Retz. (Combretaceae). One glass of the water is taken thrice daily till cure. Note that this will also stimulate appetite.	*Swertia chirata*: Chirota *Phyllanthus emblica*: Amloki *Terminalia belerica*: Bohera *Terminalia chebula*: Horitoki
9	Fever	Vines (stems with leaves) of *Tinospora crispa* (L.) Hook.f. & Thoms. (Menispermaceae) are soaked in water. The water is taken thrice daily on an empty stomach for 1 week with molasses prepared from *Saccharum officinarum* L. (Poaceae) stem juice.	*Tinospora crispa*: Khorosh *Saccharum officinarum*: Ikkhu
10	Liver malfunction	Juice obtained from rhizomes of *Zingiber officinale* Roscoe (Zingiberaceae) is taken with honey. Dosage: 10-12 drops thrice daily for 1 week.	*Zingiber officinale*: Ada
11	Coughs and mucus	Juice obtained from rhizomes of *Zingiber officinale* Roscoe (Zingiberaceae) is taken with honey. Dosage: 10-12 drops thrice daily for children; 20 drops thrice daily for adults.	*Zingiber officinale*: Ada
12	Coughs, whooping cough, fever, pneumonia	Leaves of *Justicia adhatoda* L. (Acanthaceae) are taken with leaves of *Nyctanthes arbor-tristis* L. (Verbenaceae) and honey twice daily for 7 days.	*Justicia adhatoda*: Bashok *Nyctanthes arbor-tristis*: Sheuli, Shefali phool

Table 1: Continue

13	Coughs	Juice obtained from macerated leaves of *Ocimum gratissimum* L. (Lamiaceae) is taken with honey.	*Ocimum gratissimum*: Ram tulshi
14	Toothache	Leaves of *Murraya exotica* L. are boiled in water. The water in which some salt has been dissolved is used for gargling. This is to be done 3-4 times daily for 3 days.	*Murraya exotica*: Kamini
15	Toothache, bleeding from gums	Stems of *Murraya exotica* L. (Rutaceae) are used for brushing teeth and gums.	*Murraya exotica*: Kamini
16	Helminthiasis	Powdered seeds of *Syzygium cumini* (L.) Skeels are mixed with honey and water to form a sherbet. One glass of the sherbet is taken in the morning on an empty stomach for 1-2 days.	*Syzygium cumini*: Jaam
17	Chronic dysentery (symptoms: frequent thirst, frequent and watery stool, stomach pain, fever)	Powdered pulp from seeds of *Mangifera indica* L. (Anacardiaceae) is mixed with powdered seeds of *Syzygium cumini* (L.) Skeels (Myrtaceae), honey and water and taken in the morning for 7 days to a month.	*Mangifera indica*: Aam *Syzygium cumini*: Jaam
18	Diarrhea	Juice obtained from macerated leaves of *Ludwigia adscendens* (L.) H. Hara (Onagraceae) is mixed with sugar. One teaspoonful of the mixture is taken thrice daily for 3-7 days.	*Ludwigia adscendens*: Kejer pata
19	Stomach pain	Juice obtained from macerated leaves of *Centella asiatica* (L.) Urb. (Umbelliferae) and unripe fruits of *Musa paradisiaca* L. (Musaceae) is taken once.	*Centella asiatica*: Thankuni *Musa paradisiaca*: Thota kola
20	Stomach pain	Juice from macerated leaves of *Acalypha indica* L. (Euphorbiaceae) is taken.	*Acalypha indica*: Monimona, Muktajhuri
21	To increase eye sight	Whole plant of *Ipomoea aquatica* Forssk. (Convolvulaceae) is cooked as a vegetable and eaten.	*Ipomoea aquatic*: Kolmi shak
22	Burning sensations in the scalp or head	Juice obtained from macerated leaves of *Vitex trifolia* L. (Verbenaceae) is mixed with oil obtained from seeds of *Sesamum indicum* L. (Pedaliaceae) and applied to the scalp or head for 1 month. This also reduces headache along with hair loss.	*Vitex trifolia*: Kalo nishinda *Sesamum indicum*: Til
23	To keep head cool	Crushed leaves of *Aloe barbadensis* Mill. (Aloaceae) are applied to the head.	*Aloe barbadensis*: Ghritokumari
24	Cataract, conjunctivitis, watery eyes	Juice obtained from macerated leaves of *Heliotropium indicum* L. (Boraginaceae) is mixed with salt. One drop of the mixture is applied to eyes twice daily.	*Heliotropium indicum*: Hatishur, Hatishura
25	Decrease in libido	Bark of *Terminalia arjuna* (Roxb. ex DC.) Wight & Arn. (Combretaceae) is mixed with fruit of *Hygrophila auriculata* (Schumach.) Heine (Acanthaceae) and seeds of *Nigella sativa* L. (Ranunculaceae) and soaked in water. One glass of the water is taken with honey for 1 month.	*Terminalia arjuna*: Arjun *Hygrophila auriculata*: Talmakhna *Nigella sativa*: Kalo jira
26	Pain due to boils (an inflamed pus-filled swelling on the skin)	Seeds of *Lablab purpureus* (L.) Sweet (Fabaceae) and *Lens culinaris* Medik. (Fabaceae) are crushed together and applied on top of boils, which causes bursting of the boils and the pus to come out.	*Lablab purpureus*: Shim *Lens culinaris*: Moshur
27	Diabetes	Fruits of *Swietenia macrophylla* King. (Meliaceae) are soaked in water. One glass of the water is taken daily with molasses prepared from stem juice of *Saccharum officinarum* L. (Poaceae) on an empty stomach daily.	*Swietenia macrophylla*: Mahogany *Saccharum officinarum*: Aakh
28	Diabetes	Juice obtained from leaves of *Piper longum* L. (Piperaceae) is taken. Alternately, leaves are cooked and eaten as vegetable.	*Piper longum*: Pipol
29	Diabetes	Juice obtained from macerated leaves of *Coccinia grandis* (L.) J. Voigt (Cucurbitaceae) is taken with honey. Alternately, leaves are cooked and eaten as vegetable.	*Coccinia grandis*: Telakochu

Table 1: Continue

30	To stop bleeding from external wounds	Juice from macerated leaves of *Glycosmis pentaphylla* (Retz.) Corr. (Rutaceae) Is applied to cuts and wounds.	*Glycosmis pentaphylla*: Aantshuti
31	Hoarseness of voice, broken voice	Fruits of *Carum copticum* (L.) C.B. Clarke (Apiaceae) are mixed with seeds of *Nigella sativa* L. (Ranunculaceae), powdered, and taken with honey.	*Carum copticum*: Joan *Nigella sativa*: Kalo jira
32	Bone fracture, bone fracture-induced pain	Juice from macerated vines (leaves + stems) of *Cissus quadrangularis* L. (Vitaceae) are mixed with juice from macerated leaves of *Glycosmis pentaphylla* (Retz.) Corr. (Rutaceae) and applied to area of fracture 3-4 times daily for 3 weeks.	*Cissus quadrangularis*: Har bhanga gach, Mochni, Nimko *Glycosmis pentaphylla*: Aantshuti
33	Sprain, hurt	Juice from macerated leaves of *Leea aequata* L. (Leeaceae) is applied with lime water to affected areas.	*Leea aequata*: Kau jangi, Kagi
34	Jaundice	Juice from macerated leaves of *Cajanus cajan* (L.) Millsp. (Fabaceae) is taken with molasses prepared from stem juice of *Saccharum officinarum* L. (Poaceae); dosage is 2 teaspoonfuls thrice daily for 7 days.	*Cajanus cajan*: Airi, Aarol *Saccharum officinarum*: Aakh
35	Goiter	Fruits of *Colocasia nymphaeifolia* Vent. (Araceae) are crushed with fruits of *Piper nigrum* L. (Piperaceae) and taken twice for 7 days.	*Colocasia nympahaeifolia*: Buno kochu *Piper nigrum*: Gol morich
36	To prevent stomach upsets, to keep stomach cool (bloating, stomach disturbances are thought of as due to heating of stomach)	Soft pulp within the leaves of *Aloe barbadensis* Mill. (Aloaceae) is taken with sugar in the form of a sherbet. (The outer portion of the leaf is sliced off and the inner soft pulp squeezed thoroughly in water. Sugar is then added to prepare the sherbet).	*Aloe barbadensis*: Ghritokumari
37	Burning sensations during urination, leucorrhea	Soft pulp within the leaves of *Aloe barbadensis* Mill. (Aloaceae) is taken with molasses prepared from stem juice of *Saccharum officinarum* L. (Poaceae).	*Aloe barbadensis*: Ghritokumari *Saccharum officinarum*: Aakh
38	Hypertension	Fruits of *Tamarindus indica* L. (Fabaceae) are soaked in water. One glass of the water is taken with table salt or sugar in the morning on an empty stomach for 7 days.	*Tamarindus indica*: Tentul
39	Hypertension	Soft pulp within the leaves of *Aloe barbadensis* Mill. (Aloaceae) is taken.	*Aloe barbadensis*: Ghritokumari
40	Leucorrhea	10g bark of *Azadirachta indica* A. Juss. (Meliaceae), 15g each of whole plants of *Asparagus racemosus* Willd. (Liliaceae) and *Tinospora sinensis* (Lour.) Merrill, 10g bark of *Litsea chinensis* Lam. (Lauraceae), 10g root of *Bombax ceiba* L. (Bombacaceae) and 10g root of *Erythrina indica* Lam. (Fabaceae) is mixed with water and salt and taken for 7 days on an empty stomach. If the problem is severe, this should be taken for 14 days.	*Azadirachta indica*: Neem *Asparagus racemosus*: Shotomul *Tinospora sinensis*: Padma khorosh *Litsea chinensis*: Potka *Bombax ceiba*: Shimul *Erythrina indica*: Mandar

extensive knowledge of medicinal plants and properties of various plant parts. For instance, treatment of skin diseases was done by him both with a combination of leaves of *Rauwolfia serpentina* along with oil of *Brassica campestris*, as well as roots of *Rauwolfia serpentina* along with seeds of *Piper nigrum* and rhizomes of *Zingiber officinale*. While the first formulation was topically applied, the second formulation was orally administered. That the first topical formulation included oil suggested a good knowledge of the properties of oil, because oil apart from its possible therapeutic properties, would also help in soothing and moisturizing the skin as well as help absorption of any therapeutic ingredients present in *Rauwolfia serpentina*. It is also to be noted that while the topical preparation included leaves of *Rauwolfia serpentina*, the orally administered preparation included roots of the same plant. It is possible that the roots of the plant, when administered along with the other two plant parts served as prophylaxis from inside the body.

The extensive knowledge of Kaviraj 1 was further displayed by the fact that besides four different formulations for treatment of skin diseases, he had three different formulations for treatment of excessive bleeding during menstruation, two formulations for fever, three formulations for coughs, two formulations for toothache, five formulations for gastrointestinal disorders, three formulations for diabetes, two formulations for liver disorders, and two formulations each for hypertension and leucorrhea. His formulations for the same or similar type of ailment differed considerably. Hypertension was treated with *Tamarindus indica* (belonging to

the Fabaceae family), as well as *Aloe barbadensis* (belonging to the Aloaceae family). Fever was treated with a combination of plant parts from *Swertia chirata*, *Phyllanthus emblica*, *Terminalia belerica* and *Terminalia chebula*, as well as a combination of *Tinospora crispa* and *Saccharum officinarum*. That a plant can serve multiple therapeutic purposes was also evident from his use of *Aloe barbadensis* to keep head cool, to prevent stomach upsets, and for treatment of leucorrhea as well as hypertension. Notably, the above four ailments differed totally from each other. Overall, 40 formulations were used by Kaviraj 1 for treatment of 21 different types of ailments.

In contrast to Kaviraj 1, Kaviraj 2 used 15 formulations for treatment of 10 types of ailments. The results are shown in Table 2. A similar complexity and knowledge of the prophylactic effect of plants was also displayed by Kaviraj 2, although the number of plants used and ailments treated by her were lesser than Kaviraj 1. For instance, treatment of burns, infections following burns, or eczema was treated by Kaviraj 2 both with topical application of leaves of *Tragia involucrata*, as well as oral administration of the same plant with fruits of *Capsicum frutescens* and rice. The latter plant is hot pepper, and oral taking of its fruits with cooked rice would lead to a rise in gastric secretion, which may allow the therapeutic components of *Tragia involucrata* to be absorbed and serve a prophylactic effect from inside the body. Notably, the leaves of the same plant were used for treatment of paralysis in conjunction with oil obtained from seeds of *Brassica campestris*. Again the use of oil for topical purposes, as seen with Kaviraj 1, was noticeable, for oil would help any phytochemical component(s) of *Tragia involucrata* to be smoothly spread and help its possible absorption through skin. Kaviraj 2 also treated difficult to treat diseases with allopathic medicine like diabetes and paralysis.

Table 2: Ailments treated and medicinal plants used by Kaviraj of Munshefpur village, Jessore district, Bangladesh.

Serial Number	Ailment with symptoms	Formulation	Local name of ingredients used
1	Paralysis	100g leaves of *Tragia involucrata* L. (Euphorbiaceae) are dried, powdered and passed through a thin cloth. The powder is then mixed with oil obtained from seeds of *Brassica campestris* L. (Cruciferae). The mixture is massaged onto paralyzed area for 2 weeks.	*Tragia involucrata*: Chutra pata *Brassica campestris*: Shorisha
2	Burns, infections following burns, eczema	Dried and powdered leaves of *Tragia involucrata* L. (Euphorbiaceae) are spread onto affected areas.	*Tragia involucrata*: Chutra pata
3	Burns, infections following burns, eczema	Leaves of *Tragia involucrata* L. (Euphorbiaceae) are fried and taken with 1-2 fruits of *Capsicum frutescens* L. (Solanaceae) and cooked rice.	*Tragia involucrata*: Chutra pata *Capsicum frutescens*: Morich
4	Eczema	Macerated leaves of *Glycosmis pentaphylla* (Retz.) Corr. (Rutaceae) is applied to affected areas for 1 month.	*Glycosmis pentaphylla*: Aatshuti
5	Jaundice	Juice from macerated leaves of *Cajanus cajan* (L.) Millsp. (Fabaceae) is taken with a handful of molasses prepared from stem juice of *Saccharum officinarum* L. (Poaceae). One glass of juice with molasses is taken for 1 week.	*Cajanus cajan*: Airi *Saccharum officinarum*: Aakh
6	Toothache	Roots of *Achyranthes aspera* L. (Amaranthaceae) are used to brush teeth for 1 week.	*Achyranthes aspera*: Apang, Chirchire
7	Scabies, eczema, skin diseases	Two hand full of leaves from *Azadirachta indica* A. Juss. (Meliaceae) are crushed or boiled in water followed by taking a bath in that water. Alternately macerated leaves are applied to affected areas.	*Azadirachta indica*: Neem
8	Diarrhea	Juice obtained from macerated leaves of *Litsea chinensis* Lam. (Lauraceae) is taken with honey.	*Litsea chinensis*: Potka pata, Pipulsae
9	Bloating (gas formation in stomach)	One cup of juice obtained from macerated leaves of *Mikania cordata* (Burm.f.) B. L. Robinson (Asteraceae) is taken with 1 tablespoon of molasses obtained from stem juice of *Saccharum officinarum* L. (Poaceae) every morning on an empty stomach for 1 month.	*Mikania cordata*: jarmany lota, Nairi lota *Saccharum officinarum*: Ikkhu
10	Coughs	One hand full of leaves of *Piper longum* L. (Piperaceae) is taken with 1 teaspoonful honey every morning on an empty stomach for 3 days.	*Piper longum*: Pipul

Table 2: Continue

11	To stop external bleeding from cuts	Juice from macerated leaves of *Mikania cordata* (Burm.f.) B. L. Robinson is applied to cuts.	*Mikania cordata*: Jarmany lota
12	Diabetes	Juice from macerated three handfuls of *Enydra fluctuans* Lour. (Asteraceae) is taken with raw goat milk every morning on an empty stomach for 7 days.	*Enydra fluctuans*: Helenchi shak
13	Passing of semen with urine	Juice from macerated 12-13 leaves of *Stephania japonica* (Thunb.) Miers is taken with 2 teaspoonful of sugar every morning on an empty stomach for 1 week.	*Stephania japonica*: Mochni, Doi, Nimukho pata
14	Facial infections in children	Juice obtained from macerated whole plants of *Aerva lanata* (L.) A. L. Juss. (Amaranthaceae) is fed to children with honey twice daily for 1 week. Alternately, the mixture can be applied straight to infections.	*Aerva lanata*: Doay khoiae
15	Blood dysentery	Juice from macerated 5-6 leaves of *Kalanchoe pinnata* (Lam.) Pers. (Crassulaceae) is taken with 2 teaspoonful of honey twice daily on an empty stomach for 1 week.	*Kalanchoe pinnata*: Pathor chini

Even among a similar class of disorders, like gastrointestinal disorders, plants used by Kaviraj 2 were different, again suggesting a detailed knowledge of the medicinal properties of each plant. Leaves of *Litsea chinensis* were used to treat diarrhea; on the other hand, a combination of *Mikania cordata* and *Saccharum officinarum* was used to treat gas formation in the stomach, and *Kalanchoe pinnata* was used to treat blood dysentery. Molasses obtained from the stem juice of *Saccharum officinarum* was also used by Kaviraj 1 in four instances. It is to be mentioned that although the sweetness of the molasses can make a bitter plant part more palatable, both Kavirajes believed that molasses exerted an individual as well as a synergistic effect when used in combination with juice from other plant parts. In support of this hypothesis, it was noted that both Kavirajes used honey or sugar in some of their formulations. Honey was also considered by Kavirajes to have its own therapeutic value, while sugar was basically used to make the plant preparation more palatable. As such, the use of molasses for its therapeutic effect, whether alone or in combination, seems to be a very plausible hypothesis.

The most notable features of the two Kavirajes were the number of ailments treated, and the differences in medicinal plants used between the Kavirajes, even while treating similar ailment(s). Only 7 types of ailments were treated in common by both Kavirajes. These ailments included skin diseases, hepatic disorders (jaundice), respiratory tract disorders (coughs, mucus), toothache, gastrointestinal disorders, diabetes, and to stop bleeding from cuts and wounds. Even then the medicinal plants selected for treatment of these common ailments differed considerably among the two Kavirajes. While *Azadirachta indica* was used for treatment of skin disorders by Kaviraj 2, Kaviraj 1 used the same plant along with *Curcuma longa* or with *Curcuma longa*, *Vitex negundo*, and *Cynodon dactylon*. For treatment of jaundice, both Kavirajes used a combination of the plants, *Cajanus cajan* and *Saccharum officinarum*. However, the dosage differed among the two Kavirajes. While Kaviraj 1 advised drinking only 2 teaspoonful of juice obtained from macerated leaves of *Cajanus cajan*, Kaviraj 2 advised drinking one glass of juice obtained from macerated leaves of the same plant.

Three different formulations were used by Kaviraj 1 for treatment of diabetes. These were (i) a combination of *Swietenia macrophylla* and *Saccharum officinarum*, (ii) *Piper longum*, and (iii) *Coccinia grandis*, while Kaviraj 2 used only one formulation containing one plant, namely *Enydra fluctuans*. Toothache was treated with *Murraya exotica* by Kaviraj 1; the same problem was treated with *Achyranthes aspera* by Kaviraj 2. Bleeding from external cuts and wounds was treated with *Glycosmis pentaphylla* by Kaviraj 1, but treated with *Mikania cordata* by Kaviraj 2. Similar to Kaviraj 1, Kaviraj 2 also displayed knowledge about the manifold medicinal effects of plants. *Mikania cordata* was used by Kaviraj 2 for treatment of two very dissimilar disorders, namely bleeding from cuts and wounds, as well as bloating (gas formation in the stomach). However, if bloating is caused by ulceration of the stomach due to hyperacidity (which can also cause internal stomach bleeds), the plant may be serving the dual purposes of stopping both internal as well as external bleeding.

Differences in the type of ailments treated were also observed between the two Kavirajes. Only 7 types of ailments were treated in common. Kaviraj 1 treated excessive bleeding during menstruation, fever, helminthiasis, reduced eye sight, burning sensations in head or scalp, eye infections, decrease in libido, boils, broken voice, bone fractures, sprains, goiter, and leucorrhea, which were not treated by Kaviraj 2. Kaviraj 2 treated paralysis, passing of semen with urine, and facial infections in children, which were not treated by

Table 3: Differences in ailments treated and medicinal plants used for treatment by the Kavirajes of the two surveyed villages.

Ailment	Medicinal plants used (singly or in combination)	
	Kaviraj 1 (Arpara village)	Kaviraj 2 (Munshefpur village)
Skin diseases	1. *Rauwolfia serpentina, Brassica campestris* 2. *Rauwolfia serpentina, Piper nigrum, Zingiber officinale* 3. *Vitex negundo, Cynodon dactylon, Azadirachta indica, Curcuma longa* 4. *Azadirachta indica, Curcuma longa*	1. *Tragia involucrata, Brassica campestris* 2. *Tragia involucrata* 3. *Glycosmis pentaphylla* 4. *Azadirachta indica*
Excessive bleeding during menstruation	1. *Ficus benghalensis, Lawsonia inermis, Oryza sativa* 2. *Mimusops elengi, Elettaria cardamomum, Syzygium aromaticum* 3. *Vitis trifolia, Carum copticum*	
Fever	1. *Swertia chirata, Phyllanthus emblica, Terminalia belerica, Terminalia chebula* 2. *Tinospora crispa, Saccharum officinarum*	
Hepatic disorders	1. *Zingiber officinale* 2. *Cajanus cajan, Saccharum officinarum*	1. *Cajanus cajan, Saccharum officinarum*
Respiratory tract disorders (coughs, mucus, pneumonia)	1. *Zingiber officinale* 2. *Justicia adhatoda, Nyctanthes arbor-tristis* 3. *Ocimum gratissimum*	1. *Piper longum*
Toothache	1. *Murraya exotica*	1. *Achyranthes aspera*
Helminthiasis	1. *Syzygium cumini*	
Gastrointestinal disorders	1. *Mangifera indica, Syzygium cumini* 2. *Ludwigia adscendens* 3. *Centella asiatica, Musa paradisiaca* 4. *Acalypha indica*	1. *Litsea chinensis* 2. *Mikania cordata, Saccharum officinarum* 3. *Kalanchoe pinnata*
To increase eye sight	1. *Ipomoea aquatica*	
Burning sensations in head, to keep head cool	1. *Vitex trifolia, Sesamum indicum* 2. *Aloe barbadensis*	
Eye infections	1. *Heliotropium indicum*	
Decrease in libido	1. *Terminalia arjuna, Hygrophila auriculata, Nigella sativa*	
Boils	1. *Lablab purpureus, Lens culinaris*	
Diabetes	1. *Swietenia macrophylla, Saccharum officinarum* 2. *Piper longum* 3. *Coccinia grandis*	1. *Enydra fluctuans*
To stop bleeding	1. *Glycosmis pentaphylla*	1. *Mikania cordata*
Broken voice	1. *Carum copticum, Nigella sativa*	
Bone fracture	1. *Cissus quadrangularis, Glycosmis pentaphylla*	
Sprain, hurt	1. *Leea aequata*	
Goiter	1. *Colocasia nymphaeifolia, Piper nigrum*	
Burning sensations during urination, leucorrhea	1. *Aloe barbadensis, Saccharum officinarum* 2. *Azadirachta indica, Asparagus racemosus, Tinospora sinensis, Litsea chinensis, Bombax ceiba, Erythrina indica*	
Passing of semen with urine		1. *Stephania japonica*
Hypertension	1. *Tamarindus indica* 2. *Aloe barbadensis*	
Paralysis		1. *Tragia involucrata, Brassica campestris*
Facial infections in children		1. *Aerva lanata*

Kaviraj 1. While the differences may indicate lack of medicinal plant knowledge in the treatment of some diseases, it may also indicate a degree of specialization among the folk medicinal practitioners, as is also common among allopathic doctors. The Kavirajes attributed these differences to the efficacy of medicinal plants that they used for treatment. If a medicinal plant was used by them for treatment of a certain disease and found to be less or not efficacious, the Kaviraj would discontinue treatment for that disease till an efficacious plant was found through trial and error or otherwise. By otherwise, the Kavirajes said that they sometimes obtained plants through dreams, or through chance gathering of such knowledge from lay persons or other practitioners, or even occasionally through discerning a similarity in plant or plant part shape with the diseased organ.

The present study highlights the fact that considerable differences exist between Kavirajes of different areas or even the same area of Bangladesh as to ailments treated and the choice of medicinal plants used for treatment of any specific ailment. This observation demonstrates the uniqueness of any particular Kavirajes' treatment methods. It also shows that a diversity of medicinal plant knowledge exists among the Kavirajes, both as to plant species as well as to the number of ailments that can be treated with any given plant species. The Kavirajes' method, as observed in the present study, also demonstrated a certain depth of knowledge in

the efficaciousness of different parts from the same plant when administered either orally or topically, and also indicated that the Kavirajes also had a certain amount of knowledge in the use of additives, like the use of oil with plant parts for topical administration, or the use of molasses with plant parts for oral administration. Allopathic medicine has gained considerably through observation of indigenous people's medicinal practices (Gilani and Rahman, 2005). The Kavirajes of Bangladesh merit further consideration for detailed scientific studies as to their uses of various medicinal plants for treatment of diverse ailments. Diseases like hypertension or diabetes are on the rise in modern society because of a change in lifestyle and an increase in stress. The medicinal plants used by the Kavirajes in the present study to alleviate diabetes or hypertension can prove useful in the discovery of novel drugs to treat such diseases.

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