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ORIGINAL ARTICLES

Differences in Selection of Ailments and Medicinal Plants by Folk Medicinal Practitioners: a Study of Practitioners in Barobazar Village of Jhenidaha District, Bangladesh

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Farhana Islam, Farhana Israt Jahan, Syeda Seraj, Ishita Malek, A.F.M. Nazmus Sadat, Mirza Nipa Monalisa, Auditi Swarna, Sherejad Sanam, Mohammed Rahmatullah; Differences in selection of ailments and medicinal plants by folk medicinal practitioners: a study of practitioners in Barobazar village of Jhenidaha district, Bangladesh

ABSTRACT

A comparative study as to ailments treated and medicinal plants used was made among three practicing folk medicinal practitioners of Barobazar village in Jhenidaha district, Bangladesh. Kaviraj 1 treated 11 different types of disorders, using 16 different formulations containing 23 plant species. Kaviraj 2 treated 16 different types of disorders, using 21 formulations containing 37 plant species. One formulation of Kaviraj 2 also included a bird and a snail species, and another formulation consisted of wearing an amulet. Kaviraj 3 treated 8 different types of disorders, using 13 formulations containing 15 plant species. Four types of ailments were treated in common between Kavirajes 1 and 2; 1 common ailment between Kavirajes 1 and 3, and 5 common ailments between Kavirajes 2 and 3. Diabetes was the only common ailment treated by all three Kavirajes. Ailments treated by Kaviraj 1 but not Kavirajes 2 and 3 included respiratory tract disorders, hypertension, chicken pox, anemia, acne, and helminthiasis. Kaviraj 2 apparently specialized in treatment of erectile dysfunction and various types of animal, reptile and insect bites, like snake bite, dog bite, cat bite, and poisonous insect bite. Ailments treated only by Kaviraj 3 included ear ache, oral lesions and lesions on the tongue, and fever. The choice of medicinal plant selected for treatment of any particular ailment also differed widely among the Kavirajes. While Kaviraj 1 treated diabetes with a combination of *Ficus racemosa*, *Allium cepa*, *Allium sativum*, *Zingiber officinale*, *Capsicum frutescens*, and *Brassica napus* or alternately, only with *Abrus precatorius*, Kaviraj 2 treated the same disease with a combination of *Glycosmis pentaphylla* and *Sida rhombifolia*, and Kaviraj 3 treated diabetes with a combination of *Tinospora cordifolia* and *Curcuma longa*. Kaviraj 1 treated leucorrhea with *Zingiber purpureum* or with a combination of *Asparagus racemosus*, *Withania somnifera* and *Piper cubeba*; Kaviraj 2 treated leucorrhea with a combination of *Abroma augusta* and *Scoparia dulcis*. Kaviraj 3 treated gastrointestinal disorders with *Scoparia dulcis*. The plant, *Heliotropium indicum* was used by both Kavirajes 1 and 2 for treatment of eye infections; however, Kaviraj 2 used the same plant also for treatment of erectile dysfunction. Overall, it is concluded from the survey results that Kavirajes practicing in the same area tend to concentrate or specialize in treatment of certain diseases, which treatment is specific to the Kaviraj only. Notably, similar specialization methods are observed with allopathic doctors, who besides treating some ailments in common with other allopathic doctors, further tend to specialize in a given field, probably to face less competition. The divergences in use of medicinal plants further suggest that every individual Kaviraj possess his or her own repertoire of medicinal plants. A single plant species may contain a wide variety of bioactive phytochemicals, and the present survey results point out that to obtain a comprehensive idea of the medicinal properties of plants, individual Kavirajes of the country has to be surveyed to gather information on the various uses of any particular plant species.

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

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Introduction

Folk medicine practice is a common form of traditional medicinal practices in Bangladesh. In reality, folk medicinal practitioners are the primary health-care providers to substantial segments of the rural population, as well as segments of the urban population within the country. This is because modern allopathic doctors and practitioners of established traditional medicine like Ayurveda and Unani tend to practice in densely populated areas, and invariably end up practicing in large cities and towns. On the other hand, folk medicinal practitioners, otherwise known as Kavirajes or Vaidyas reside in the 86,000 villages of the country and small semi-rural towns. Because of their close intermingling with the general rural and semi-urban population, potential patients develop a social relationship with the Kavirajes and feel free to approach the Kavirajes not only with problems related to physical or mental diseases, but also any other family or social problems that they are facing. The other advantage of folk medicine is their simplicity of use. Kavirajes rely almost exclusively on medicinal plants for treatment, and usually one plant or a plant part is used for treatment of a single disease, unless the disease is complicated with the presence of a variety of symptoms. Use of amulets or inclusion of animal or other life forms in formulations is rarely prescribed by the Kavirajes.

Bangladesh has about 86,000 villages spread throughout the country. The rural people constitute the majority of the population. The villages may be densely or sparsely populated, depending on their location. A typical village may contain around 2,000 persons; however, a large number of villages can be found with 5-fold more people. A typical village may contain a single practicing Kaviraj. On the other hand, villages with a large population may contain multiple Kavirajes. The presence of multiple Kavirajes in a village raises a number of questions, as to whether under such circumstances, a Kaviraj selects any particular diseases in which he or she alone specializes, or all Kavirajes treat same types of diseases. Since the profession of Kaviraj usually is kept confined with the family with accumulated knowledge being passed from generation to generation, does all Kaviraj within any given area use similar plant species for treatment of any specific ailment, or does the plant species used differ between Kavirajes? If the types of diseases treated by different Kavirajes in one village are similar, obviously the Kavirajes have to face intense competition between them. The same applies to if all Kavirajes use the same plant formulation for treatment of any specific ailment, because then patients may concentrate on Kavirajes based on reasons other than any ability in successful treatment of diseases.

Our previous ethnomedicinal surveys conducted among the folk medicinal practitioners (Kavirajes) of the mainstream Bengali-speaking population, as well as tribal medicinal practitioners indicated that plant species used by the Kavirajes tend to differ widely between even adjoining areas with the same vegetation cover, although the diseases treated may be the same (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). This was surprising, for the presence of similar vegetation cover would suggest the availability of similar species of medicinal plants. As such, because of possible information exchanges, the Kavirajes were expected to use same or similar plant species (like belonging to the same Family) for treatment of any given disease. Obviously, our results suggested that this was not the case. Our survey results obtained thus far indicated that different Kavirajes used different plant species for treating the same disease. The objective of the present study was to conduct a survey among three practicing Kavirajes of Barobazar village in Jhenidaha district, Bangladesh to find out answers as to whether Kavirajes practicing in the same area treat the same ailments and use same plant(s) for treatment of any specific ailment.

Materials and Methods

For purposes of this study, Barobazar village in Jhenidaha district was randomly selected because of its large population size and more so, because it had three practicing Kavirajes within the same village. Kaviraj Abdus Sattar (Kaviraj 1) was 65 years old and had an ongoing practice spanning 30 years. Kaviraj Yasin Shaikh (Kaviraj 2) was also 65 years old and his ongoing practice spanned a period of 45 years. Kaviraj Hosne Ara (Kaviraj 3) was 55 years old and her ongoing practice spanned 10 years. She was the only female among the three Kavirajes.

Informed consent was first obtained from all three Kavirajes. They were told about the purpose of our visits and consent obtained from them individually that the information collected may be disseminated in national and international publications. Individual interviews were conducted 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 interviewers on guided field-walks through areas from where they obtained their medicinal plants, pointed out the plants, and described their uses. Individual plant specimens were collected, dried on the spot, and brought back to Dhaka for identification. All plant specimens were identified by Mr. Manjur-Ul-Kadir Mia, ex-Curator and Principal Scientific Officer of the Bangladesh National Herbarium. Interviews were

conducted in Bengali, a language spoken by both Kavirajes and interviewers alike. Kaviraj 2 included in his formulations, bird as well as a gastropod (snail) species. These were identified with the help a reference book, Encyclopedia of Flora and Fauna of Bangladesh (2009).

Results and Discussion

Kaviraj 1 was observed to treat 11 different types of disorders with the help of 16 formulations containing a total of 23 plant species. The results are shown in Table 1. He had multiple formulations for treatment of similar ailment. For instance, leucorrhea was treated by him with *Zingiber purpureum* as well as a combination of *Asparagus racemosus*, *Withania somnifera*, and *Piper cubeba*. Similarly, eye infections were treated by him through three different formulations. The first contained leaves of *Heliotropium indicum*; the second contained leaves of *Lawsonia inermis*, while the third formulation contained fruits of *Phyllanthus emblica*. In all three instances, juice obtained from the respective plant part was applied to the eyes. The formulations of Kaviraj 1 included both simple (i.e. containing a single plant species) as well as complex formulations (i.e. consisting of multiple plant species). The formulation for diabetes was his most complex formulation and consisted of fruits of *Ficus racemosa*, bulbs of *Allium cepa* and *Allium sativum*, rhizomes of *Zingiber officinale*, fruits of *Capsicum frutescens*, and oil obtained from seeds of *Brassica napus*, the latter being used to fry the other ingredients. Following frying, the fried mix was advised to be taken with cooked rice. However, an alternate form of diabetes treatment advised by Kaviraj 1 was just eating the fruits of *Ficus racemosa* in the fried form, suggesting that *Ficus racemosa* was the really anti-diabetic plant species, the rest possibly being auxiliary items for eating the fruits of this plant in a fried form. On the other hand specific amounts of the other plant parts were prescribed to be used during frying, like 2 bulbs of *Allium cepa*, 1 bulb of *Allium sativum*, 10g of *Zingiber officinale* rhizomes, and 4 fruits of *Capsicum frutescens*. Even the amount of oil was fixed at 2 tablespoonfuls. While this could be an arbitrarily chosen combination by the Kaviraj, the main effect of which was to make the fried form of fruits of *Ficus racemosa* more palatable, it could also mean that precise amounts of the different plant parts were necessary to make the total mix an anti-diabetic formulation.

Kaviraj 1 further showed a distinctive feature in his treatment. For instance, he differentiated his treatment methods for helminthiasis in children versus helminthiasis in adults. While children were administered juice obtained from leaves of *Andrographis paniculata*, adults were administered powdered leaves of *Nicotiana tabacum*. Since the latter plant is the tobacco plant, administration of leaf powder of this plant in all probability could be detrimental to the children's health. On the other hand, since tobacco is regularly smoked or chewed by the rural people (adults), they can deal with oral administration of the leaves without causing any serious and detrimental problems like gastrointestinal upsets. It is also interesting that for treatment of asthma (a respiratory condition marked by spasms in the bronchi of the lungs, causing difficulty in breathing), Kaviraj 1 advised smoking dried leaves and flowers of *Datura metel* wrapped in a leaf of *Justicia adhatoda*. While on the surface, the treatment method may seem contra-indicatory, *Justicia adhatoda* is used in folk medicinal system of Bangladesh for treatment of respiratory disorders, including asthma. The plant is known to contain the vasodilator, vasicinone (Amin and Mehta, 1959), which could be of help to asthma patients when inhaled. The plant is also known to possess anti-tussive (anti-coughing) properties (Dhuley, 1999).

Kaviraj 2 treated 16 ailments with 21 formulations containing 37 different plant species. The results are shown in Table 2. Like Kaviraj 1, he also used multiple formulations for treatment of similar type of disorders. As an instance, for treatment of jaundice, he used two formulations. The first consisted of leaf juice of *Cajanus cajan* to be taken with molasses obtained from stem juice of *Saccharum officinarum*. His second formulation was highly complex, consisting of cooking and partaking of a young chicken or young rock pigeon in combination with mucus from the mouth of a land snail, fruits of *Piper nigrum*, rhizomes of *Zingiber officinale*, bulbs of *Allium cepa* and *Allium sativum*, fruits of *Capsicum frutescens*, and leaves of *Cinnamomum tamala*. It is very much possible that the real ingredients in the formulation were the bird and the snail species, the rest being typical spices added to cooked meat dishes in Bangladesh. Also notable in this regard, is that young chicken or young pigeon meat is regarded in Bangladesh folklore to have the ability to increase strength in sick persons, be it adults or children.

Kaviraj 2 appeared to specialize in treatment of bites from poisonous reptiles, mammals or insects. His other unusual mode of treatment was for erectile dysfunction, in which patients were advised to wear an amulet containing the roots of *Heliotropium indicum*. The patients were advised to uproot the plant with bated breath and bend the roots thrice over before putting them in an amulet. These latter advises could probably be to instill in the patient much needed mental confidence rather than having any physical effect towards a cure. So long as the patient is led to believe that he is performing something out of the way, in fact something extraordinary or even supernatural, his mental confidence is restored by just performing these extraordinary acts. Modern

Table 1: Medicinal plants used and ailments treated by Kaviraj 1 of Barobazar village, Jhenidaha district, Bangladesh.

Serial Number	Ailment with symptoms	Formulation	Local name of ingredients used
1	Leucorrhea	Juice obtained from 100g sliced and macerated rhizomes of *Zingiber purpureum* Roscoe is taken with one teaspoonful of sugar daily for 1 month.	*Zingiber purpureum*: Bon ada
2	Leucorrhea	100g roots or whole plant of *Asparagus racemosus* Willd. (Liliaceae) is mixed with 100g leaves of *Withania somnifera* (L.) Dunal (Solanaceae) and 50g unripe and dried fruits of *Piper cubeba* L. (Piperaceae). The mixture is dried under the sun, powdered and pills prepared from it. One pill is taken daily for 1 month.	*Asparagus racemosus*: Shotomuli *Withania somnifera*: Ashwogondha *Piper cubeba*: kabab chini
3	Eye infections (redness in eyes, watery eyes, conjunctivitis)	Juice obtained from macerated leaves of *Heliotropium indicum* L. (Boraginaceae) is strained through a piece of cloth. Two drops of the juice is applied to each eye 3-4 times daily for 7 days.	*Heliotropium indicum*: Hatishura
4	Eye infections (redness in eyes, watery eyes, conjunctivitis)	Juice from macerated leaves of *Lawsonia inermis* L. (Lythraceae) is strained through a piece of cloth. Two drops of the juice is applied to each eye 3-4 times daily for 7 days.	*Lawsonia inermis*: Mehedi
5	Eye infections (redness in eyes, watery eyes, conjunctivitis)	Juice from unripe fruits of *Phyllanthus emblica* L. (Euphorbiaceae) is applied (2 drops) to each eye twice daily for 3 days.	*Phyllanthus emblica*: Amloki
6	Chronic cough	Juice obtained from macerated 100g leaves of *Justicia adhatoda* L. (Acanthaceae), 50g rhizomes of *Zingiber officinale* Roscoe (Zingiberaceae), and 50g bulbs of *Allium cepa* L. (Liliaceae) is thoroughly mixed and taken twice daily for 7 days (dosage: one teaspoonful).	*Justicia adhatoda*: Bashok *Zingiber officinale*: Ada *Allium cepa*: Peyaj
7	Hypertension	Ripe fruits (50g) of *Tamarindus indica* L. (Fabaceae) are soaked in 1 glass of water. Two teaspoonful of sugar or 1 handful of dry molasses from stem juice of *Saccharum officinarum* L. (Poaceae) is mixed with the water. One glass of the mixture is taken daily for 1 month.	*Tamarindus indica*: Tentul *Saccharum officinarum*: Aakh
8	Diabetes	100g fruits of *Ficus racemosa* L. (Moraceae) is combined with 2 bulbs of *Allium cepa* L. (Liliaceae), 1 bulb of *Allium sativum* L. (Liliaceae), 10g of rhizomes of *Zingiber officinale* Roscoe (Zingiberaceae), 4 fruits of *Capsicum frutescens* L. (Solanaceae) and 2 tablespoonful of oil obtained from seeds of *Brassica napus* L. (Cruciferae). Salt is added to the mixture and it is then fried. The fried mix is taken with cooked rice. Alternately, fruits of *Ficus racemosa* are eaten in the fried form.	*Ficus racemosa*: Dumur *Allium cepa*: Peyaj *Allium sativum*: Roshun *Zingiber officinale*: Ada *Capsicum frutescens*: Morich *Brassica napus*: Shorisha
9	Diabetes	Juice obtained from macerated leaves of *Abrus precatorius* L. (Fabaceae) is taken with one teaspoonful of sugar once daily for 1 month.	*Abrus precatorius*: Kuch pata

Table 1: Continue

10	Small pox, chicken pox	Stems and flowers of *Moringa oleifera* Lam. (Moringaceae) are taken in the fried form or cooked as vegetable and taken. Note that this also acts as preventive medicine.	*Moringa oleifera*: Shojna gach
11	Anemia	Stems of *Moringa oleifera* Lam. (Moringaceae) are boiled in water and chewed.	*Moringa oleifera*: Shojna gach
12	Acne	The skin of fruit of *Citrus aurantium* L. (Rutaceae) is rubbed on the face once daily for 2 weeks.	*Citrus aurantium*: Komla lebu
13	Helminthiasis in children	Two teaspoonfuls of juice obtained from fresh macerated leaves of *Andrographis paniculata* (Burm. F.) Wall. ex Nees (Acanthaceae) is taken in the morning on an empty stomach for 4-5 days.	*Andrographis paniculata*: Kalomegh
14	Helminthiasis in adults	Fresh leaves of *Nicotiana tabacum* L. (Solanaceae) are washed, dried and powdered. 125 mg of the powder is mixed with water, slightly warmed and taken.	*Nicotiana tabacum*: Tamak
15	Rheumatism, rheumatic pain	½ cup juice obtained from macerated leaves of *Datura stramonium* L. (Solanaceae) is mixed with oil from seeds of *Brassica napus* L. (Cruciferae) and warmed. When still slightly warm, the mixture is applied to affected areas.	*Datura stramonium*: Shada dhutra *Brassica napus*: Shorisha
16	Asthma	Dried leaves and flowers of *Datura metel* L. (Solanaceae) is wrapped in a leaf of *Justicia adhatoda* L. (Acanthaceae) and smoked like a cigarette.	*Datura metel*: Kalo dhutura, Krishna dhutura *Justicia adhatoda*: Bashok

Table 2: Medicinal plants used and ailments treated by Kaviraj 2 of Barobazar village, Jhenidaha district, Bangladesh.

Serial Number	Ailment with symptoms	Formulation	Local name of ingredients used
1	Snake bite	Seven leaves of *Rauwolfia serpentina* (L.) Benth. ex Kurz (Apocynaceae) are collected facing westward and with bated breath. One handful of gum from rotten *Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guill. & Perr. (Combretaceae) plant is also collected facing westward with bated breath. They are mixed with roots of *Aristolochia indica* L. (Aristolochiaceae), macerated and taken with milk. At the same time the mixture is applied to snake-bitten area.	*Rauwolfia serpentina*: Choto chondro *Aristolochia indica*: Isher mul *Anogeissus latifolia*: Doya
2	Jaundice (yellowness in face and eyes)	Juice obtained from macerated leaves of *Cajanus cajan* (L.) Millsp. is mixed with 2 teaspoonful molasses obtained from stem juice of *Saccharum officinarum* L. (Poaceae). One glass is taken daily for 7 days in the morning on an empty stomach.	*Cajanus cajan*: Airi *Saccharum officinarum*: Aakh
3	Jaundice	One young chicken (*Gallus gallus domesticus*, Family: Phasianidae) or one young rock pigeon (*Columba livia*, Family: Columbidae) is cooked with mucus around the mouth from three land snails (*Macrochlamys indica*, Family: Ariophantidae), fruits of *Piper nigrum* L. (Piperaceae), rhizomes of *Zingiber officinale* Roscoe (Zingiberaceae), bulb of *Allium cepa* L. (Liliaceae), bulb of *Allium sativum* L. (Liliaceae), fruits of *Capsicum frutescens* L. (Solanaceae), leaves of *Cinnamomum tamala* (Buch.-Ham.) Nees & Eberm. (Lauraceae) and salt and orally administered 1-2 times daily.	*Gallus gallus domesticus*: Murgi *Columba livia*: Kobutor *Macrochlamys indica*: Shamuk *Piper nigrum*: Gol morich *Allium cepa*: Peyaj *Allium sativum*: Roshun *Capsicum frutescens*: Morich *Cinnamomum tamala*: Tejpata

Table 2: Continue

4	Dog bite	Three drops of gum from *Calotropis gigantea* (L.) Ait.f. (Asclepiadaceae) are first applied to the bitten area. Fruits of the hot pepper, *Capsicum frutescens* L. (Solanaceae) are then vigorously rubbed on the bitten area. When the bitten area starts to burn because of the rubbing of hot peppers the rubbing is stopped. Then 7 batashas (local sweet) are taken and one drop of gum from *Calotropis gigantea* is applied to each batasha. One batasha is to be eaten daily for 7 days in the morning on an empty stomach.	*Calotropis gigantean*: Shet akondo *Capsicum frutescens*: Kancha morich
5	Poisonous insect bite	Seven leaves of *Vernonia cinerea* (L.) Less. Are plucked with bated breath. They are then mixed with 50g roots of *Achyranthes aspera* L. (Amaranthaceae), 21 fruits of *Piper nigrum* L. (Piperaceae) and 3 drops of honey. The mix is macerated and pills prepared from the mix are dried in the sun. One pill is to be taken daily on an empty stomach for 21 days.	*Vernonia cinerea*: Khud keshori *Achyranthes aspera*: Chirchira, Apang *Piper nigrum*: Gol morich
6	Erectile dysfunction	Roots of *Heliotropium indicum* L. (Boraginaceae) are uprooted with bated breath. The roots are then bended thrice over, put in an amulet and tied to the waist.	*Heliotropium indicum*: Hatishur
7	Cataract, eye infections	Juice from macerated leaves of *Heliotropium indicum* L. (Boraginaceae) is mixed with one grain of salt. One drop is applied to both eyes every morning for 2-3 days.	*Heliotropium indicum*: Hatishur
8	Rheumatism, rheumatic pain, paralysis	Three fruits of *Datura metel* L. (Solanaceae) and 100g of macerated bulb of *Allium sativum* L. (Liliaceae) is fried in 100g ghee (clarified butter) till the amount is reduced to about ½ chatak (1 chatak = 62.5g). The decoction is then cooled and applied to affected areas.	*Datura metel*: Kalo dhutra *Allium sativum*: Roshun
9	Leucorrhea	Small pieces of stems of *Abroma augusta* L.f. (Sterculiaceae) are soaked in water containing 2 tablespoonful of juice obtained from macerated leaves of *Scoparia dulcis* L. (Scrophulariaceae). One glass of the water is taken with sugar every morning on an empty stomach till cure.	*Abroma augusta*: Ulot kombol *Scoparia dulcis*: Mishridana pata
10	Bloating (gas formation in the stomach)	One handful of leaves of *Stephania japonica* (Thunb.) Miers is taken with one teaspoonful sugar.	*Stephania japonica*: Akhondi, Nimukho pata
11	Bloating (gas formation in the stomach)	20 ml of fresh juice obtained from leaves of *Kalanchoe pinnata* (Lam.) Pers. (Crassulaceae) is taken with 1 teaspoonful sugar and ½ cup warm water.	*Kalanchoe pinnata*: Pathorkuchi
12	Cuts, sprains	Leaves of *Kalanchoe pinnata* (Lam.) Pers. (Crassulaceae) are warmed and then bandaged to affected area with a piece of cloth for 2-3 days.	*Kalanchoe pinnata*: Pathorkuchi
13	Cuts	Juice obtained from one handful of *Croton bonplandianum* Baill. (Euphorbiaceae) is applied to cuts to stop bleeding and alleviate pain.	*Croton bonplandianum*: Bon morich gach, Bonjhal
14	Scabies, eczema	Fruits of *Solanum violaceum* Orteg. (Solanaceae) are fried in mustard oil and taken with rice for 2-3 days.	*Solanum violaceum*: Tith baegun
15	Diabetes	Two teaspoonful of juice obtained from macerated leaves of *Glycosmis pentaphylla* (Retz.) Corr. (Rutaceae) and *Sida rhombifolia* L. (Malvaceae) is taken with a little honey on an empty stomach once daily for 1 month.	*Glycosmis pentaphylla*: Aatshoti *Sida rhombifolia*: Berela
16	Syphilis, gonorrhea (symptoms: passing of blood and pus with urine; Kaviraj claimed that syphilis and gonorrhea may sometime lead to diabetes through thickening of urine)	50g bark of *Terminalia arjuna* (Roxb. ex DC.) Wight & Arn. (Combretaceae), 20g powdered plant of *Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guill & Perr. (Combretaceae), seven seeds of *Mucuna pruriens* (L.) DC. (Fabaceae), water with which rice has been washed a second time, whole plant of *Asparagus racemosus* Willd. (Liliaceae), 50g root of *Bombax ceiba* L. (Bombacaceae), 3 fruits each of *Phyllanthus emblica* L. (Euphorbiaceae), *Terminalia belerica* (Gaertn.) Roxb. (Combretaceae) and *Terminalia chebula* Retz. (Combretaceae), one	*Terminalia arjuna*: Arjun *Anogeissus latifolia*: Doya *Mucuna pruriens*: Alkeshi *Asparagus racemosus*: Shotomuli *Bombax ceiba*: Shimul *Phyllanthus emblica*: Amloki *Terminalia belerica*: Boira *Terminalia chebula*: Hortoki *Croton tiglium*: Joiphol *Swertia chirata*: Chirota

Table 2: Continue

		fruit of *Croton tiglium* L. (Euphorbiaceae) and powdered bark of *Swertia chirata* (Roxb. ex Fleming) H. Karst. (Gentianaceae) are mixed and macerated together. One teaspoonful of the macerated mix is taken with 2 teaspoonful sugar and one glass water every morning for 1 week. Note that this treatment also gets rid of gastric problems.	
17	Cat bite	Juice from macerated leaves of *Urena lobata* L. (Malvaceae) is applied to bitten area.	*Urena lobata*: Bilai achra
18	Decrease of milk in lactating mothers	50g dry powdered portion of *Ipomoea mauritiana* Jacq. (Convolvulaceae) underneath the soil is taken with 1 glass of cow or goat milk on an empty stomach for 5-7 days.	*Ipomoea mauritiana*: Bhui kumra
19	White dysentery (dysentery with mucus), blood dysentery	Four fresh young leaves of *Syzygium cumini* (L.) Skeels (Myrtaceae) is macerated with 1g leaves of *Cynodon dactylon* (L.) Pers. (Poaceae) in a small amount of water. The juice is strained and slightly warmed and mixed with ½ cup of cow or goat milk. This is taken twice daily for 3-4 days.	*Syzygium cumini*: Jaam *Cynodon dactylon*: Durba
20	Dysentery	5g bark of *Terminalia arjuna* (Roxb. ex DC.) Wight & Arn. (Combretaceae) is thoroughly macerated and taken with ½ cup goat's milk.	*Terminalia arjuna*: Arjun
21	Dysentery	An unripe fruit of *Aegle marmelos* (L.) Corr. (Rutaceae) is burnt from the outside in the evening. The following morning, 150g pulp within the burnt fruit is taken on an empty stomach with sugar or molasses. This is done for 10-12 days.	*Aegle marmelos*: Bel

allopathic doctors also feel a need to restore in patients with sexual dysfunction a degree of mental confidence, for sexual dysfunction can be a result of a patient's loss in his confidence to have sex, rather than a real loss in ability to have sex. As soon as the mental confidence of the patient is restored, the patient performs in a normal manner.

Another complex formulation used by Kaviraj 2 was for treatment of sexually transmitted diseases like syphilis or gonorrhea. In this instance, a total a 10 plant parts were used, namely bark of *Terminalia arjuna*, whole plant of *Anogeissus latifolia*, seeds of *Mucuna pruriens*, whole plant of *Asparagus racemosus*, root of *Bombax ceiba*, fruits of *Phyllanthus emblica*, *Terminalia belerica*, *Terminalia chebula*, and *Croton tiglium*, and bark of *Swertia chirata*. Kaviraj 2, however, also used simple formulations. For treatment of bloating, he advised partaking of leaves of *Stephania japonica* or juice obtained from leaves of *Kalanchoe pinnata*. In both cases, sugar was advised to be added, possibly to make the formulation more palatable. His knowledge of the diverse medicinal properties of a plant species was also shown in his prescribing leaves of *Kalanchoe pinnata* to be used for cuts or sprains. Another instance, which showed in Kaviraj 2 an extensive knowledge of the medicinal properties of a given plant, was his treatment of various mammal, reptile, or poisonous insect bites with different plant species. While dog and cat bites were treated, respectively, with (*Calotropis gigantea* in combination with *Capsicum frutescens*) and *Urena lobata*, snake bites were treated with a combination of *Rauwolfia serpentina*, *Anogeissus latifolia*, and *Aristolochia indica*, and poisonous insect bites were treated with a combination of *Vernonia cinerea*, *Achyranthes aspera* and *Piper nigrum*.

Kaviraj 3 treated 8 ailments with 13 formulations consisting of 15 plant species. The results are shown in Table 3. Similar to Kavirajes 1 and 2, multiple formulations were used by her for treatment of ailments of a similar nature. Skin diseases were treated with *Amaranthus spinosus* or a combination of *Vitex negundo* and *Terminalia chebula*. Weak liver was treated either with a combination of *Enydra fluctuans* and *Brassica napus*, or with *Corchorus capsularis* only. Like Kaviraj 1, she also distinguished in her treatment between children and adults. Dysentery in adults was treated with *Scoparia dulcis*, while dysentery in children was treated with juice obtained from leaves of *Phyllanthus emblica*. That in the latter case, the mother had to go around the plant for 3 times before plucking a handful of leaves, was probably to calm the mother, who must be distressed when her children fell sick with dysentery. Traditional medicine usually takes a holistic approach in treatments; in this case the treatment possibly effected soothing the nerves of an anxious mother as well as treatment for the dysentery-ridden child. Like Kaviraj 2, Kaviraj 3 also treated gonorrhea. In her case, though, the treatment simply followed administration of juice obtained from roots of *Amaranthus spinosus*.

An analysis of the treatment methods of the three Kavirajes pointed to several features. A feature common to all three Kavirajes, was treatment of similar or same ailments with multiple formulations. These according to the Kavirajes, was necessitated by the fact that all plants or plant parts were not available throughout the year.

Table 3: Medicinal plants used and ailments treated by Kaviraj 3 of Barobazar village, Jhenidaha district, Bangladesh.

Serial Number	Ailment with symptoms	Formulation	Local name of ingredients used
1	Ear ache, entering s of water within the ear	Leaves of *Plumbago zeylanica* L. (Plumbaginaceae) are held over a fire and squeezed. 1-2 drops of juice that comes out is applied to the ears for 1-2 days.	*Plumbago zeylanica*: Chita
2	Diabetes	The leaves and stems of *Tinospora cordifolia* (Willd.) Hook.f. & Thoms. (Menispermaceae) are crushed and soaked in 1 glass water overnight. The following morning one pinch of dried and powdered rhizome of *Curcuma longa* L. (Zingiberaceae) is added to the water and the water orally taken on an empty stomach. This is done for 5-7 days.	*Tinospora cordifolia*: Guloncho, Khorosh *Curcuma longa*: Holud
3	Dysentery	Juice obtained from macerated leaves of *Scoparia dulcis* L. (Scrophulariaceae) is taken twice daily for 2-3 days.	*Scoparia dulcis*: Mishri dana
4	Dysentery in children (green stool color)	The mother of the child suffering from dysentery will go 3 times around the plant, *Phyllanthus reticulatus* Poir. (Euphorbiaceae) and then pluck a handful of leaves. Three drops of juice obtained from the macerated leaves is given to the child twice daily for 3 days.	*Phyllanthus reticulatus*: Chithi gach, Chitki gach
5	Oral lesions, lesions on the tongue	Juice from macerated whole plant (in case of adults) or leaves and flowers (in case of children) of *Aerva lanata* (L.) A. L. Juss. (Amaranthaceae) is mixed with butter or ghee (clarified butter) to make a paste. The paste is applied to lesions twice daily for 1-2 days.	*Aerva lanata*: Doay khoiae
6	Oral lesions, lesions on the tongue	Leaves and flowers of *Aerva lanata* (L.) A. L. Juss. (Amaranthaceae) is powdered and mixed with 3 drops of shohaga (cosmetic ingredient – unidentified plant product) and 3 drops of honey and applied thrice daily to lesions.	*Aerva lanata*: Doay khoiae
7	Gonorrhea, passing of semen with urine, burning sensations and pain in the penis, unusual penile erection	The roots of *Amaranthus spinosus* L. (Amaranthaceae) are freshly taken and macerated with a little amount of water. The juice obtained is mixed with ½ cup water and one and a half teaspponful of sugar or powdered mishri (crystalline sugar) or honey and the mixture taken.	*Amaranthus spinosus*: Kanta notae
8	Scabies, eczema, skin diseases	The leaves, stems and roots of *Amaranthus spinosus* L. (Amaranthaceae) are thoroughly dried and burnt to ashes. The ashes are mixed with coconut oil and applied to affected areas of skin.	*Amaranthus spinosus*: Kanta notae
9	Scabies, eczema, skin diseases	One teaspoonful of juice obtained from macerated leaves of *Vitex negundo* L. (Verbenaceae) is mixed with 2-3g of dried and powdered fruits of *Terminalia chebula* Retz. (Combretaceae) and taken with water 1-2 times daily.	*Vitex negundo*: Nishinda *Terminalia chebula*: Horitoki
10	Weak liver (symptoms: whole body takes on an ash color)	100g leaves of *Enydra fluctuans* Lour. (Asteraceae) is sliced, added to 150 ml water with salt and boiled. When the volume of the water reaches 1 cup, the decoction is cooled. Prior to eating rice, the decoction is taken with 4-5 drops of oil obtained from seeds of *Brassica napus* L. (Cruciferae). This is continued for 2-4 weeks.	*Enydra fluctuans*: Hinche shak *Brassica napus*: Shorisha
11	Weak liver (symptoms: whole body takes on an ash color)	2g leaves of *Corchorus capsularis* L. (Tiliaceae) is soaked in 50 ml water overnight. The following morning, the water is strained through a thin piece of clean cloth and taken on an empty stomach. This is continued for 7 days, and if necessary for another 7 days.	*Corchorus capsularis*: Pat shak
12	Hepatic disorders	5-10 drops of juice obtained from macerated rhizomes of *Curcuma longa* L. (Zingiberaceae) are given to children; for adults, 1 teaspoonful of juice is taken with a little sugar or honey for a few days.	*Curcuma longa*: Holud
13	Fever	10g of fresh roots of *Vitis trifolia* L. (Vitaceae) is mixed with 10g seeds of *Vigna mungo* (L.) Hepper (Fabaceae), macerated in cold water and taken.	*Vitis trifolia*: Goale lota (choto) *Vigna mungo*: Mash kalai

Thus a Kaviraj, if he or she wants to be successful in practice, must have a variety of plants in his or her repertoire for use whenever the need arises throughout the year.

Two other features distinguished the medicinal practices of the Kavirajes from one another. The first dealt with the almost exclusive nature of diseases treated by the Kavirajes. The second feature was that the Kavirajes

almost invariably used different plant species and formulations for treatment of any specific ailment. Only four diseases were found to be commonly treated by Kavirajes 1 and 2, one disease commonly treated between Kavirajes 1 and 3, five diseases commonly treated between Kavirajes 2 and 3, and one disease (diabetes) treated commonly between Kavirajes 1, 2 and 3. Even then the Kavirajes differed from one another in the species of plant used for treatment. While Kaviraj 1 treated diabetes with a combination of *Ficus racemosa*, *Allium cepa*, *Allium sativum*, *Zingiber officinale*, *Capsicum frutescens*, and *Brassica napus* or alternately, only with *Abrus precatorius*, Kaviraj 2 treated the same disease with a combination of *Glycosmis pentaphylla* and *Sida rhombifolia*, and Kaviraj 3 treated diabetes with a combination of *Tinospora cordifolia* and *Curcuma longa*. Kaviraj 1 treated leucorrhea with *Zingiber purpureum* or with a combination of *Asparagus racemosus*, *Withania somnifera* and *Piper cubeba*; Kaviraj 2 treated leucorrhea with a combination of *Abroma augusta* and *Scoparia dulcis*. Kaviraj 3 treated gastrointestinal disorders with *Scoparia dulcis*, while Kaviraj 2 treated gastrointestinal disorders with *Stephania japonica* or *Kalanchoe pinnata* or (*Syzygium cumini* with *Cynodon dactylon*) or *Terminalia arjuna* or *Aegle marmelos*. Gonorrhea was treated by Kaviraj 2 with a combination of ten plants, while Kaviraj 3 used only one plant for treatment of this disease. The plant, *Heliotropium indicum* was used by both Kavirajes 1 and 2 for treatment of eye infections; however, Kaviraj 2 used the same plant also for treatment of erectile dysfunction. The results are shown in Table 4.

Table 4: Comparative analysis of ailments treated and medicinal plants used by the three Kavirajes of Barobazar village, Jhenidaha district, Bangladesh.

Type of ailment	Medicinal plants used in formulations		
	Kaviraj 1	Kaviraj 2	Kaviraj 3
Leucorrhea	1. *Zingiber purpureum* 2. *Asparagus racemosus, Withania somnifera, Piper cubeba*	1. *Abroma augusta, Scoparia dulcis*	
Eye infections, cataract	1. *Heliotropium indicum* 2. *Lawsonia inermis* 3. *Phyllanthus emblica*	1. *Heliotropium indicum*	
Respiratory tract disorders (coughs, asthma)	1. *Justicia adhatoda, Zingiber officinale, Allium cepa* 2. *Datura metel, Justicia adhatoda*		
Hypertension	1. *Tamarindus indica, Saccharum officinarum*		
Diabetes	1. *Ficus racemosa, Allium cepa, Allium sativum, Zingiber officinale, Capsicum frutescens, Brassica napus* 2. *Abrus precatorius*	1. *Glycosmis pentaphylla, Sida rhombifolia*	1. *Tinospora cordifolia, Curcuma longa*
Chicken pox	1. *Moringa oleifera*		
Anemia	1. *Moringa oleifera*		
Acne	1. *Citrus aurantium*		
Helminthiasis	1. *Andrographis paniculata* 2. *Nicotiana tabacum*		
Rheumatism, rheumatic pain, paralysis	1. *Datura stramonium, Brassica napus*	1. *Datura metel, Allium sativum*	
Snake bite		1. *Rauwolfia serpentina, Anogeissus latifolia*	
Hepatic disorders (jaundice, weak liver)		1. *Cajanus cajan, Saccharum officinarum* 2. *Piper nigrum, Zingiber officinale, Allium cepa, Allium sativum, Capsicum frutescens, Cinnamomum tamala*	1. *Enydra fluctuans, Brassica napus* 2. *Corchorus capsularis* 3. *Curcuma longa*
Dog bite		1. *Calotropis gigantea, Capsicum frutescens*	
Poisonous insect bite		1. *Vernonia cinerea, Piper nigrum*	
Cat bite		1. *Urena lobata*	
Erectile dysfunction		1. *Heliotropium indicum*	
Gastrointestinal disorders (bloating, dysentery, white dysentery, blood dysentery)		1. *Stephania japonica* 2. *Kalanchoe pinnata* 3. *Syzygium cumini, Cynodon dactylon* 4. *Terminalia arjuna* 5. *Aegle marmelos*	1. *Scoparia dulcis* 2. *Phyllanthus reticulatus*
Cuts, sprains		1. *Kalanchoe pinnata* 2. *Croton bonplandianum*	

Table 4: Continue

Skin disorders (scabies, eczema)	1. *Solanum violaceum*	1. *Amaranthus spinosus* 2. *Vitex negundo, Terminalia chebula*
Sexually transmitted diseases (syphilis, gonorrhea)	1. *Terminalia arjuna, Anogeissus latifolia, Mucuna pruriens, Asparagus racemosus, Bombax ceiba, Phyllanthus emblica, Terminalia belerica, Terminalia chebula, Croton tiglium, Swertia chirata*	1. *Amaranthus spinosus*
Decrease of milk in lactating mothers	1. *Ipomoea mauritiana*	
Ear ache		1. *Plumbago zeylanica*
Oral lesions, lesions on the tongue		1. *Aerva lanata*
Fever		1. *Vitis trifolia, Vigna mungo*

Diseases exclusively treated by Kaviraj 1 included respiratory tract disorders (coughs, asthma), hypertension, chicken pox, anemia, acne, and helminthiasis. Diseases exclusively treated by Kaviraj 2 included snake bite, dog bite, cat bite, poisonous insect bite, erectile dysfunction, cuts, sprains, and decrease of milk in lactating mothers. Diseases exclusively treated by Kaviraj 3 included ear ache, oral lesions, lesions on the tongue, and fever. Thus it appears that while simultaneously practicing within any given range of population and thus facing the same population as patients, Kavirajes tend to specialize in treatment of certain diseases, and these diseases are not treated by other practicing Kavirajes of the area. Whether this is a choice, which is kind of mutually agreed upon by the practicing Kavirajes, or comes out of necessity (i.e. the formulation of one Kaviraj being so superior to other Kavirajes in treatment of any specific ailment, that patients with that ailment only visit the Kaviraj with the better formulation) is a matter of debate and needs to be further examined. Our interviews with the three Kavirajes indicated that it is possibly the latter, i.e. the formulation of a particular Kaviraj for any exclusively treated disease was much better than the other Kavirajes such as to give him or her advantage. The other thing mentioned by the Kavirajes as to the exclusiveness of the disease treated was that the Kaviraj was particularly knowledgeable in treatment for that disease and which knowledge was not possessed by the others, which again arrives at the afore-mentioned conclusion. Any extra bit of knowledge can only lead to preparation of a better formulation, which would be more appreciated by the patient. As such, exclusive knowledge leads to exclusive formulations, which in turn leads to exclusiveness in the disease(s) treated.

We did not find any satisfactory answer to the question as to why different plant species were used by the Kavirajes for treatment of any commonly treated ailment, even though the plant species used by the first Kaviraj for treatment was equally available to the second or third Kaviraj. The most that could be concluded that after obtaining knowledge of treatment with a particular plant (such knowledge can be obtained through passage from a previous generation or from books or through trial and error) or being successful in treatment with a specific plant species, the Kaviraj does not use other plants but keeps to the same plant or plant combination used by him or her successfully in the first place. Any alterations made, like multiple formulations used for treatment of the same ailment by the same Kaviraj, would be tried exclusively by the Kaviraj in the first place, and not gained through hearsay from other Kavirajes. In this point, it may be mentioned that the medicinal plants and formulations of any Kaviraj is a closely guarded secret and usually only passed from generation to generation within the family. The only exception is passage of this knowledge to a trusted disciple, who has served the Kaviraj as an apprentice for years or even decades. As a result, patients or others are not fully acquainted with the medicinal plant knowledge of the Kaviraj, and even if they visit other Kavirajes, can at the best, offer only rudimentary knowledge about the medicinal plants and formulations used by the first Kaviraj.

The inter- as well as intra-variability of the formulations of the Kavirajes (i.e. using different plants, plant parts or plant combinations for treatment of the same ailment or same general nature of ailment by the same or different Kaviraj) presents a fascinating opportunity to modern scientists. At the same time, the exclusiveness of treatment of at least certain ailments by different Kavirajes merit a careful and comprehensive survey of all folk medicinal practitioners of the country. Allopathic medicine can benefit greatly from such surveys. The modern scientist can benefit from the plethora of plants used by folk medicinal practitioners of Bangladesh for treatment of any specific disease. A number of diseases that are treated by folk medicinal practitioners (Kavirajes) cannot be treated with allopathic drugs. Moreover, some diseases treated with allopathic drugs cause serious side-effects. Even a common pain killer drug like paracetamol can cause hepatic damages as well as gastrointestinal upsets. Folk medicine offers new possibilities of fresh drug discoveries from the plant kingdom, which allopathic medicine can use to effect total cure or at least minimize serious side-effects.

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