



ORIGINAL ARTICLES

Use of inorganic substances in folk medicinal formulations: a case study of a folk medicinal practitioner in Tangail district, Bangladesh

Md. Ashrafi Haque, Mridul Kumer Shaha, Salah Uddin Ahmed, Rumana Akter, Hafizur Rahman, Sujan, Chakravotry, A.H.M. Nahid Imran, Md. Tarequl Islam, Rajendra Chandra Das, Mohammed Rahmatullah

Department of Pharmacy, University of Development Alternative, Dhanmondi, Dhaka-1205, Bangladesh

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ABSTRACT

Bangladesh has a number of traditional medicinal systems like homeopathy, Ayurveda, Unani and the folk medicinal system. The latter three systems mainly rely on medicinal plants in their various formulations for treatment of diverse ailments. Various Ayurvedic formulations contain inorganic substances like gold, silver, lead, mercury, arsenic, zinc, tin, copper and sulfur along with medicinal plants. It was the objective of the present study to determine whether folk medicinal practitioners also use inorganic substances in their formulations. Towards that a survey was carried out in Tangail district to learn more about the use of inorganic substances in folk medicinal formulations. One practitioner was observed to use elements like gold, mercury and sulfur in his formulations. The elements were used in combination to prepare an ingredient known as makardhwaj – a known Ayurvedic formulation. Makardhwaj was not prescribed singly but always in combination with medicinal plants. Altogether, the practitioner was observed to use 51 medicinal plants distributed into 32 families. These plants were used in 46 different formulations for treatment of a variety of diseases like jaundice, respiratory difficulties, rheumatism, stop bleeding from cuts and wounds, leucorrhea, debility, gastrointestinal disorders, fever, pain, urinary tract disorders, skin disorders, sexual disorders, oral and tongue lesions, infections, edema, menstrual disorders, cardiovascular disorders, helminthiasis, chicken pox, gonorrhoea, and progressive loss of eye sight. Makardhwaj was used in eight out of the 46 formulations. The preparation of makardhwaj appeared to be quite complicated in that pure gold, mercury and sulfur was blended for 6-7 hours every day over a period of 7 days followed by mixing with red flowers of *Bombax ceiba* tree, drying, and cooking in a glass flask for 24 hours. The use of makardhwaj suggests that at least some of the folk medicinal practitioner's formulations possess Ayurvedic influence, which is not surprising considering that both types of traditional medicinal practices have co-existed side-by-side in Bangladesh for centuries.

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

Introduction

Traditional medicinal systems exists side-by-side with allopathic medicine in almost every country of the world in the present age. Not only various indigenous communities, but also the mainstream community people of different countries are known to visit traditional medicinal practitioners, if not all the time, then at least at various periods of their existence for treatment of diverse ailments. It is a well known fact that traditional medicinal systems have been recognized by the World Health Organization (WHO), and that there is a resurgence of interest in such systems in modern scientists (Cotton, 1996). Bangladesh has several forms of traditional medicine, which includes homeopathy, Ayurveda, Unani, folk medicinal system, and home remedies. Among the various systems of traditional medicine in Bangladesh, Ayurveda, Unani, folk medicinal system and home remedies rely mostly on plant species as the major ingredient in medicinal formulations.

Besides medicinal plants, a number of Ayurvedic formulations are known to contain inorganic substances like mercury, arsenic, lead, zinc, tin, iron, sulfur and copper. Herbo-metallic Ayurvedic preparations can be bhasma (powder of a substance obtained by calcinations; mainly applied to metals and minerals), rasa-yoga (preparations containing minerals as main ingredients; the minerals may be mica, copper-pyrites, or elements

Corresponding Author: Dr. Mohammed Rahmatullah, Pro-Vice Chancellor, University of Development Alternative House No. 78, Road No. 11A (new) Dhanmondi R/A, Dhaka-1205 Bangladesh
Phone: 88-01715032621 Fax: 88-02-8157339
E-mail: rahamatm@hotmail.com

like gold, silver or copper), and rasa aushadhi (preparations containing metals and minerals). Since metals may be toxic in their native forms, classical Ayurveda describes methods for detoxification of both metals and minerals.

Over centuries, Ayurvedic and folk medicinal practitioners have existed side-by-side in Bangladesh. In fact practitioners of both disciplines are referred to in Bengali as Kavirajes or Vaidyas. We had been conducting extensive surveys on folk medicinal practices among Kavirajes in various regions of Bangladesh as well as indigenous community or tribal medicinal practitioners, whose medicinal practices may be considered as a variant of folk medicinal practices of the mainstream population (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 surveys thus far, the only inorganic substance that we have observed to be used by the Kavirajes was sulfur, which was used mainly as an additional ingredient in formulations containing medicinal plants for treatment of dermal infections. Since Ayurvedic formulations are thought to pre-date folk medicinal formulations, it was of interest to learn whether Ayurvedic formulations have influenced folk medicinal formulations in the use of inorganic substances in folk medicinal formulations. A preliminary survey was carried out in Tangail district of Bangladesh and it was learnt that one folk medicinal practitioner of Gachabari village in Tangail district uses inorganic substances in his medicinal formulations. Accordingly, a detailed interview of the practitioner was carried out to document both his usage of medicinal plants as well as his use of inorganic substances for treatment of different ailments.

Materials and Methods

The present survey was conducted at Gachabari village of Tangail district, which is located in the central-north region of Bangladesh. A preliminary survey conducted within the district revealed the presence of one folk medicinal practitioner or Kaviraj, who used inorganic elements in at least some of his medicinal formulations. Informed consent was initially obtained from the Kaviraj, Mr. Suvas Chandra Sarkar, by religion Hindu and aged 58 years to publish his name and his medicinal formulations nationally and internationally. The Kaviraj mentioned that he had been practicing for the last 25 years. The survey was conducted during 2011.

Interview of the Kaviraj was done with the help of a semi-structured questionnaire and the guided field-walk method of Martin (1995) and Maundu (1995). In this method, the Kaviraj took the interviewers on guided field-walks through regions (primarily forest regions and fallow lands) from where he collects his medicinal plants, pointed out the plants and described their uses. Detailed formulations were obtained in later evening sessions from the Kaviraj. Interviewers were conducted in the Bengali language, which was spoken by both Kaviraj as well as the interviewers. Plant specimens were photographed, collected and dried in situ, and then brought back for identification at the Bangladesh National Herbarium at Dhaka. Voucher specimens were deposited both at the Bangladesh National Herbarium and the Medicinal Plant Collection Wing of the University of Development Alternative.

Results and Discussion

It was observed that the Kaviraj mainly dispensed 46 formulations containing medicinal plant as the chief ingredient for treatment of a diverse variety of ailments, which included jaundice, respiratory difficulties, rheumatism, stop bleeding from cuts and wounds, leucorrhoea, debility, gastrointestinal disorders, fever, pain, urinary tract disorders, skin disorders, sexual disorders, oral and tongue lesions, infections, edema, menstrual disorders, cardiovascular disorders, helminthiasis, chicken pox, gonorrhoea, and progressive loss of eye sight. The results are shown in Table 1. Altogether 51 plant species distributed into 32 families were used in his formulations. The Fabaceae and the Zingiberaceae family contributed the largest number of plants with 4 plants each coming from these families. The results are shown in Table 2. The Euphorbiaceae family contributed 3 plant species.

Administration of various formulations was generally oral or topical depending on the ailment. For instance, juice from macerated young leaves and stems of *Ocimum tenuiflorum* was orally administered for treatment of mucus, coughs, and respiratory difficulties. On the other hand, gum of *Jatropha curcas* was topically applied for oral and tongue lesions. Preparations were observed to consist of plant parts from a single plant or more than one plant. Juice obtained from a combination of macerated leaves of *Ajuga macrosperma* and *Cynodon dactylon* was topically applied to stop bleeding from external cuts and wounds. As an example of more than one plant used in an orally administered formulation, juice obtained from leaves and underground tubers of *Trichosanthes cordata* was mixed with juice obtained from leaves of *Ocimum tenuiflorum* and orally administered as treatment for sudden fits of vomiting, fever, and headache.

The Kaviraj distinguished between oral administrations of fresh juice, syrup prepared from juice, and juice or syrup that has to be bottled. While making syrup, usually salt or water was added to fresh juice. Alternately, syrup would be prepared from a combination of juice obtained from plant parts of two different plants. As an

example of the first, salt was added to combined juices of *Trichosanthes cordata* leaves and tubers and *Ocimum tenuiflorum* leaves (see Serial No. 8, Table 1). As an example of the second, juice obtained from tubers of *Curculigo orchioides* was mixed with water to form syrup (see Serial No. 18, Table 1). The same applied to a mixture of crushed fruits or leaves of *Phyllanthus emblica* and crushed fruits of *Terminalia bellerica*, to which water was added to form syrup (see Serial No. 19, Table 1). On the other hand, the juice obtained from macerated leaves of *Centella asiatica* was mixed with water and orally administered when fresh (see Serial No. 30, table 1), but the Kaviraj did not refer to this formulation as syrup. Apparently, syrup referred to a mixture which was denser than simple juice or which would have additions of ingredients, e.g. salt. If any formulation was too dense to start with, water would be added to dilute it but since the resulting mix was still dense then it would be referred to as syrup. However, juice obtained from macerated leaves of *Coccinia grandis* was mixed with salt (see Serial No. 39, Table 1) for treatment of diarrhea or dysentery, and that mixture was not mentioned by the Kaviraj as syrup.

For several orally or topically administered formulations, the Kaviraj gave the formulations in a bottled form. Roots of *Cyperus difformis* were dried, powdered, soaked in water and bottled. The resultant mixture was orally administered as treatment of sutika badhok disease (Kaviraj term for wasting away of body following childbirth, see Serial No. 20, Table 1). Juice obtained from crushed leaves of *Heliotropium indicum* was mixed with cold water and bottled. Drops of the mixture were then applied to the eyes as treatment of conjunctivitis or burning sensations in eyes (see Serial No. 27, Table 1). The purposes for bottling could be either to allow phytochemical components present in plant parts to get more thoroughly mixed in water with time or to allow fermentation to occur while the mixture is stored in a bottle. It is to be noted here that fermentation is a major and necessary process in the preparations of arishtas (arishta or herbal wine being produced by fermenting a combination of herbs, plants, roots fruit and bark) in Ayurvedic medicine. As such, some formulations used by the Kaviraj seemed to possess Ayurvedic medicinal influences.

Ayurvedic influences could be seen in some of the Kaviraj's other formulations, notably the use of a classical Ayurvedic formulation, namely, makardhwaj. Makardhwaj is a preparation containing inorganic elements like mercury, arsenic, lead, zinc, tin, iron, sulfur and copper. Makardhwaj can be of many types depending on the use of different elements; however, one of the most important makardhwaj (red makardhwaj) involves the use of gold, mercury and sulfur in the ratio of 1:2:4 (Khedekar et al., 2011). This is precisely the type of makardhwaj observed to be used by the Kaviraj in the present survey. Makardhwaj was used by the Kaviraj in 8 out of his 46 formulations. In classical Ayurveda formulations, makardhwaj is used as a stimulant and vitalizer (Sinyorita et al., 2011) or with herbal juices and fruits for a variety of chronic ailments (Kumar et al., 2006). The Kaviraj did not use makardhwaj by itself; it was always used in combination with medicinal plants. The various ailments treated by the Kaviraj with these herbo-metallic formulations included jaundice, leucorrhea, debility, urinary or kidney problems, as an abortifacient, gastrointestinal problems, abnormal heart beats, and sexual diseases and disorders. Makardhwaj was observed by the Kaviraj to be used in pills (see Serial No. 1, Table 1), as well as in syrups (see Serial No. 5, Table 1). The use of makardhwaj in the Kaviraj's formulations strongly indicates Ayurvedic influences, which is not surprising considering that Ayurveda and folk medicinal system has co-existed in present Bangladesh for centuries.

There were several other interesting aspects in the present Kaviraj's treatments. The Kaviraj also prescribed medicinal plants for hunger (see Serial Nos. 12, 14 and 15). Whether the medicinal plant parts merely satiated the appetite or had further therapeutic values, was not mentioned by the Kaviraj. But since two of the plant parts were tubers of *Dioscorea esculenta* and *Dioscorea pentaphylla* and are known to be rich in carbohydrates and can act as substitute for potatoes, they possibly supplied the carbohydrate needs of a hungry person. Fruits of *Ziziphus rugosa* were also advised to be eaten by the Kaviraj during hunger. Since other edible fruits were not advised, the fruits of this plant may have therapeutic values or hunger-suppressing properties.

Besides medicinal plants and makardhwaj, two of the Kaviraj's formulations were interesting from the view point that the first contained bark of *Oroxylum indicum*, makardhwaj, yellow flowers, and soft feathers from the wings of a yellow bird (see Serial No. 1, Table 1) for treatment of jaundice. The second contained juice obtained from macerated flowers of *Pentapetes phoenicea* combined with oil obtained from the leech, *Hirudo medicinalis* for treatment of sexual disorders (see Serial No. 41, Table 1). Taken together, the present Kaviraj seemed to mix versatile elements in his formulations, which included medicinal plants or plant parts, parts or products obtained from birds and insects, as well as inorganic substances, which has not been observed in our previous surveys in other regions of Bangladesh with other Kavirajes. It is to be noted here that unlike most other Kavirajes surveyed by us thus far, the present Kaviraj also prescribed wearing of amulets and garlands containing plant parts (see Serial Nos. 32, 37 and 43). In another of his formulation, the Kaviraj did not use any medicinal plant at all. Instead, soil clinging to roots of *Semecarpus anacardium* was topically applied as treatment for skin infections (see Serial No. 10). It is possible that chemicals secreted by the roots themselves or insects or microorganisms clinging to the roots may possess anti-microbial properties for which this soil was used.

At least two of the present Kaviraj's formulations seemed to be based on the theory of "like cures like". Thus yellow flowers of *Oroxylum indicum* were used with soft feathers of a yellow bird (see Serial No. 1, Table 1) for

treatment of jaundice, a condition whose indications are yellowish coloration of the body and urine). Red flowers of *Hibiscus rosa sinensis* were used to treat prolonged menstruation, which can lead to heavy blood loss. Although flowers of this plant can be of many colors, only red flowers were used as signified by the local name mentioned by the Kaviraj as rokto joba, rokto in Bengali meaning blood or reddish color.

Table 1: Medicinal plants and other ingredients used by the folk medicinal practitioner of Gachabari village in Tangail district, Bangladesh.

Serial Number	Ailment with symptoms	Formulation	Local name of plants/ingredients used
1	Jaundice (symptoms: fever, loss of appetite, body ache, yellowish coloration of body, yellow color of urine).	Bark of <i>Oroxylum indicum</i> (L.) Vent. (Bignoniaceae) is macerated with yellow flowers of the same plant flowering in the Bengali month of Bhadra), soft feathers from wings of yellow bird, and makardhwaj*. Pills prepared from macerated mix is taken once daily for 7 days. If not cured, the dosage is continued for another 7 days.	<i>Oroxylum indicum</i> : Kanai dinga
2	Mucus, coughs, respiratory difficulties.	Juice obtained from macerated young leaves and stems, alternately young whole plants of <i>Ocimum tenuiflorum</i> L. (Lamiaceae) is mixed with honey. 1-2 teaspoonful of the mixture is administered orally thrice daily for 4-5 days.	<i>Ocimum tenuiflorum</i> : Kalo tulshi
3	Rheumatism, rheumatic pain in hands, legs and waist.	Stems of <i>Alocasia macrorrhizos</i> (L.) G. Don. (Araceae) are crushed to obtain juice. The juice is orally taken thrice every month. Dosage is 2-3 cups for adults and 2-3 teaspoonfuls for children. Alternately, stems are fried and taken as vegetable daily till cure. Note that the juice if it comes in contact with the body may cause itching. Fried stems when eaten can cause itching in throat.	<i>Alocasia macrorrhizos</i> : Fun kochu
4	Stop bleeding from external cuts and wounds, infected wounds.	Juice obtained from macerated leaves of <i>Ajuga macrosperma</i> Wall. ex Benth. (Lamiaceae) and <i>Cynodon dactylon</i> (L.) Pers. (Poaceae) is applied 4-5 times daily in the morning and evening to cuts, wounds and infections.	<i>Ajuga macrosperma</i> : Charan tulshi <i>Cynodon dactylon</i> : Durba ghas
5	Leucorrhoea (in women) (symptoms: weakness, loss of appetite, headache, whitish discharge in urine).	Syrup is prepared from juice obtained from macerated stems of <i>Achyranthes aspera</i> L. (Amaranthaceae) and makardhwaj. 1-2 teaspoonful of the syrup is taken twice daily for 7 days.	<i>Achyranthes aspera</i> : Udvut nangra
6	Debility, particularly in elderly persons	Tubers from 2-3 year old plants of <i>Butea monosperma</i> (Lam.) Taub. (Fabaceae) are dug out and dried in the sun. Pea-sized pills are made from powdered, dried tubers and makardhwaj. Pills are taken twice daily for 1 month.	<i>Butea monosperma</i> : Polash
7	Gastric troubles (symptoms: vomiting, loss of appetite, stomach ache).	Juice obtained from macerated leaves of <i>Mikania cordata</i> (Burm.f.) B. L. Robinson (Asteraceae) is mixed with sugar to form syrup. ½ teaspoonful or ¼ chatak of the syrup is taken twice daily for 1 month (chatak is a local measure approximating 62.5g).	<i>Mikania cordata</i> : Bideshi nou lota
8	Sudden fits of vomiting, fever, head ache.	Juice obtained from leaves and underground tubers of <i>Trichosanthes cordata</i> Roxb. (Cucurbitaceae) is mixed with a little salt and juice obtained from leaves of <i>Ocimum tenuiflorum</i> L. (Lamiaceae) to make syrup. ½ teaspoonful of the syrup is taken twice for 1 day only.	<i>Trichosanthes cordata</i> : Bhuin kumra <i>Ocimum tenuiflorum</i> : Kalo tulshi
9	Blood in urine, kidney stones (symptoms: weakness, lower abdominal pain, 1-2 drops of urine coming out only, burning sensations during urination).	Juice obtained from macerated stems of <i>Costus speciosus</i> (J. König.) Sm. (Costaceae) and roots of <i>Thespesia lampas</i> (Cav.) Dalz. ex Dalz. & Gibs. (Malvaceae) is mixed with makardhwaj to prepare syrup. 2-3 teaspoonfuls of the syrup is taken 2-3 times daily for 7 days.	<i>Costus speciosus</i> : Khewa <i>Thespesia lampas</i> : Matsyo guru
10	Ring worm, infections of the skin.	Soil clinging to the roots of <i>Semecarpus anacardium</i> L.f. (Anacardiaceae) is collected, dried and powdered. The powder is topically applied till cure.	<i>Semecarpus anacardium</i> : Behula
11	Sexual disorders (low density semen, erectile dysfunction, premature ejaculation).	Stems of <i>Abroma augusta</i> L.f. (Sterculiaceae) are soaked in water to form syrup. Alternately, stems of <i>Abroma augusta</i> are mixed with leaves or tubers of <i>Costus speciosus</i> , macerated to obtain juice and syrup prepared from juice. 1 cup of syrup is taken twice daily for 1 month.	<i>Abroma augusta</i> : Ulot kombol <i>Costus speciosus</i> : Khewa
12	Hunger.	Tubers of <i>Dioscorea esculenta</i> (Lour.) Burkill (Dioscoreaceae) are dug out, boiled and eaten.	<i>Dioscorea esculenta</i> : Gati alu
13	Substitute for milk of nursing mother.	Rhizomes of <i>Curcuma alismatifolia</i> Gangnep. (Zingiberaceae) are boiled in water and fed to infants whose nursing mothers lack enough milk. On boiling, the	<i>Curcuma alismatifolia</i> : Shothi bali

		decoction becomes of whitish coloration like milk.	
14	Hunger.	Tubers of <i>Dioscorea pentaphylla</i> L. (Dioscoreaceae) are dug from underneath the soil, boiled and eaten.	<i>Dioscorea pentaphylla</i> : Shou-ura alu
15	Hunger.	Fruits of <i>Ziziphus rugosa</i> Lam. (Rhamnaceae) are eaten.	<i>Ziziphus rugosa</i> : Anai gota
16	Abortifacient.	Bark of <i>Flacourtia indica</i> (Burm.f.) Merr. (Flacourtiaceae) is dried, powdered, mixed with makardhwaj and water to form syrup. 2 teaspoonful of the syrup is orally administered in the morning on an empty stomach one month earlier to when abortion is desired.	<i>Flacourtia indica</i> : Aura, Boinch
17	Dysentery (frequent stool, abdominal pain), flatulency, stomach ache, indigestion.	Barks of <i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn. (Combretaceae) and fruits of <i>Phyllanthus emblica</i> L. (Euphorbiaceae) are crushed and soaked in water for one day. 2 teaspoonfuls of the resulting syrup is taken thrice daily for 7 days.	<i>Terminalia arjuna</i> : Arjun <i>Phyllanthus emblica</i> : Aula gota gach
18	Sexual problems (erectile dysfunction, premature ejaculation).	Tubers of <i>Curculigo orchiooides</i> Gaertn. (Amaryllidaceae) are crushed to obtain juice, which is then mixed with water to form syrup. 2 teaspoonfuls of the syrup is taken twice daily for 10-12 days.	<i>Curculigo orchiooides</i> : Shokti bindu
19	Stomach disorders, flatulency, indigestion.	Fruits or leaves of <i>Phyllanthus emblica</i> L. (Euphorbiaceae) are crushed with fruits of <i>Terminalia belerica</i> (Gaertn.) Roxb. (Combretaceae) and mixed with water to form syrup. 2-3 teaspoonfuls of the syrup is taken thrice daily for 15 days.	<i>Phyllanthus emblica</i> : Aula gota gach <i>Terminalia belerica</i> : Bohera
20	Sutika badhok disease (symptoms: wasting away of body following childbirth).	Roots of <i>Cyperus difformis</i> L. (Cyperaceae) are dried, powdered and soaked in water and bottled in a clean bottle. 2-3 teaspoonfuls of the mixture is taken thrice daily for 15 days.	<i>Cyperus difformis</i> : Nengshi
21	Flatulency, stomach pain, indigestion.	Crushed fruits of <i>Terminalia belerica</i> (Gaertn.) Roxb. (Combretaceae) are mixed with makardhwaj and peasized pills made from the mixture. 1 pill is taken twice daily for 10-12 days. Alternately, juice obtained from crushed fruits is bottled. 2 teaspoonfuls of the juice is taken twice daily for 10-12 days.	<i>Terminalia belerica</i> : Bohera
22	Oral and tongue lesions.	Leaves and stems are cut from <i>Jatropha curcas</i> L. (Euphorbiaceae) and ensuing sap (gum) is collected. Alternately, a cut is made in the stem and the ensuing gum collected. The gum is applied to lesions for 30 minutes at a time once daily in the morning on an empty stomach. This is continued for 2-3 days. Note that this might cause itching in mouth or tongue.	<i>Jatropha curcas</i> : Shada kandar
23	Leg infections, especially between the fingers.	Leaves of <i>Mimosa pudica</i> L. (Fabaceae) are soaked in water. The water is slightly warmed and infected area washed with the water. Infected area is also soaked in the warm water for 10 minutes twice daily for 3-4 days.	<i>Mimosa pudica</i> : Laal lojjaboti
24	Vomiting, stomach pain, diarrhea.	Juice obtained from macerated leaves of <i>Artemisia nilagirica</i> (Clarke) Pamp. (Asteraceae) is mixed with water and bottled. 1 teaspoonful of the mixture is taken twice daily for 1 day.	<i>Artemisia nilagirica</i> : Nag duma
25	Head ache on one side of the head (generally occurs more in the morning and evening).	Crushed leaves or roots of <i>Cleome viscosa</i> L. (Capparaceae) are applied to head. Alternately, juice obtained from macerated leaves or roots is applied to painful areas.	<i>Cleome viscosa</i> : Aadh kopali
26	Edema or swellings in hands or legs.	8-10 leaves of <i>Justicia gendarussa</i> L. (Acanthaceae) are soaked in a little kerosene and warmed over a fire. The leaves are then slightly massaged over swollen areas once daily before going to sleep. This is continued till swellings subside.	<i>Justicia gendarussa</i> : Bish jhar
27	Conjunctivitis, burning sensations in eyes, to expedite delivery.	Juice obtained from crushed leaves of <i>Heliotropium indicum</i> L. (Boraginaceae) is mixed with cold water and bottled. 1 drop of the mixture is applied to eyes 2-3 times daily for 2-3 days for eye problems. Note that application of too much juice can cause blurriness. If child is not born on due time, then to expedite delivery, roots of <i>Heliotropium indicum</i> are mixed with roots of <i>Mimosa pudica</i> and tied to toes for 30 minutes. Note that in this case whole roots have to be used and not broken roots.	<i>Heliotropium indicum</i> : hati chora <i>Mimosa pudica</i> : Laal lojjaboti
28	Prolonged menstruation.	Flowers of <i>Hibiscus rosa sinensis</i> L. (Malvaceae) are plucked with one breath facing east. 2 teaspoonful of juice obtained from crushed flowers is orally administered 2-3 times daily for 3 days. Alternately, one handful of flowers of <i>Hibiscus rosa sinensis</i> and leaves of <i>Ajuga macrosperma</i> Wall. ex Benth. (Lamiaceae) is crushed to obtain juice. The juice is divided into three portions and	<i>Hibiscus rosa sinensis</i> : Rokto joba <i>Ajuga macrosperma</i> : Charan tulshi

		each portion is orally administered at 2 hour intervals.	
29	Abnormal heart beats, vomiting, seizures, trembling in hands and legs.	Rhizomes of <i>Curcuma caesia</i> Roxb. (Zingiberaceae) and <i>Curcuma amada</i> Roxb. (Zingiberaceae) are crushed, mixed with makardhwaj and pea-sized pills prepared from the mixture. 1 pill is taken 2-3 times daily for 10-12 days.	<i>Curcuma caesia</i> : Laal shoti <i>Curcuma amada</i> : Shada shoti
30	Stomach pain, swelling (edema) in hands or legs.	Juice prepared from macerated leaves of <i>Centella asiatica</i> (L.) Urb. (Umbelliferae) is mixed with water. 2 teaspoonfuls of the juice is administered orally 2-3 times daily for 2-3 days for stomach ache. For swellings, leaves are soaked in warm water and applied to swellings or massaged onto swellings.	<i>Centella asiatica</i> : Thankuni, Dhomanik
31	Oral or tongue lesions.	Stems and leaves of <i>Jatropha gossypifolia</i> L. (Euphorbiaceae) are cut off and the ensuing sap (gum) collected and immediately applied to lesions and kept there for 30 minutes. This is done once daily in the morning on an empty stomach for 2-3 days. Note that this may cause itching in mouth or tongue.	<i>Jatropha gossypifolia</i> : Laal kandar
32	Edema.	Stems of <i>Tinospora crispa</i> (L.) Hook.f. & Thoms. (Menispermaceae) and stems of <i>Parthenocissus quinquefolia</i> (L.) Planch. (Vitaceae) are made into garlands and tied around the waist for 7 days.	<i>Tinospora crispa</i> : Padma guloncho nou/lota <i>Parthenocissus quinquefolia</i> : Gonga shagor
33	Urinary and sexual problems in men (erectile dysfunction, premature ejaculation).	2 teaspoonfuls of juice obtained from macerated leaves of <i>Kalanchoe pinnata</i> (Lam.) Pers. (Crassulaceae) is taken with water twice daily for 7 days.	<i>Kalanchoe pinnata</i> : Pathorchura, Pathorkuchi
34	Toothache, helminthiasis, skin diseases, chicken pox.	Bark of <i>Azadirachta indica</i> A. Juss. (Meliaceae) is used for brushing teeth during toothache. Juice from macerated leaves of the plant is orally administered for helminthiasis (1 cup once daily for 3 days). Leaves are soaked in warm water and the water used for bathing as treatment for skin diseases. Macerated combination of leaf and bark is applied topically to pustules during chicken pox.	<i>Azadirachta indica</i> : Neem
35	Throat pain, hoarse voice, tonsil pain.	Juice obtained from crushed rhizomes of <i>Alpinia nigra</i> (Gaertn.) B. L. Burt. (Zingiberaceae) is mixed with water, slightly warmed, and bottled. 1 cup of the mixture is taken twice daily for 3-4 days. Alternately, juice mixed with slightly warm water is used for gargling for 3-4 days at night before sleep.	<i>Alpinia nigra</i> : Bau ada
36	Tooth ache.	Floral stalks of <i>Mangifera indica</i> L. (Anacardiaceae) are applied to painful tooth 2-3 times daily for 2-3 days. The stalks are to be used immediately following collection.	<i>Mangifera indica</i> : Aam
37	Jaundice.	Stems of <i>Cuscuta reflexa</i> Roxb. (Cuscutaceae) are worn around the neck as a garland for 15 days. The patient reportedly feels comfortable within 2-3 days.	<i>Cuscuta reflexa</i> : Alok lota
38	Gonorrhea, spermatorrhea, erectile dysfunction, premature ejaculation, frequent urination but 1-2 drops of urine coming out only each time.	Pea-sized pills are prepared from a combination of roots of <i>Asparagus racemosus</i> Willd. (Liliaceae), leaves of <i>Kalanchoe pinnata</i> (Lam.) Pers. (Crassulaceae) and makardhwaj. 1 pill is taken once daily for 15 days.	<i>Asparagus racemosus</i> : Shotomul <i>Kalanchoe pinnata</i> : Pathorchura
39	Diarrhea, dysentery.	Juice obtained from macerated leaves of <i>Coccinia grandis</i> (L.) J. Voigt (Cucurbitaceae) is mixed with salt. 2 teaspoonful of the mixture is taken once daily for 5-7 days.	<i>Coccinia grandis</i> : Telakochu
40	Excessive bleeding during menstruation.	Flowers of <i>Rosa damascena</i> Mill. (Rosaceae) are crushed with red flowers of <i>Hibiscus rosa sinensis</i> L. (Malvaceae) and seeds of <i>Pterocarpus santalinus</i> L.f. (Fabaceae) to obtain juice. 2 teaspoonfuls of the juice is taken twice daily for 7 days.	<i>Rosa damascena</i> : Laal golap <i>Hibiscus rosa sinensis</i> : Rokto joba <i>Pterocarpus santalinus</i> : Laal chondon
41	Sexual disorders.	Juice obtained from macerated flowers of <i>Pentapetes phoenicea</i> L. (Sterculiaceae) is mixed with oil obtained from leeches (<i>Hirudo medicinalis</i> L.) and massaged onto the penis or vaginal region twice daily for 7 days.	<i>Pentapetes phoenicea</i> : Dupur-eful
42	Progressive loss of eye sight.	1 teaspoonful of juice obtained from crushed flowers is taken once daily at night for 7 days.	<i>Mirabilis jalapa</i> : Shondhya ful
43	Protection from poisoning by other persons.	Roots of <i>Ruellia tuberosa</i> L. (Acanthaceae) are plucked in one breath on a Saturday or a Tuesday. The roots are put in an amulet and the amulet sealed with wax. If any food, especially water is suspected to be poisoned the amulet is placed before the food or water. Alternately, the amulet is worn around the waist continuously.	<i>Ruellia tuberosa</i> : Sham khet, Shampret gach

44	To stop bleeding from external cuts and wounds, minor infections.	Young leaves of <i>Cynodon dactylon</i> (L.) Pers. (Poaceae) are crushed with leaf stalks of <i>Piper betle</i> L. (Piperaceae) and dried sap of <i>Acacia catechu</i> (L.f.) Willd. (Fabaceae) and applied to wounds or infections.	<i>Cynodon dactylon</i> : Durba ghash <i>Piper betle</i> : Paan <i>Acacia catechu</i> : Khoyer
45	Decreased eyesight.	2-4 teaspoonfuls of juice obtained from crushed leaves of <i>Colocasia affinis</i> H. Li et Z.X. Wei (Araceae) is mixed with honey and taken orally twice daily for 30 days.	<i>Colocasia affinis</i> : Ojat kochu
46	Oral lesions.	Crushed leaves of <i>Leucas aspera</i> (Willd.) Link (Lamiaceae) are applied to lesions once daily for 7 days.	<i>Leucas aspera</i> : Chet nath gach

*Preparation of makardhwaj. Shudh (purified) Swarn (gold) pieces 4 Tola (1 tola approximates 11.6g) was blended with Shudh Parad (mercury) 8 Tola. Shudh Gandhak (sulfur) 16 Tola was regularly added in small quantities to the Swarn-Parad mixture and thoroughly blended for 6-7 hours every day over a period of 7 days to form Kajjali (quality of makardhwaj depended on the length of blending time). Kajjali was then treated with Karpas flower (red variety, flowers of *Bombax ceiba* L., family: Bombacaceae) juice 3 times. The mixture was dried and transferred to a Kaach-Kupi (glass flask). Kaach-Kupi was layered 7 times with cloth plastered with wet-mud/clay and the Kaach-Kupi was cooked for 24 hours. On cooling red-colored makardhwaj was obtained.

Table 2: Family-wise distribution of medicinal plants used by the folk medicinal practitioner of Gachabari village in Tangail district, Bangladesh.

Plant name	Plant Serial No.	Family	Family Serial No.
<i>Justicia gendarussa</i>	1	Acanthaceae	1
<i>Ruellia tuberosa</i>	2	Acanthaceae	1
<i>Achyranthes aspera</i>	3	Amaranthaceae	2
<i>Curculigo orchoides</i>	4	Amaryllidaceae	3
<i>Mangifera indica</i>	5	Anacardiaceae	4
<i>Semecarpus anacardium</i>	6	Anacardiaceae	4
<i>Alocasia macrorrhizos</i>	7	Araceae	5
<i>Colocasia affinis</i>	8	Araceae	5
<i>Artemisia nilagirica</i>	9	Asteraceae	6
<i>Mikania cordata</i>	10	Asteraceae	6
<i>Oroxylum indicum</i>	11	Bignoniaceae	7
<i>Heliotropium indicum</i>	12	Boraginaceae	8
<i>Cleome viscosa</i>	13	Capparaceae	9
<i>Terminalia arjuna</i>	14	Combretaceae	10
<i>Terminalia belerica</i>	15	Combretaceae	10
<i>Costus speciosus</i>	16	Costaceae	11
<i>Kalanchoe pinnata</i>	17	Crassulaceae	12
<i>Coccinia grandis</i>	18	Cucurbitaceae	13
<i>Trichosanthes cordata</i>	19	Cucurbitaceae	13
<i>Cuscuta reflexa</i>	20	Cuscutaceae	14
<i>Cyperus difformis</i>	21	Cyperaceae	15
<i>Dioscorea esculenta</i>	22	Dioscoreaceae	16
<i>Dioscorea pentaphylla</i>	23	Dioscoreaceae	16
<i>Jatropha curcas</i>	24	Euphorbiaceae	17
<i>Jatropha gossypifolia</i>	25	Euphorbiaceae	17
<i>Phyllanthus emblica</i>	26	Euphorbiaceae	17
<i>Acacia catechu</i>	27	Fabaceae	18
<i>Butea monosperma</i>	28	Fabaceae	18
<i>Mimosa pudica</i>	29	Fabaceae	18
<i>Pterocarpus santalinus</i>	30	Fabaceae	18
<i>Flacourtia indica</i>	31	Flacourtiaceae	19
<i>Ajuga macrosperma</i>	32	Lamiaceae	20
<i>Leucas aspera</i>	33	Lamiaceae	20
<i>Ocimum tenuiflorum</i>	34	Lamiaceae	20
<i>Asparagus racemosus</i>	35	Liliaceae	21
<i>Hibiscus rosa sinensis</i>	36	Malvaceae	22
<i>Thespesia lampas</i>	37	Malvaceae	22
<i>Azadirachta indica</i>	38	Meliaceae	23
<i>Tinospora crispa</i>	39	Menispermaceae	24
<i>Piper betle</i>	40	Piperaceae	25
<i>Cynodon dactylon</i>	41	Poaceae	26
<i>Ziziphus rugosa</i>	42	Rhamnaceae	27
<i>Rosa damascena</i>	43	Rosaceae	28
<i>Abroma augusta</i>	44	Sterculiaceae	29
<i>Pentapetes phoenicea</i>	45	Sterculiaceae	29
<i>Centella asiatica</i>	46	Umbelliferae	30
<i>Parthenocissus quinquefolia</i>	47	Vitaceae	31
<i>Alpinia nigra</i>	48	Zingiberaceae	32
<i>Curcuma alismatifolia</i>	49	Zingiberaceae	32
<i>Curcuma amada</i>	50	Zingiberaceae	32
<i>Curcuma caesia</i>	51	Zingiberaceae	32

Taken together, the present Kaviraj's formulations contained a number of novel aspects. Some of the formulations showed distinctive Ayurvedic influences, while other formulations consisted of using bird or insect products, and in one instance, merely soil clinging to a particular medicinal plant's roots. Although there exists a tendency to dismiss folk medicinal practices by a number of modern scientists and allopathic medicine practitioners, folk medicine takes a holistic approach to cure and scientific researches need to be conducted on a number of these folk medicinal treatments to verify their efficacy. In our previous reports we have on numerous occasions demonstrated that many of the use of medicinal plants by folk medicinal practitioners have been validated through modern scientific research. The present Kaviraj's formulations (at least some), is expected to be validated when proper scientific studies are conducted.

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