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ORIGINAL ARTICLES

A Survey of Medicinal Plants Used by Folk Medicinal Practitioners in Three Villages of Jessore District, Bangladesh

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ABSTRACT

Folk medicinal practitioners play a vital role in the health-care system of Bangladesh. They are known as Kavirajes and their patients include a substantial segment of both rural and urban populations of the country. They almost exclusively administer simple formulations of medicinal plants, which may be used singly or in combination, but which formulations are used for treatment of a diverse variety of ailments including a few that cannot be cured with modern allopathic medicine. Folk medicine is generally a family tradition and the knowledge is passed on from generation to generation. From centuries old practice, Kavirajes have therefore obtained a unique knowledge about medicinal plants of the country, which can prove beneficial to science in its quest for newer and more efficacious drugs. Almost every Kaviraj has his or her own unique repertoire of medicinal plants. To document this information in a comprehensive manner, it is therefore necessary to conduct surveys among the thousands of Kavirajes of the country. The objective of this present study was to conduct an ethnomedicinal survey among the Kavirajes of three villages in Jessore district of Bangladesh. Surveys were conducted with the help of a semi-structured questionnaire, open interviews and the guided field-walk method. It was observed that the Kavirajes of the three villages surveyed used 40 different plant species, which were distributed into 31 families. The Acanthaceae family contributed the maximum number of four plants followed by the Fabaceae family with three plants. Besides whole plants, various plant parts including leaves, roots, stems, barks, flowers, fruits, seeds, rhizomes and sap were used in the formulations. The various ailments treated by the Kavirajes included diabetes, leucorrhea, gastrointestinal disorders, hepatic disorders, snake bites, pain, menstrual problems, animal bites, eye disorders, cardiovascular disorders, bone fractures, respiratory tract disorders, poisoning, skin diseases, helminthiasis, and cuts and wounds. A number of modern drugs have been derived from the plant kingdom. As such, this information obtained from the Kavirajes can pave the way for further scientific studies and discovery of novel components from these medicinal plants, which in turn can lead to discovery of newer and better drugs.

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

Introduction

Folk medicinal system is one of the traditional systems of medicine practiced in Bangladesh and which has continued for centuries. The practitioners of folk medicine in Bangladesh are known as Kavirajes. Bangladesh has over 86,000 villages and practically every village has one or more practicing Kavirajes depending on the size of the village population. Kavirajes are also present in the towns and cities of the country. A large segment of the rural and urban population of Bangladesh relies on these Kavirajes to satisfy

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their primary health-care needs. This has been made possible because of the lack of proper medical facilities in the villages and towns as well as poor communication facilities between the various regions of the country and the two major cities of Dhaka and Chittagong, where modern medical facilities in the form of efficient doctors, clinics, and hospitals are primarily located. Since the Kavirajes almost exclusively administer medicinal plants in their formulations, which plants they gather from surrounding areas, their formulations are in general cheap and readily available. Combined with the familiarity that the Kavirajes have with the villagers because of residence in the same village, the population, particularly the rural population frequent the Kavirajes as their first, and often the last resort for treatment of both common as well as difficult to cure diseases.

The knowledge of medicinal plants gained by a Kaviraj throughout his or her years of practice is kept within the family and passed on from generation to generation. As a result, over centuries of cumulative and successive practices, the Kavirajes have gained considerable expertise on medicinal plants of the area. Their formulations are also simple, being merely decoctions, paste, or often using simply juice from whole plant or plant parts, which are administered orally or topically, depending on the disease. Over the centuries and with each passing generation, each Kaviraj has thus accumulated information on medicinal plants, which is unique. Since a number of modern medicines (e.g. quinine) owe their existence to being first isolated from medicinal plants, it is therefore important to gather information from practitioners, who have first-hand knowledge about these plants. Furthermore, to get comprehensive information on the medicinal plants of Bangladesh and their potential uses, it is important to gather data from as many Kavirajes as possible.

We have been conducting interviews and surveys of the Kavirajes of various regions of the country over the last few years. Our surveys have also included the medicinal practitioners of various tribes of the country. Notably, the tribal medicinal practitioners also depend primarily on medicinal plants for treatment. These surveys have resulted in documentation of a large number of plants used by the Kavirajes of the mainstream population as well as the tribal medicinal practitioners of the country (Nawaz *et al*., 2009; Rahmatullah *et al*., 2009a-c; Hossan *et al*., 2010; Mollik *et al*., 2010; Rahmatullah *et al*., 2010a-d; Jahan *et al*., 2011). However, large regions of the country along with their Kavirajes remain to be properly interviewed and their knowledge and use of medicinal plants remain to be documented. It was, therefore, the objective of the present study to conduct an ethnomedicinal survey among the Kavirajes of three villages of Jessore district, Bangladesh – an area where previously we have not conducted any surveys.

Materials and Methods

The survey area comprised of the villages of Fulbaria, Baguri, and Bagh-achra in Jessore district of Bangladesh. Each village had one practicing Kaviraj and all three Kavirajes, namely Md. Abdul Jabbar, Md. Icharuddin Mollah, and Mst. Rasheda Begum were interviewed during the present survey. While the first two Kavirajes were male, the last mentioned Kaviraj was female. In between themselves, the three Kavirajes had more than sixty five years of collective practicing experiences.

Informed consent was initially obtained from all the three Kavirajes. Consent was particularly obtained for dissemination of the obtained information in national or international scientific journals. Information was obtained through open interviews 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 on guided field-walks through areas from where they collected their medicinal plants, pointed out the plants, and described their uses. All plant specimens were photographed, collected and dried on the spot. Dried specimens were brought back to Dhaka for identification. Plant identification was done by Mr. Manjur-Ul-Kadir Mia, ex-Curator and Principal Scientific Officer of Bangladesh National Herbarium.

Interviews were conducted in Bengali, the language being spoken by both Kavirajes and the interviewers. Information was double-checked with the Kavirajes in later evening sessions. Interviews were also conducted of village residents randomly selected as to whether they visit the Kavirajes interviewed. The patients not only affirmed that they visit the Kavirajes whenever the need arose, but also expressed considerable satisfaction with the Kavirajes' treatment. They also mentioned that because of the efficacy of the Kavirajes' treatment, they visit the Kavirajes on a regular basis. No allopathic doctors were observed in the three villages surveyed.

Results and Discussion

Our survey indicated that the Kavirajes of the three villages surveyed used 40 plants distributed into 31 families for treatment of various ailments. The results are shown in Table 1. It was also observed that besides whole plants, virtually every plant part was used, albeit for different plants and for treatment of different ailments. The various plant parts used in the formulations included leaves, stems, roots, barks, flowers, fruits, seeds, rhizomes, and plant sap. The Acanthaceae family contributed the maximum number of four plants among the different families. This family was followed by the Fabaceae family with three plants.

Diabetes was one of the major diseases treated by the Kavirajes. This disease has no complete cure in allopathic medicine; the drugs used for treatment of diabetes merely alleviates the symptoms, particularly that of increased blood sugar. One of the treatments used by the Kavirajes was fairly complex in the sense that the formulation used plant parts from five plants, namely *Andrographis paniculata*, *Curculigo orchioides*, *Asteracantha longifolia*, *Ipomoea mauritiana*, and *Ficus hispida*. The Kavirajes of these three villages did not rely on clinical diagnostic procedures for diagnosis of diabetes, like measurement of random or fasting blood sugar or glucose clearance tests. Instead, they relied on the taste of a patient's urine, general signs of debility, and the frequency of urination for determining whether a patient was diabetic or not. Their treatment, although consisting of a formulation derived from five different plants, was fairly simple. Plant parts from the five plants were merely dried, powdered and advised to be taken daily in the morning with sugar or honey. There were two notable features in this treatment. The first was the use of sugar or honey along with plant parts. The use of sugar or honey by a diabetic patient would not be in accordance with modern medical practices for either substance would increase the blood sugar levels more and make diabetes treatment more complicated. Yet this is a practice that we have seen used by other Kavirajes in other areas for treatment of diabetes. While to some extent, the use of a sweetener like sugar or honey is to negate the taste of a highly bitter substance like leaves of *Andrographis paniculata*, sugar or honey seemed to be used by the Kavirajes to increase the blood sugar so that the plant parts can exert their effects. Although not tested scientifically, it is possible that increased sugar in the bloodstream may cause a positive inducement for the responsible anti-diabetic phytochemical(s) present in the plant parts to act possibly synergistically to lower blood sugar or to induce increased insulin secretion from the pancreas. It also remains to be tested scientifically, whether phytochemical(s) present in the five plant parts used can cause any regeneration of pancreatic beta cells, which are responsible for the secretion of insulin. The second interesting observation was that the same formulation was used for treatment of leucorrhea. Leucorrhea is a urinary disease, a major symptom of which is cloudiness of urine or whitish discharge in urine. From that view point, the Kavirajes appeared to treat diabetes more as a urinary disease than a metabolic disorder.

The same plant was seen to be used by the Kavirajes for treatment of diverse ailments; however, in these cases, the plant was used in a different set of combination with other plants for treatment. For instance, as mentioned earlier, the plant *Asteracantha longifolia* was used in combination with *Andrographis paniculata*, *Curculigo orchioides*, *Ipomoea mauritiana*, and *Ficus hispida* for treatment of diabetes and leucorrhea. However, for treatment of acidity or hepatic disorders, *Asteracantha longifolia* was used in combination with plant parts from *Aloe vera*, *Plantago ovata*, and *Sterculia urens*.

A similar multiple plant combination(s) was observed to be used by the Kavirajes for treatment of snake bites. For instance, for treatment of snake bites, in one formulation, the Kavirajes orally administered a mixture of macerated leaves of *Ecbolioum viride*, *Aristolochia indica*, and *Barringtonia racemosa*. In another formulation, the Kavirajes orally administered the juice of a *Euphorbia* species with the boiled fruits of another plant (local name johor, remains to be identified).

Common ailments like coughs or whooping coughs were usually treated with only one plant. Juice from macerated leaves of *Justicia adhatoda* was used for treatment of whooping coughs. The fruits of *Solanum torvum* were advised by the Kavirajes to be fried in oil and taken for whooping coughs. Even for severe coughs, the fruits of a single plant, namely *Acacia nilotica* was used. Occasionally, different parts from the same plant were used for treatment of different ailments. The fruits of *Acacia nilotica* were used for treatment of severe coughs, while the leaves were used for treatment of presence of mucus with watery stool, and flowers used for treatment of chicken pox. Notably, flowers were also advised by the Kavirajes to be taken during the particular time of year when chicken pox mostly occurs as a preventive measure against contracting the disease. Fruits were also advised to be taken for the same purpose. The leaves, also of a single plant, *Cassia sophera* was used for treatment of long-term coughs.

Table 1: Medicinal plants used by the Kavirajes of the three villages surveyed in Jessore district.

Serial Number	Scientific Name	Family Name	Local Name	Utilize Part	Ailment
1	*Andrographis paniculata* (Burm. F.) Wall. ex Nees	Acanthaceae	Kalomegh	Leaf	Diabetes, leucorrhea. Leaves of *Curculigo orchioides* are mixed with leaves of *Ipomoea mauritiana*, leaves of *Andrographis paniculata*, and fruits of *Ficus hispida* and seeds of *Asteracantha longifolia*. The whole mixture is dried, powdered and taken daily in the morning with sugar or honey in the form of sherbet.
2	*Asteracantha longifolia* (L.) Nees	Acanthaceae	Taal-makhna	Seed	Diabetes, leucorrhea. Leaves of *Curculigo orchioides* are mixed with leaves of *Ipomoea mauritiana*, leaves of *Andrographis paniculata*, and fruits of *Ficus hispida* and seeds of *Asteracantha longifolia*. The whole mixture is dried, powdered and taken daily in the morning with sugar or honey in the form of sherbet. Acidity, hepatic disorders. For acidity or hepatic disorders, pulp of *Aloe vera* is taken with isab-gul powder (powdered husks of seeds of *Plantago ovata*, also known as white or blonde psyllium), katila gum (gum from *Sterculia urens*) and seeds of *Asteracantha longifolia* in the form of a sherbet.
3	*Ecbolium viride* (Forsk.) Alston	Acanthaceae	Shib-jota	Leaf	Snake bite. Leaves of *Aristolochia indica* are combined with leaves of *Ecbolium viride* and *Barringtonia racemosa*, macerated and orally administered to snake -bitten person. Snake bite. Juice from macerated leaves is orally administered.

Table 1: Continue

4	*Justicia adhatoda* L.	Acanthaceae	Baksha	Leaf	Whooping cough persisting for a long time. Juice obtained from macerated leaves is orally administered for 2-3 days.
5	*Aloe vera* (L.) Burm.f.	Aloaceae	Ghritokumari	Soft pulp within leaf	Hair loss, calcium deficiency, reduced eyesight, acidity, hepatic disorders, to keep body cool. Pulp is made into musabbar (pulp is squeezed to obtain juice, which is then kept in a bag, where gelling occurs within 15 days, which is known as mussabar) and taken with sugar or honey for hair loss, calcium deficiency or reduced eyesight. For acidity or hepatic disorders, pulp of *Aloe vera* is taken with isab-gul powder (powdered husks of seeds of *Plantago ovata*, also known as white or blonde psyllium), katila gum (gum from *Sterculia urens*) and seeds of *Asteracantha longifolia* in the form of a sherbet. Juice from macerated leaves is taken as a sherbet to keep body cool. Pain in any part of the body. Pulp is squeezed to obtain juice, which is then kept in a bag, where gelling occurs within 15 days. This is known as mussabar. Mussabar is boiled in water and then applied as a paste to painful areas. Rheumatic pain, ordinary pain. Leaves, alternately whole plants of *Hemidesmus indicus* are mixed with leaves of Rokto-katari (unidentified), leaves of *Costus speciosus*, musabbar of *Aloe vera*, and oil from Gangetic river dolphin (*Platanista gangetica*) and then boiled with ghee (clarified butter) or mustard oil and then applied to areas affected with pain.
6	*Achyranthes aspera* L.	Amaranthaceae	Chichchiri	Leaf	Menstrual problems. Leaves of *Curculigo orchioides* are mixed with leaves of *Achyranthes aspera* and leaves of *Rauwolfia serpentina* and an unidentified metal called by the Kaviraj as 'kantilo'. The whole mixture is crushed, dried, powdered and taken in pill form (one pill every morning and evening).
7	*Curculigo orchioides* Gaertn.	Amaryllidaceae	Talchara	Leaf or part of plant above the surface of soil	Diabetes, leucorrhea. Leaves of *Curculigo orchioides* are mixed with leaves of *Ipomoea mauritiana*, leaves of *Andrographis paniculata*, and fruits of *Ficus hispida* and seeds of *Asteracantha longifolia*. The whole mixture is dried, powdered and taken daily in the morning with sugar or honey in the form of sherbet. Menstrual problems. Leaves of *Curculigo orchioides* are mixed with leaves of *Achyranthes aspera* and leaves of *Rauwolfia serpentina* and an unidentified metal called by the Kaviraj as 'kantilo'. The whole mixture is crushed, dried, powdered and taken in pill form (one pill every morning and evening).
8	*Hemidesmus indicus* R.Br.	Apocynaceae	Anontomool	Leaf, whole plant	Rheumatic pain, ordinary pain. Leaves, alternately whole plants of *Hemidesmus indicus* are mixed with leaves of Rokto-katari plant (unidentified), leaves of *Costus speciosus* and oil from Gangetic river dolphin (*Platanista gangetica*) and then boiled with ghee (clarified butter) or mustard oil and then applied to areas affected with pain.
9	*Rauwolfia serpentina* (L.) Benth.ex Kurz	Apocynaceae	Choto chondor	Leaf	Menstrual problems. Leaves of *Curculigo orchioides* are mixed with leaves of *Achyranthes aspera* and leaves of *Rauwolfia serpentina* and an unidentified metal called by the Kaviraj as 'kantilo'. The whole mixture is crushed, dried, powdered and taken in pill form (one pill every morning and evening).
10	*Aristolochia indica* L.	Aristolochiaceae	Choto ishe gach	Leaf	Snake bite. Leaves of *Aristolochia indica* are combined with leaves of *Ecbolium viride* and *Barringtonia racemosa*, macerated and the juice obtained orally administered to snake-bitten person. Poisonous infections on any part of the body. Initially, the infected area is washed with warm water. Following the wash, juice obtained from macerated leaves is applied to the infected part. This procedure is continued for a week.
11	*Calotropis gigantea* (L.) Ait.f.	Asclepiadaceae	Akondo	Sap	Cat or dog bite. Sap is applied to bitten area. At the same time, the patient is advised to take sap with ripe bananas.
12	*Mikania cordata* (Burm.f.) B. L. Robinson	Asteraceae	Jarmany lota	Leaf	Flatulence, stomach pain due to acidity. Juice from a combination of macerated leaves of *Costus speciosus* and *Mikania cordata* are taken for flatulence or stomach pain due to acidity. Blood dysentery. Juice obtained from squeezing 8-10 leaves is taken in a container and a hot iron rod put inside the juice. The juice is next orally administered following removal of the iron rod.
13	*Heliotropium indicum* L.	Boraginaceae	Hatishura	Leaf	Conjunctivitis (symptoms: redness in eye, watery eye, waste accumulating in eye corners). 1-2 drops of juice obtained from squeezed leaves is applied to eyes.
14	*Capparis zeylanica* L.	Capparaceae	Biral-achra	Leaf, root	Poisoning in body due to poisonous bites of any creature. Roots are macerated with black pepper or hot peppers, made into pills and orally administered. Alternately juice obtained from squeezed leaves is applied to bitten area.
15	*Terminalia arjuna* (Roxb. ex DC.). Wight & Arn	Combretaceae	Arjun	Bark	Cardiovascular disorders. Bark is soaked in a glass of water overnight. The following morning, the water is taken on an empty stomach. The preparation is considered to be good for protecting heart against any disorders, to keep heart in normal condition, as well as good for long-term patients with cardiovascular problems.
16	*Ipomoea mauritiana* Jacq.	Convolvulaceae	Bhui kumra	Leaf	Diabetes, leucorrhea. Leaves of *Curculigo orchioides* are mixed with leaves of *Ipomoea mauritiana*, leaves of *Andrographis paniculata*, and fruits of *Ficus hispida* and seeds of *Asteracantha longifolia*. The whole mixture is dried, powdered and taken daily in the morning with sugar or honey in the form of sherbet.
17	*Costus speciosus* (J. König.) Sm.	Costaceae	Kanara	Leaf	Diabetes, acidity. Leaves of *Costus speciosus* are chewed with one leaf of *Piper betle* to reduce sugar immediately during diabetes. Juice from of macerated leaves of *Costus speciosus* and *Mikania cordata* are taken for flatulence or stomach pain due to acidity. Rheumatic pain, ordinary pain. Leaves, alternately whole plants of *Hemidesmus indicus* are mixed with leaves of Rokto-katari (unidentified), leaves of *Costus speciosus*, musabbar of *Aloe vera*, and oil from Gangetic river dolphin (*Platanista gangetica*) and then boiled with ghee (clarified butter) or mustard oil and then applied to areas affected with pain.
18	*Kalanchoe pinnata* (Lam.) Pers.	Crassulaceae	Pathorkuchi	Leaf	Bone fracture, sprains. Whole plants of *Cissus quadrangularis* are mixed with *Cuscuta reflexa* plants and leaves of *Kalanchoe pinnata*, macerated, and applied as poultice to fractured or sprained area.
19	*Coccinia grandis* (L.) J. Voigt	Cucurbitaceae	Telakochu	Leaf	Severe headache. Juice from macerated leaves, when applied to head can cure any headache within 30 minutes according to the Kavirajes.
20	*Cuscuta reflexa* Roxb.	Cuscutaceae	Shorno lota	Whole plant	Bone fracture, sprains. Whole plants of *Cuscuta reflexa* are mixed with whole plants of *Cissus quadrangularis* and leaves of *Kalanchoe pinnata*, macerated and applied to fractured or sprained area.
21	*Emblica officinalis* Gaertn.	Euphorbiaceae	Amloki	Fruit	Allergy. One portion of leaves of *Azadirachta indica* is mixed with two portions of rhizomes of *Curcuma longa* and three portions of fruits of *Emblica officinalis*, dried and powdered, and taken every morning for allergy.

Table 1: Continue

22	*Euphorbia sp.*	Euphorbiaceae	Nag-naginir gach	Whole plant	Snake bite. Juice obtained from macerated whole plant of this *Euphorbia* sp. is mixed with fruits of johor (unidentified) plant (which has been boiled in water till it forms a molasses like substance) and administered orally to snake bite patients.
23	*Acacia nilotica* (L.) Delile	Fabaceae	Babla	Leaf, flower, fruit	Severe cough, mucus with watery stool, chicken pox. Fruits are powdered and mixed with a little sugar, mishri (crystalline sugar) or molasses and taken 2-3 times daily for 4-5 days for severe coughs. If mucus is present with coughs, that will also be cured. 4g young leaves is soaked in ½ poa (local measure approximating 125g = 2 chataks) water and then boiled in the same water till the volume is reduced to 1 chatak. The decoction is then taken with sugar or mishri twice daily for 3 days for treatment of mucus with watery stool. Chicken pox. Flowers or fruits are taken for treatment as well as prevention of chicken pox.
24	*Cassia sophera* L.	Fabaceae	Kal kaeshondae	Root, leaf	Constipation, symptoms of poisoning due to bad blood (blood purifier), coughs. Juice obtained from macerated leaves is taken in the morning on an empty stomach for relief of constipation. The same processes are also applied for purifying blood and get rid of poisoning symptoms due to bad blood. Juice obtained from macerated leaves is mixed with water and boiled till the volume is reduced by half. The mixture is then cooled and taken for relief of long-term coughs.
25	*Ocimum tenuiflorum* L.	Fabaceae	Radha tulshi	Leaf	Cold, mucus and fever in children. Juice from macerated leaves is orally administered to children for 2-3 days.
26	*Barringtonia racemosa* (L.) Roxb.	Lecythidaceae	Moha-shomudro	Leaf, root, bark	Skin diseases, helminthiasis, snake bite. Macerated bark is topically applied to skin for skin diseases. Macerated bark is taken with hookah (water pipe through which tobacco smoke is inhaled) water for 2-3 days for helminthiasis. Leaves or roots are macerated with black pepper and taken for snake bites. Snake bite. Leaves of *Aristolochia indica* are combined with leaves of *Ecbolium viride* and *Barringtonia racemosa*, macerated and orally administered to snake-bitten person.
27	*Lawsonia inermis* L.	Lythraceae	Mehedi	Root	Diabetes. Leaves of *Azadirachta indica* are mixed with leaves of potka (unidentified plant), and leaves of *Lawsonia inermis* and taken every morning on an empty stomach.
28	*Azadirachta indica* A. Juss.	Meliaceae	Neem	Leaf	Allergy. One portion of leaves of *Azadirachta indica* is mixed with two portions of rhizomes of *Curcuma longa* and three portions of fruits of *Emblica officinalis*, dried and powdered, and taken every morning for allergy. Diabetes. Leaves of *Azadirachta indica* are mixed with leaves of potka (unidentified plant), and leaves of *Lawsonia inermis* and taken every morning on an empty stomach.
29	*Ficus hispida* L.f.	Moraceae	Joggo dumur	Fruit	Diabetes, leucorrhea. Leaves of *Curculigo orchioides* are mixed with leaves of *Ipomoea mauritiana*, leaves of *Andrographis paniculata*, and fruits of *Ficus hispida* and seeds of *Asteracantha longifolia*. The whole mixture is dried, powdered and taken daily in the morning with sugar or honey in the form of sherbet.
30	*Musa sapientum* L.	Musaceae	Bicha kola	Base	To stop bleeding from cuts and wounds. If bleeding does not stop following cuts or wounds, the rotten base of the plant is applied to the place of bleeding.
31	*Piper betle* L.	Piperaceae	Paan	Leaf	Diabetes, acidity. Leaves of *Costus speciosus* are chewed with one leaf of *Piper betle* to reduce sugar immediately during diabetes.
32	*Piper longum* L.	Piperaceae	Pipul	Whole plant, leaf	Coughs, blood purifier (i.e. ability to cure any disease arising out from poisoning of blood). Juice from macerated whole plant or leaf is taken with honey daily in the morning for coughs. Alternately, leaves are fried oil and eaten. Juice from macerated leaves is taken with honey in the in morning for purifying blood.
33	*Plantago ovata* Forssk.	Plantaginaceae	Isabgul	Seed husk	Acidity, hepatic disorders. For acidity or hepatic disorders, pulp of *Aloe vera* is taken with isab-gul powder (powdered husks of seeds of *Plantago ovata*, also known as white or blonde psyllium), katila gum (gum from *Sterculia urens*) and seeds of *Asteracantha longifolia* in the form of a sherbet.
34	*Glycosmis pentaphylla* (Retz.) Corr.	Rutaceae	Aatshoti gach	Root	Jaundice. 100g juice obtained from macerated roots is taken with yoghurt. Skin infections, which are not easily cured. Leaves of *Glycosmis pentaphylla* are mixed with leaves of *Clerodendrum viscosum*, macerated and the juice obtained applied to skin infected area. The infection will be cured in 3 days.
35	*Scoparia dulcis* L.	Scrophulariaceae	Misri danar gach	Leaf, root	White dysentery (presence of mucus with stool), dysentery, any injury causing pain. Leaves or roots are to be chewed for 7-14 days on an empty stomach for dysentery or white dysentery. Crushed roots are applied for 7-14 days to painful areas.
36	*Solanum torvum* Swartz	Solanaceae	Tith baegun	Fruit	Whooping coughs. Small fruits are fried in oil and taken for a week.
37	*Sterculia urens* Roxb.	Sterculiaceae	Katila	Gum	Acidity, hepatic disorders. For acidity or hepatic disorders, pulp of *Aloe vera* is taken with isab-gul powder (powdered husks of seeds of *Plantago ovata*, also known as white or blonde psyllium), katila gum (gum from *Sterculia urens*) and seeds of *Asteracantha longifolia* in the form of a sherbet.
38	*Cissus quadrangularis* L.	Vitaceae	Har-bhanga	Whole plant	Bone fracture, sprains. Whole plants of *Cuscuta reflexa* are mixed with whole plants of *Cissus quadrangularis* and leaves of *Kalanchoe pinnata*, macerated and applied to fractured or sprained area.
39	*Cissus trifolia* (L.) K. Schum.	Vitaceae	Goale lota	Leaf	Bleeding from external cuts and wounds, snake bite. Crushed leaves are applied to cuts and wounds to stop bleeding. Juice obtained from macerated leaves is applied as soon as possible to snake bites.
40	*Curcuma longa* L.	Zingiberaceae	Holud	Portion of stem beneath the soil, rhizome	Allergy, helminthiasis in children. One portion of leaves of *Azadirachta indica* is mixed with two portions of rhizomes of *Curcuma longa* and three portions of fruits of *Emblica officinalis*, dried and powdered, and taken every morning for allergy. 15-20 drops of juice obtained from macerated rhizomes is orally administered to children every morning for helminthiasis. Adults can also benefit from this treatment. Sprain, injury. Crushed rhizome is applied with salt and lime to affected areas to reduce pain. This is done for 2-3 days. Allergy. One portion of leaves of *Azadirachta indica* is mixed with two portions of rhizomes of *Curcuma longa* and three portions of fruits of *Emblica officinalis*, dried and powdered, and taken every morning for allergy.

Interestingly, among all the formulations used by the Kavirajes, only one formulation contained an animal ingredient. Oil obtained from the Gangetic river dolphin, *Platanista gangetica* was used in combination with four different plant parts for treatment of both rheumatic pain as well as ordinary pain. One of the plants used in the above preparation, namely *Costus speciosus* had other uses also. Leaves of this plant were used in

combination with leaves of *Piper betle* for treatment of diabetes. Leaves of this plant were also used in combination with leaves of *Mikania cordata* for treatment of flatulence or stomach pain.

The available scientific literature suggests that a number of the plants used by the Kavirajes possess relevant pharmacological properties to justify their use. For instance, ethanolic extract of *Andrographis paniculata* has been shown to possess anti-diabetic property (Zhang and Tan, 2000). Notably, this plant is used by the Kavirajes in combination with other plants for treatment of diabetes. Two components isolated from the plant, namely andrographolide and 14-deoxy-11,12-didehydroandrographolide reportedly attenuated high glucose-induced fibrosis and apoptosis in murine renal mesangeal cell lines (Lee *et al*., 2010). The same also holds true for *Terminalia arjuna*, a plant used by the Kavirajes for treatment of cardiovascular disorders. Reported relevant effects in the scientific literature include: protective effects of plant bark against Doxorubicin-induced cardiotoxicity (Singh *et al*., 2008); significant inotropic and hypotensive effect of bark, also increases in coronary artery flow and protection of myocardium against ischemic damage, reviewed by Dwivedi (2007); protection of rabbit heart by bark against ischemic-reperfusion injury (Gauthaman *et al*., 2005); cardioprotective effect of alcoholic extract of bark in an *in vivo* model of myocardial ischemic-reperfusion injury (Karthikeyan *et al*., 2003); efficacy of the plant in chronic stable angina (Dwivedi and Gupta, 2002; Bharani *et al*., 2002); beneficial effects of bark of the plant in isolated ischemic-reperfused rat heart (Gauthaman *et al*., 2001); and beneficial effects in coronary artery disease (significant reductions in anginal frequency) (Dwivedi and Jauhari, 1997).

Documentation of traditional medicinal knowledge of various countries is important because such knowledge is fast disappearing because of changes in human lifestyle as a result of globalization and other factors. Plants have always formed an important component in scientific discoveries of novel lead compounds, which have always played a major role in the discovery of better allopathic drugs. Traditional medicinal practitioners, throughout their working with medicinal plants for centuries, possess first-hand as well as extensive knowledge on the properties of many medicinal plants. This knowledge can prove useful in saving of both time and money in conducting researches on the plant kingdom, for then scientists can begin with appropriate relevant experiments on a particular plant instead of blind experiments. The medicinal plants obtained in the present survey, can as such, prove useful for further scientific research towards discovery of newer and better medicines.

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