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Antidiabetic Plants and Formulations Used by Folk Medicinal Practitioners of Two Villages in Narail and Chuadanga Districts, Bangladesh

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ABSTRACT

Diabetes is a debilitating disease affecting millions of people worldwide including Bangladesh. Recent years have witnessed a significant rise of diabetes in both urban and rural areas of Bangladesh because of dietary habits and a more sedentary lifestyle. The disease has no known cure in modern allopathic medicine; in fact modern medicine merely attempts to control the symptoms of diabetes like increased blood sugar levels, and tries to mitigate the various other complicated problems that can arise out of diabetes like increased cardiovascular risks, diabetic retinopathy, diabetic neuropathy, and kidney failure, to name only a few. On the other hand, folk medicinal practitioners of Bangladesh have been treating diabetes for centuries and claim to have effective treatments for the disease as well as treatment for mitigating other symptoms arising from diabetes. The folk medicinal practitioners (known usually as Kavirajes) use both simple and complex formulations of medicinal plants for treatment of the disease. It was the objective of the present survey to conduct a survey among the Kavirajes of two randomly selected villages in Narail and Chuadanga districts, Bangladesh to collect information on medicinal plants and formulations used by the Kavirajes for treatment of diabetes. It was observed that the Kavirajes of the two villages surveyed used a total of 24 medicinal plants or plant parts for treatment. While some treatment formulations consisted of only a single medicinal plant, there were also complex formulations involving multiple plant parts. A perusal of the relevant scientific literature indicated that a number of the plants used by the Kavirajes for treatment of diabetes had been reported to possess antidiabetic properties. The plants reported in the present survey thus present considerable potential for further scientific research towards finding novel lead compounds for treatment of diabetes.

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

Introduction

Diabetes is a debilitating disease and a leading cause of premature morbidity and mortality in Bangladesh (Mahtab and Habib, 2009). Since the disease has no known modern allopathic cure, it requires life-long health care services to be provided to the patient, thus creating an enormous financial burden on the patient, family, as well as the Government. This financial burden, by itself, in particularly the low income people of developing countries, can cause the patient to forego life-supporting medical services, leading to more diabetes-induced complications and an untimely death. Diabetes-induced complications may include increased risks of development of hypertension, cardiovascular disorders, diabetic neuropathy, diabetic retinopathy, and kidney failure. Recent surveys have not only indicated that diabetes is prevalent in Bangladesh, but also incidences of diabetes are on the rise caused by changes in food habits and introduction of a more sedentary nature of lifestyle. This rise has been seen both in urban as well as in rural areas among all sections of the population.

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A sample of 2011 non-diabetic adults aged 20 and above in Bangladesh, studied for a five-year period, found that both loss and excessive gain of body mass index were risks for increased diabetes (Asghar *et al*., 2011). Another survey on presence of obesity (an influencing factor for causing diabetes) in affluent school children of Bangladesh found that the prevalence of obesity was 17.9% (Mohsin *et al*., 2010). The prevalence of type 2 diabetes was found to be 8.5% in a randomly selected subject group of 975 people of both sexes in an urbanizing rural community of Bangladesh (Rahman *et al*., 2007). The prevalence of impaired fasting glucose, impaired glucose tolerance, and diabetes were reported to be 1.3, 2.0 and 7.0%, respectively in a study conducted with 5000 randomly selected persons aged 20 years or more in a rural area of the country (Rahim *et al*., 2008).

In a further survey on 5265 participants aged 20 or older in an urban area of Bangladesh, the prevalence of type 2 diabetes was observed to be 11.2% overall (Sayeed *et al*., 2007). A rising prevalence of diabetes has been reported in a study conducted among the rural population of Bangladesh aged 20 years or more within the study period of several periods. While the prevalence of diabetes was 2.3% in 1999, it rose to 6.8% in 2004 (Rahim *et al*., 2007). Even in urbal slum population of Bangladesh (where obviously the people are poor and necessity forces them to adopt a non-sedentary lifestyle), the prevalence of type 2 diabetes has been found to be overall 8.1% in a study comprising of 1555 slum dwellers of Dhaka city (Rahim *et al*., 2004). Prevalence of type 2 diabetes and impaired fasting glycemia (6.6 and 8.5%, respectively) has also been reported also among the tribal population of Khagrachari Hill Tracts, who are generally known as hard-working and whose daily activities necessitates climbing up and down steep hill sides (Abu Sayeed *et al*., 2004).

Bangladesh has a long history of traditional medicine. A number of medicinal systems exist, which have been in practice for centuries. These include Ayurvedic, Unani, and the folk medicinal system. The latter is practiced by practitioners known as Kavirajes or Vaidyas. The Kavirajes practice a simplified form of medicine where medicinal plants or plant parts are used for treatment of diverse ailments. Normally, simple preparations of plants like decoctions or pastes are used, which are then administered either orally or topically. The knowledge of medicinal plants is closely guarded and kept within the family and passed on from generation to generation. Practically every village of the 86,000 villages of the country has one or two practicing Kavirajes. Kavirajes are also present in the cities. Bangladesh has also a number of tribes; tribal medicinal practitioners do not differ significantly from Kavirajes and their practice of medicine can also be classified as folk medicine. Since Kavirajes differ considerably in their formulations of medicinal plants for treatment of any specific ailment, and this difference exists even between adjoining villages or cities, it is therefore important to survey as many Kavirajes as possible to obtain a comprehensive view of the medicinal plants of the country and the various diseases that are treated with these plants. Such knowledge is important also from the scientific view point. Medicinal plants have long been a source for allopathic drugs, and interest in medicinal plants is at the moment on the increase because of the side-effects associated with a number of synthetic drugs, as well as the development of modern drug-resistant organisms.

Kavirajes claim to have medicinal plant formulations for treatment and cure of both diabetes and associated symptoms. It is of importance to collect such information because of the absence of any modern medicine for cure of diabetes. We had been conducting ethnomedicinal surveys among the Kavirajes and tribal medicinal practitioners for a number of years (Hossan *et al*., 2010; Mollik *et al*., 2010; Nawaz *et al*., 2009; Rahmatullah *et al*., 2009a-c; Rahmatullah *et al*., 2010a-d). Our surveys have indicated that local people have a strong belief in the practice of the Kavirajes, suggesting that the formulations used by the Kavirajes, are at least, to a certain extent effective. Our earlier surveys have further indicated that many of the medicinal plants used by the Kavirajes for treatment of any specific ailment have been vindicated by scientific findings (Anwar *et al*., 2010; Jahan *et al*., 2010; Mannan *et al*., 2010; Rahman *et al*., 2010; Rahmatullah *et al*., 2009d,e). The objective of the present study was to conduct a survey among the Kavirajes of two adjacent villages in Narail and Chuadanga districts, Bangladesh to find out about medicinal plants and formulations used by the Kavirajes of these two villages for treatment of diabetes and related complications.

Materials and Methods

The present survey was carried out in two adjoining villages, namely Rupganj village in Narail district, and Muktipara village of Chuadanga district of Bangladesh. Each village had one practicing Kaviraj. Informed consent was obtained from both Kavirajes prior to any interviews. After obtaining consent, interviews were conducted in the Bengali language, the language being spoken by both Kavirajes and the interviewers. Interviews were conducted with the help of a semi-structured questionnaire and a slight modification of the field-walk method of Martin (1995) and Maundu (1995). In this method, the Kavirajes were asked as to whether they treat diabetic patients, and when informed in the affirmative, the Kavirajes took the interviewers in guided field-walks to areas where they collected their medicinal plants for treatment of diabetic patients.

After showing the various plants used, the Kavirajes brought back the interviewers to their abode and described in details about mode of plant preparations, formulations, and dosages. Plant specimens were photographed, collected and dried and brought back later to Dhaka for identification. Plant identifications were done by Mr. Manjur-ul-Kadir Mia, ex-Curator and Principal Scientific Officer of the Bangladesh National Herbarium.

Results and discussion

The Kavirajes of the two villages surveyed used a total of 24 plants distributed into 20 families for treatment of diabetes and associated symptoms. The various formulations included whole plant, leaf, stem, bark, flower, seed, and tuber. While the Kaviraj who was interviewed at Rupganj village of Narail district had several antidiabetic formulations, his counterpart at Muktipara village of Chuadanga district had only one antidiabetic formulation. The Kavirajes did not use any modern blood sugar or other diagnostic tests for determination of whether a patient was diabetic or not. Their identification of a diabetic patient was based on several factors, namely as to whether the person suffered from frequent thirsts and urinations, whether the patient's urine had a sweet taste, and whether the patient complained of weakness and debility. The pallor of the skin was also among the factors toward determination of diabetes.

The Narail district Kaviraj used both simple and moderately complex formulations for treatment of diabetic patients. An example of a simple formulation was use of juice from macerated young stems of *Mikania cordata*, which was administered orally. An instance of a moderately complex formulation was the use of barks of *Mangifera indica*, *Syzygium cumini*, *Psidium guajava*, *Aegle marmelos*, and *Azadirachta indica*, which were boiled in water, and the liquid portion of the strained decoction orally administered. On the other hand, the sole antidiabetic formulation of the Kaviraj from Chuadanga district consisted of plant parts from nine different plants. It was further observed that for most formulations, the Kavirajes advised the preparations to be taken either on an empty stomach (i.e. before meals) or during the start of the meal, i.e. after a few mouthful of the meal has been taken. Besides specific formulations, it was further observed that the Narail Kaviraj advised the patients to take either cluster of flowers and inner portion of trunks of *Musa sapientum* or fruits of *Ficus hispida* in the cooked form as vegetables. The Narail Kaviraj did not base his different antidiabetic formulations on the severity of the disease; rather the determining factor behind the different formulations appeared to be the seasonal availability of the plants that were being administered. To avoid this difficulty of seasonal availability, the Chuadanga Kaviraj made his formulation during the time of the year when all ingredients (medicinal plants) were available and preserved the strained decoction in air-tight water bottles, and which were used throughout the year.

The Kavirajes did not advise any dietary restriction apart from one dietary formulation advised by the Chuadanga Kaviraj. In this instance, the dietary formulation consisted of four plants, which were to be taken in a cooked form with vegetables. 400g each of *Oryza sativa* (rice), *Triticum aestivum* (wheat), and *Vigna radiata* (a pulse) was to be mixed with 20g seeds of *Carum copticum* and the mixture thoroughly dried in the sun and powdered. 50g of the powder was advised to be mixed with 400g water and adequate amounts of seasonal vegetables and cooked. The diabetic patient was advised to eat this combination instead of the normal staple diet of rice. According to the Chuadanga Kaviraj, the above formulation helped the diabetic patient to maintain health and body strength better than when the patient is getting his main energy source from rice alone (notably the staple diet of Bangladeshis is rice, which depending on financial status is taken with vegetables, fish or meat). It is to be noted that since only 50g of the above formulation was advised to be taken by the diabetic patient by the Chuadanga Kaviraj, the net intake of carbohydrate will be low (both because of the low amount of rice and wheat – the main sources of carbohydrates in the above formulation), but also the patient will have adequate protein intake, because almost one-third of the above mix is composed of a pulse, which has high protein content. The net result of such a diet can be easily inferred to result in low blood sugar and loss of any obesity and as such ameliorate the complications of diabetes.

A perusal of the scientific literature demonstrated that a substantial number of the medicinal plants used by the two Kavirajes surveyed in the present study have been reported with antidiabetic properties. Briefly, just to cite recent scientific reports, antidiabetic properties including hypoglycemic effects, a-glucosidase inhibitory activities, or amelioration of diabetes-induced oxidative damages, as well as other properties, which can be beneficial during diabetes has been described for *Mangifera indica* (Zinjarde *et al*., 2011; Li *et al*., 2010); *Terminalia belerica* (Sabu and Kuttan, 2009); *Terminalia chebula* (Murali *et al*., 2007); *Coccinia grandis* (Zinjarde *et al*., 2011); *Momordica charantia* (Tripathi and Chandra, 2010); *Emblica officinalis* (Suryanarayana *et al*., 2007); *Tamarindus indica* (Maiti *et al*., 2005); *Azadirachta indica* (Bhat *et al*., 2009); *Tinospora cordifolia* (Reddy *et al*., 2009); *Psidium guajava* (Soman *et al*., 2010); *Syzygium cumini* (Bopp *et al*., 2009; Shinde *et al*., 2008); *Aegle marmelos* (Narendhirakannan and Subramanian, 2010); and *Solanum torvum* (Takahashi *et al*., 2010).

Table 1: Antidiabetic plants and formulations used by Kavirajes of two randomly surveyed villages of Narail and Chuadanga districts, Bangladesh.

Serial Number	Scientific Name	Family Name	Local Name	Utilize Part	Ailment with formulations and dosages
1	Mangifera indica L.	Anacardiaceae	Aam	Bark	Diabetes. Barks of Mangifera indica, Syzygium cumini, Psidium guajava, Aegle marmelos, and Azadirachta indica are taken (100g each) and sliced into small pieces. The pieces are then boiled in 1 liter of water till the volume is reduced to ½ liter. After cooling, the decoction is strained and the liquid part stored in an air-tight container. 2 tablespoonful of the liquid is taken in the morning and evening.
2	Cuminum cyminum L.	Apiaceae	Jeera	Seed cyminum)	and taken in the morning Diabetes. 10-12 leaves of Centella asiatica are macerated with a little salt and several cumin seeds (seeds of Cuminum while starting the breakfast.
3	Amorphophallus campanulatus Blume ex Decne	Araceae	Ol	Tuber	Diabetes. 100g tuber is boiled in water and made into a paste after addition of salt, pepper, and oil. The paste is taken 1-2 times daily.
4	Mikania cordata (Burm.f.) B. L. Robinson	Asteraceae	Jarmany lota	Top of young stem	Diabetes. Juice from macerated 5-6 top of young stems is taken every morning on an empty stomach.
5	Terminalia belerica (Gaertn.) Roxb.	Combretaceae	Bohera	Fruit	Diabetes. 100g whole plant of Swertia chirata are mixed with 100g each of top portions of stems of Tinospora cordifolia, fruit of Solanum torvum, fruit of Piper longum, fruit of Terminalia chebula, fruit of Terminalia belerica, and fruit of Emblica officinalis, 1 tola (local measure approximating 11.6g) fruit of Piper cubeba, and 50g fruit of Amomum aromaticum. The mixture is boiled in 2 liter water till the volume is reduced to ½ liter. The decoction is cooled, strained and the clear liquid is stored in an air-tight glass container. Two teaspoonfuls of the liquid are taken with three teaspoonfuls of water twice daily on an empty stomach. (Chuadanga)
6	Terminalia chebula Retz.	Combretaceae	Horitoki	Fruit	Diabetes. 100g whole plant of Swertia chirata are mixed with 100g each of top portions of stems of Tinospora cordifolia, fruit of Solanum torvum, fruit of Piper longum, fruit of Terminalia chebula, fruit of Terminalia belerica, and fruit of Emblica officinalis, 1 tola (local measure approximating 11.6g) fruit of Piper cubeba, and 50g fruit of Amomum aromaticum. The mixture is boiled in 2 liter water till the volume is reduced to ½ liter. The decoction is cooled, strained and the clear liquid is stored in an air-tight glass container. Two teaspoonfuls of the liquid are taken with three teaspoonfuls of water twice daily on an empty stomach. (Chuadanga)
7	Coccinia grandis (L.) J. Voigt	Cucurbitaceae	Telakochu	Top of young stem	Diabetes. Paste is prepared from macerated 5-6 top of young stems with the addition of a little salt. The paste is taken with warm rice at the beginning of a meal 1-2 times daily.
8	Momordica charantia L.	Cucurbitaceae	Korola	Fruit	Diabetes. Juice from a fairly large-size fruit is taken in the morning. Alternately, fruits are made into a paste and taken in the morning at the beginning of breakfast.

Table 1: Continue.

9	Emblica officinalis Gaertn.	Euphorbiaceae	Amloki	Fruit	Diabetes. 100g whole plant of Swertia chirata are mixed with 100g each of top portions of stems of Tinospora cordifolia, fruit of Solanum torvum, fruit of Piper longum, fruit of Terminalia chebula, fruit of Terminalia belerica, and fruit of Emblica officinalis, 1 tola (local measure approximating 11.6g) fruit of Piper cubeba, and 50g fruit of Amomum aromaticum. The mixture is boiled in 2 liter water till the volume is reduced to ½ liter. The decoction is cooled, strained and the clear liquid is stored in an air-tight glass container. Two teaspoonfuls of the liquid are taken with three teaspoonfuls of water twice daily on an empty stomach. (Chuadanga).
10	Tamarindus indica L.	Fabaceae	Tetul	Seed	Diabetes. Seeds are dried in the sun and then further dried over a fire carefully so that they do not get burnt. They are then powdered and kept in an air-tight glass container. 1-2 tablespoonful of the powder is soaked in 1 glass of water for ½ hour to 1 hour. They are next taken twice daily after meals.
11	Flacourtia indica (Burm.f.) Merr.	Flacourtiaceae	Buj, Bouchi fol	Leaf, fruit	Diabetes. ½ tablespoonful of juice obtained from macerated leaf or fruit is taken in the morning on an empty stomach.
12	Swertia chirata (Roxb. ex Fleming) H. Karst.	Gentianaceae	Chirota	Whole plant	Diabetes. 100g whole plant of Swertia chirata are mixed with 100g each of top portions of stems of Tinospora cordifolia, fruit of Solanum torvum, fruit of Piper longum, fruit of Terminalia chebula, fruit of Terminalia belerica, and fruit of Emblica officinalis, 1 tola (local measure approximating 11.6g) fruit of Piper cubeba, and 50g fruit of Amomum aromaticum. The mixture is boiled in 2 liter water till the volume is reduced to ½ liter. The decoction is cooled, strained and the clear liquid is stored in an air-tight glass container. Two teaspoonfuls of the liquid are taken with three teaspoonfuls of water twice daily on an empty stomach. (Chuadanga)
13	Azadirachta indica A. Juss.	Meliaceae	Neem	Bark	Diabetes. Barks of Mangifera indica, Syzygium cumini, Psidium guajava, Aegle marmelos, and Azadirachta indica are taken (100g each) and sliced into small pieces. The pieces are then boiled in 1 liter of water till the volume is reduced to ½ liter. After cooling, the decoction is strained and the liquid part stored in an air-tight container. 2 tablespoonful of the liquid is taken in the morning and evening.
14	Tinospora cordifolia (Willd.) Hook.f. and Thoms.	Menispermaceae	Guloncho	Top portion of stem	Diabetes. 100g whole plant of Swertia chirata are mixed with 100g each of top portions of stems of Tinospora cordifolia, fruit of Solanum torvum, fruit of Piper longum, fruit of Terminalia chebula, fruit of Terminalia belerica, and fruit of Emblica officinalis, 1 tola (local measure approximating 11.6g) fruit of Piper cubeba, and 50g fruit of Amomum aromaticum. The mixture is boiled in 2 liter water till the volume is reduced to ½ liter. The decoction is cooled, strained and the clear liquid is stored in an air-tight glass container. Two teaspoonfuls of the liquid are taken with three teaspoonfuls of water twice daily on an empty stomach. (Chuadanga).

Table 1: Continue.

15	Ficus hispida L.f.	Moraceae	Job dumur	Fruit	Diabetes. Fruits are dried and powdered. Two teaspoonfuls of dried and powdered fruit is taken with adequate amount of water in the morning and evening immediately after meals. Alternately, fruits are also taken in the cooked form as vegetable.
16	Musa sapientum L.	Musaceae	Kola	Cluster of flowers (locally known as mocha), inner portion of trunk (locally known as thore)	Diabetes. Mochas and thores are regularly eaten as vegetable in the cooked form.
17	Psidium guajava L.	Myrtaceae	Peyara	Bark	Diabetes. Barks of Mangifera indica, Syzygium cumini, Psidium guajava, Aegle marmelos, and Azadirachta indica are taken (100g each) and sliced into small pieces. The pieces are then boiled in 1 liter of water till the volume is reduced to ½ liter. After cooling, the decoction is strained and the liquid part stored in an air-tight container. 2 tablespoonful of the liquid is taken in the morning and evening.
18	Syzygium cumini (L.) Skeels	Myrtaceae	Jaam	Bark, seed	Diabetes. Barks of Mangifera indica, Syzygium cumini, Psidium guajava, Aegle marmelos, and Azadirachta indica are taken (100g each) and sliced into small pieces. The pieces are then boiled in 1 liter of water till the volume is reduced to ½ liter. After cooling, the decoction is strained and the liquid part stored in an air-tight container. 2 tablespoonful of the liquid is taken in the morning and evening. Diabetes. One tablespoonful of dried and powdered seeds are taken with adequate amounts of water in the morning on an empty stomach.
19	Piper cubeba L.f.	Piperaceae	Kabab chini	Fruit	Diabetes. 100g whole plant of Swertia chirata are mixed with 100g each of top portions of stems of Tinospora cordifolia, fruit of Solanum torvum, fruit of Piper longum, fruit of Terminalia chebula, fruit of Terminalia belerica, and fruit of Emblica officinalis, 1 tola (local measure approximating 11.6g) fruit of Piper cubeba, and 50g fruit of Amomum aromaticum. The mixture is boiled in 2 liter water till the volume is reduced to ½ liter. The decoction is cooled, strained and the clear liquid is stored in an air-tight glass container. Two teaspoonfuls of the liquid are taken with three teaspoonfuls of water twice daily on an empty stomach. (Chuadanga)
20	Piper longum L.	Piperaceae	Pipul	Fruit	Diabetes. 100g whole plant of Swertia chirata are mixed with 100g each of top portions of stems of Tinospora cordifolia, fruit of Solanum torvum, fruit of Piper longum, fruit of Terminalia chebula, fruit of Terminalia belerica, and fruit of Emblica officinalis, 1 tola (local measure approximating 11.6g) fruit of Piper cubeba, and 50g fruit of Amomum aromaticum. The mixture is boiled in 2 liter water till the volume is reduced to ½ liter. The decoction is cooled, strained and the clear liquid is stored in an air-tight glass container. Two teaspoonfuls of the liquid are taken with three teaspoonfuls of water twice daily on an empty stomach. (Chuadanga)

Table 1: Continue.

21	Aegle marmelos (L.) Corr.	Rutaceae	Bel	Fruit	Diabetes. Unripe fruit is sliced in thin pieces and dried thoroughly in the sun. The dried slices are then powdered. 2-3 tablespoonfuls of powder are mixed with water and taken 2-3 times daily after meals. Diabetes. Barks of Mangifera indica, Syzygium cumini, Psidium guajava, Aegle marmelos, and Azadirachta indica are taken (100g each) and sliced into small pieces. The pieces are then boiled in 1 liter of water till the volume is reduced to ½ liter. After cooling, the decoction is strained and the liquid part stored in an air-tight container. 2 tablespoonful of the liquid is taken in the morning and evening
22	Solanum torvum Swartz	Solanaceae	Tit baegun	Fruit	Diabetes. 100g whole plant of Swertia chirata are mixed with 100g each of top portions of stems of Tinospora cordifolia, fruit of Solanum torvum, fruit of Piper longum, fruit of Terminalia chebula, fruit of Terminalia belerica, and fruit of Emblica officinalis, 1 tola (local measure approximating 11.6g) fruit of Piper cubeba, and 50g fruit of Amomum aromaticum. The mixture is boiled in 2 liter water till the volume is reduced to ½ liter. The decoction is cooled, strained and the clear liquid is stored in an air-tight glass container. Two teaspoonfuls of the liquid are taken with three teaspoonfuls of water twice daily on an empty stomach. (Chuadanga).
23	Centella asiatica (L.) Urb.	Umbelliferae	Thankuni	Leaf	Diabetes. 10-12 leaves of Centella asiatica are macerated with a little salt and several cumin seeds (seeds of Cuminum cyminum) and taken in the morning while starting the breakfast.
24	Amomum aromaticum Roxb.	Zingiberaceae	Elach	Fruit	Diabetes. 100g whole plant of Swertia chirata are mixed with 100g each of top portions of stems of Tinospora cordifolia, fruit of Solanum torvum, fruit of Piper longum, fruit of Terminalia chebula, fruit of Terminalia belerica, and fruit of Emblica officinalis, 1 tola (local measure approximating 11.6g) fruit of Piper cubeba, and 50g fruit of Amomum aromaticum. The mixture is boiled in 2 liter. water till the volume is reduced to ½ liter. The decoction is cooled, strained and the clear liquid is stored in an air-tight glass container. Two teaspoonfuls of the liquid are taken with three teaspoonfuls of water twice daily on an empty stomach. (Chuadanga).

Note that under "Ailments with formulations and dosages" in the Table above, Chuadanga in parenthesis means that the formulation was collected from Kaviraj in Muktipara village, Chuadanga district, Bangladesh. The rest of the formulations and dosages were collected from Kaviraj in Rupganj village, Narail district, Bangladesh.

The above citations represent only a fraction of the reports available on the antidiabetic properties of plants used by the Kavirajes of Narail and Chuadanga districts for treatment of diabetes. A detailed pharmacological evaluation of the plants is under preparation. However, overall the antidiabetic reports present in the scientific literature points to two things; first, that the plants used by the Kavirajes are not serving merely as placebos but do indeed contain relevant antidiabetic properties, and second, a higher degree of scientific analysis of the antidiabetic properties of the plants in question have a strong potential of discovery of efficacious antidiabetic drugs, which can prove beneficial not only for the treatment of diabetes, but also for amelioration of diabetes-induced other complicating health factors.

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