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MEDICINAL PLANTS AND FORMULATIONS USED BY THE SOREN CLAN OF THE SANTAL TRIBE IN RAJSHAHI DISTRICT, BANGLADESH FOR TREATMENT OF VARIOUS AILMENTS

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Abstract

The Santals form the largest tribal community in northern Bangladesh reside primarily in Rajshahi and Rangpur Divisions, where they live in the districts of Rajshahi, Rangpur, Thakurgaon, Dinajpur, and Panchagarh. Although they are fast losing their traditional medicinal practices, they still have their own medicinal practitioners who rely mostly on medicinal plants for treatment of a variety of ailments. The traditional medicinal practices vary quite extensively between the twelve clans of the Santals. The objective of the present study was to conduct an ethnomedicinal survey amongst the Soren clan of the Santal community residing in two villages of Tanor Santal Para in Rajshahi district to collect information on their use of medicinal plants. Interviews were conducted of the two existing Santal traditional medicinal practitioners of the Soren clan with the help of a semi-structured questionnaire and using the guided field-walk method. Plant specimens as pointed out by the practitioners were collected and pressed on the field and identification completed at the Bangladesh National Herbarium. Information on 53 medicinal plants distributed into 32 families was obtained in this survey. Ailments treated by these plants included skin disorders, respiratory tract disorders, gastro-intestinal disorders, sexual dysfunctions, sexually transmitted diseases, diabetes, helminthiasis, pain, urinary problems, filariasis, leprosy, tuberculosis, epilepsy, snake bite, enlarged heart, and paralysis. The medicinal plants used by the Santals merit further scientific studies for some of their formulations are used to treat diseases like diabetes, paralysis, enlarged heart, tuberculosis, and filariasis for which modern medicine has no known cure or medicines have developed resistant vectors.

Key words: Asian medicine, CAM, ethnomedicine, alternative therapy

Introduction

Human beings have probably used medicinal plants for thousands of years for cure of their various ailments and still continue to do so (Sofowora, 1982; Hill, 1989). Indigenous communities, otherwise known as tribal people, aboriginal people, or original inhabitants exist in many countries of the world and have their own traditional medicinal practitioners, who rely on a holistic approach for treatment of ailments involving plant, animal or insect parts together with amulets and incantations. Although allopathic medicine is in vogue today, it remains a fact that many modern drugs owe their existence to observations of indigenous medicinal practices (Balick and Cox, 1996). Such drugs include aspirin, atropine, ephedrine, digoxin, morphine, quinine, reserpine and tubocurarine, to name only a few (Gilani and Rahman, 2005). Allopathic medicine cannot completely cure a number of diseases like diabetes, hypertension, or cardiovascular disorders. These diseases are increasingly affecting large sections of the population of the world because of changes in lifestyle, increased stresses of the modern age, and change in food habits. Still other diseases like malaria and tuberculosis have developed drug-resistant vectors. Traditional medicine and medicinal plants offer a prospect for discovery of new drugs with the potential of complete cure for these diseases. Indigenous communities, through their residing for thousands of years in forests or close proximity to forests have gathered extensive knowledge on medicinal plants and their properties. This knowledge can be searched out and can provide a more accessible means for scientific discovery of efficacious drugs than researching blindly on the about 250,000 floral species that are thought to exist in current times.

The Santals are one of the largest indigenous communities in Bangladesh. They are spread in the northern part of Bangladesh in Rajshahi and Rangpur Divisions and mainly concentrated in the districts of Rajshahi, Rangpur, Thakurgaon, Panchagarh and Dinajpur. Besides Bangladesh, large communities of Santals can be found in Bihar, Orissa and Chhota Nagpur of the neighboring country, India. They are considered to be descendants of the Austric-speaking Proto-Australoid race. In Bangladesh their estimated number is about 100,000. Santal people are animistic nature-worshippers although in recent years vast numbers are converting to Christianity. However, they have not given up their previous beliefs totally and still consider the Sun God or Sing Bonga as their principal deity. Their main diet consist of rice, fish and vegetables, which are supplemented with mollusks, crabs, and meat of turtles, pigs, cattle, wild cats and rabbits.

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Currently, the Santals are divided into eleven clans, namely Baske, Besra, Coré, Hamda, Hembrom, Kisku, Marndi, Murmu, Shona Pauria, Soren and Tudu, with a twelfth clan, namely the Bedea supposedly getting lost. Each Santal village has their own leader called the manjhi, who is supported by four assistants known as the jog manjhi, paranik, jog paranik, and godet. Since the community as a whole, and the clans in particular have widely spread in the northern districts, most Santals now reside in villages intermingled with the mainstream Bengali population and have adopted the Bengali language. However, some areas still contain pure Santal villages, often referred to in the Bengali language as Santal Para (Santal Area). The Santals, partly because of their tradition, and partly because they cannot afford allopathic doctors and allopathic medicines, still rely on their own traditional medicinal practitioners (some Santals call them ojhas) for treatment of their various ailments. Essentially, treatment of various ailments is done with medicinal plants.

We have previously reported Santal medicinal practices of Santals of Rangpur and Thakurgaon districts (Rahmatullah et al, 2009; Rahmatullah et al, 2010). During the course of these studies, it was observed that the use of medicinal plants varied extensively between traditional medicinal practitioners of various clans. The first report gave a composite picture of the traditional medicinal practices of all the clans within the study area, while the second dealt mostly with Santals belonging to the Murmu clan. It was felt that separate studies need to be conducted, which are clan-specific and so can contribute more to the understanding of the nature of clan-specific medicinal practices within Santal traditional medicine. The objective of the present study was therefore to conduct an ethnomedicinal survey among specifically the Soren clan of the Santals who resided in Tanor Santal Para of Kannapara and Mondumala villages of Rajshahi district in Bangladesh. An advantage of conducting an ethnomedicinal survey in the present study area was the exclusivity of the Soren clan, who resided in an area distinct not only from the mainstream Bengali-speaking population, but also from other Santal clans.

Materials and Methods

The present study was conducted among the Soren clan of the Santal tribe residing in two villages of Rajshahi district, namely Kannapara and Mondumala. Cumulatively, the two villages were called by the Bengali population as Tanor Santal Para, meaning that they were inhabited exclusively by the Santals. The two villages had a Santal population of around 2,000. The clan had two traditional medicinal practitioners. Typical of the clan system of naming among the Santals, the two traditional medicinal practitioners of the Soren clan were named Goyeswar Soren and Rabikeshta Soren. Informed consent was initially obtained from the practitioners as well as the clan Headman. The Santals could speak Bengali fluently, and interviews were conducted in Bengali with the help of a semi-structured questionnaire and the guided field-walk method of Martin (1995) and Maundu (1995). Briefly, in this method, the practitioners took the interviewers on guided field-walk through areas from where they collected their medicinal plants, pointed out the plants and described their uses. Formulation details were obtained from the practitioners in evening sessions. Plant specimens were collected on the spot, pressed and dried and brought back to the Bangladesh National Herbarium at Dhaka for identification. Help was also taken regarding identification of plants from Mr. Manzur-Ul-Kadir Mia, ex-Curator and Principal Scientific Officer of the Bangladesh National Herbarium.

Results

Plants and their distribution into families

The present survey showed that 53 plant species distributed in to 32 families were used by the Soren traditional healers. The results are shown in Table 1. The various plant families included the Acanthaceae, Acoraceae, Amaranthaceae, Amaryllidaceae, Anacardiaceae, Apocynaceae, Asteraceae, Bombacaceae, Boraginaceae, Cucurbitaceae, Cyperaceae, Euphorbiaceae, Fabaceae, Lamiaceae, Lauraceae, Liliaceae, Menispermaceae, Moraceae, Orchidaceae, Oxalidaceae, Passifloraceae, Piperaceae, Plantaginaceae, Plumbaginaceae, Rubiaceae, Rutaceae, Solanaceae, Sterculiaceae, Umbelliferae, Verbenaceae, Vitaceae, and the Zingiberaceae family. Not all plants were collected from the wild. *Piper betle* was cultivated both by the Sorens as well as adjoining village population for chewing its leaf with betel nut. *Zingiber officinale*, *Piper nigrum*, *Cinnamomum tamala*, *Cinnamomum verum*, and *Curcuma longa* are widely used in Bangladesh cuisine as spices and so were available in village markets. *Mangifera indica* is a widely cultivated tree in Bangladesh and its fruit, mango, enjoys substantial consumer demand while in season.

Plant parts used and mode of preparation

The various plant parts used in the formulations included whole plants, leaves, roots, stems, barks, flowers, fruits, seeds, rhizomes, and wood. Percent-wise, they represented, respectively, 3.4, 34.5, 29.3, 1.7, 3.4, 1.7, 10.3, 10.3, 3.4 and 1.7% of total uses. Applications of these plant parts were either oral or topical following specific formulations. The various formulations included maceration (to obtain juice), direct application or partaking of plant part, pills prepared from macerated and dried plant part, smoking of plant part, partaking of boiled or fried plant part(s), soaking of plant part in water followed by partaking of the water, and decoctions. Decoctions were usually made by boiling the plant part in water till the volume was reduced by half, followed by straining the water through a piece of thin cloth. The water was then further used. Frying of any plant part, if

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necessary, was done in ghee (sometimes mixed with sesame oil), ghee being clarified butter and prepared by boiling the butter till it attained a yellow color. The oily part was then separated from the residue at the bottom by straining through a piece of cloth. A

Table 1: Medicinal plants and formulations used for treatment of various ailments by the Soren clan of Santals of Rajshahi district, Bangladesh.

Serial Number	Ailment with symptoms	Formulation	Local name of ingredients used
1	Paralysis, rheumatic pain (pain may be accompanied with swellings)	Leaves of *Vanda tessellata* (Roxb.) G. Don (Orchidaceae) are macerated with ginger slices [rhizomes of *Zingiber officinale* Roscoe (Zingiberaceae)] and applied to affected areas. *Patients reported that application for a long time gives good results in paralysis and is satisfactory for rheumatic pain.	*Vanda tessellata*: Rashna *Zingiber officinale*: Ada
2	Abscess on breast (accompanied by pain, inflammation and pus formation), rheumatic pain, joint pain, pain in nails or corner of nails or any type of pain, asthma, helminthiasis, dog bite	For breast abscess, 4-5 leaves of *Datura metel* L. (Solanaceae) are macerated with 7 slices of rhizomes of *Zingiber officinale* Roscoe (Zingiberaceae) and applied to affected area. If there is only pain but no pus formation in the abscess, macerated leaves of *Datura metel* are applied to abscess with old ghee (clarified butter). For any type of pain, warm leaves are applied to painful areas to obtain instant relief. For asthma, dried and powdered leaves of *Datura metel* are wrapped in a leaf of *Justicia adhatoda* L. (Acanthaceae) and smoked like a cheroot. Alternately, leaves, flowers, fruits and roots of *Datura metel* are each taken in small portions and boiled. Smoke is inhaled while the parts are boiling. 2-3 drops of juice obtained from leaves of *Datura metel* is taken with milk from which butter has been churned out for helmintic infections. Roots of *Datura metel* are taken with raw milk every morning following breakfast for 3 days if a person is dog-bitten.	*Datura metel*: Konok dhutura *Zingiber officinale*: Ada *Justicia adhatoda*: Bashok
3	Snake bite	The snake-bitten patient is orally administered macerated leaves of *Premna integrifolia* L. (Verbenaceae) along with black peppers. At the same time macerated roots of the plant are applied to the bitten area.	*Premna integrifolia*: Goinal gach
4	Asthma, respiratory difficulties, chest pain due to cold, helminthiasis	For asthma and respiratory difficulties 4 tolas (1 tola = 12.5g) of powdered root of *Clerodendrum indicum* (L.) Kuntze (Lamiaceae) is mixed with honey and taken during night time. For chest pain due to cold, 3g of bark of fresh root or 2g of dried root is taken with warm water. For helminthiasis, 2g fresh root is macerated with 3-4 leaves. Pills prepared from the macerated mix are dried. 1-3 pills are taken as needed. *Patient report is that the formulation works very well for asthma and respiratory difficulties.	*Clerodendrum indicum*: Bamun hati
5	Burning sensations in hands or legs, **otishar** (Soren practitioner's term for dysentery, symptoms including black stool, blood with stool, thirst, fever, vomiting tendency, stomach pain)	Whole plants of *Oldenlandia corymbosa* L. (Rubiaceae) are soaked in water; the plants are then boiled in 4 cups of water. When the volume is reduced to 2 cups the water is strained through a piece of cloth and divided into two equal portions. One portion is to be taken in the morning, the other in the evening as treatment for burning sensations in hands or legs. For otishar, whole plants are macerated and taken orally.	*Oldenlandia corymbosa*: Koboch, Khet papra
6	Passing of semen with	For gonorrhea, 8-12 ml of juice obtained from fresh	*Tinospora cordifolia*: Guloncho

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	urine, leucorrhea, helminthiasis, gonorrhea, respiratory difficulties	stems of *Tinospora cordifolia* (Willd.) Hook.f. & Thoms. (Menispermaceae) is mixed with boiled cow milk or with cold water and taken in the morning, afternoon and evening. For respiratory difficulties, juice obtained from fresh stems of *Tinospora cordifolia* is mixed with juice obtained from leaves of *Justicia adhatoda* L. (Acanthaceae) and *Ocimum tenuiflorum* L. (Lamiaceae) and taken. For passing of semen with urine or leucorrhea, juice obtained from leaves and young stems of *Tinospora cordifolia* is mixed with a little powdered turmeric [dried, powdered rhizome of *Curcuma longa* L. (Zingiberaceae)] and taken in the morning on an empty stomach. *Patient report is that formulation is especially good and widely taken for passing of semen with urine and leucorrhea.	*Justicia adhatoda*: Bashok, Harboksh *Ocimum tenuiflorum*: Shada tulshi *Curcuma longa*: Holud
7	Helminthiasis, deafness due to old age	For helminthiasis, seeds of *Centratherum anthelminticum* (L.) Kuntze ex Gamble (Asteraceae) are slightly powdered and taken. For deafness, powdered seeds of *Centratherum anthelminticum* are taken with leaves of *Curculigo orchioides* Gaertn. (Amaryllidaceae) in the morning on an empty stomach.	*Centratherum anthelminticum*: Somraaj *Curculigo orchioides*: talmul
8	Passing of semen with urine (called **meho** by Santal practitioners)	2g bark of *Euphorbia neriifolia* L. (Euphorbiaceae) is macerated with 4 leaves of *Piper betle* L. (Piperaceae) and taken during evening or at night before falling asleep.	*Euphorbia neriifolia*: Tejbol *Piper betle*: Paan
9	Typhoid, snake bite	4-5 leaves of *Acorus calamus* L. (Acoraceae) are macerated and taken for typhoid. 2.5g of roots of the plant are mixed with 4-5 black peppers, macerated and orally administered to snake-bitten patients. *Note that if the patient is suffering from respiratory difficulties because of snake venom, the difficulty is corrected.	*Acorus calamus*: Boch
10	Abscess, diabetes, lack of appetite, vomiting tendency due to poisoning	2-3 teaspoonful of juice obtained from crushed leaves and roots of *Coccinia grandis* (L.) J. Voigt (Cucurbitaceae) is slightly warmed and taken for diabetes. For lack of appetite, especially due to fever or mucus, leaves are boiled and then fried in ghee (clarified butter) and eaten. 5-6 tablespoonful of juice obtained from leaves is administered to patients who are vomiting due to effects of poisoning. Macerated leaves are applied as poultice to abscesses.	*Coccinia grandis*: Telakucha
11	Chicken pox, typhoid, influenza (symptoms: fever, mucus, body ache, tremor, dry cough)	Roots of *Solanum barbisetum* Nees (Solanaceae) are soaked in water. The water is taken twice daily in the morning and evening for chicken pox. Leaves of *Solanum barbisetum* are boiled in water. The water is strained and taken daily for typhoid. For influenza, leaves (about 6 annas amount; 16 annas = 1 ser = about 1 kg) and equal amount of stems of *Solanum barbisetum* are mixed with 12 black peppers [fruits of *Piper nigrum* L. (Piperaceae)], 12 bay leaves [leaves of *Cinnamomum tamala* (Buch.-Ham.) Nees & Eberm., (Lauraceae)], 2 fruits of *Piper longum* L., 1 chatak (1 chatak = 1 anna) rock salt, a little amount of powdered dried bark of *Cinnamomum verum* J.Presl. (Lauraceae) and 2 tolas (80 tolas = approximately 1 kg) of mishri (crystalline sugar) and boiled in ½ ser water in an earthen pot. When the water volume is reduced to ½ poa (4 poas = 1 ser), the decoction is cooled and the water strained through a piece of cloth. The water is then orally administered to influenza patients.	*Solanum barbisetum*: Kontikari *Piper nigrum*: Gol morich *Cinnamomum tamala*: Tejpata *Piper longum*: Pipul *Cinnamomum verum*: Daruchini

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12	Helminthiasis, piles (hemorrhoids), dysentery	For helminthiasis, one anna (1 anna = 62.5g) amount of powdered seeds of *Holarrhena pubescens* Wall. ex G. Don (Apocynaceae) is taken with cold water every morning. For piles, 2/3 anna amount of powdered bark is mixed with honey and taken. For dysentery, whole seeds are boiled in water and the water strained through a piece of cloth and then taken. *Patient report: good results for piles and dysentery.	*Holarrhena pubescens*: Indrojob, Kurchi (usually the seeds are called kurchi)
13	Filariasis, sexual dysfunction in men, night blindness	For sexual dysfunction in men 50 ml of juice obtained from leaves of *Asparagus racemosus* Willd. (Liliaceae) is put in a steel container, 100 ml ghee (clarified butter) is added and the mixture is boiled over a flame followed by cooling. The decoction is then taken with ½ cup slightly warm cow milk in the morning and evening. Alternately, 1g of powdered roots is taken with sugar. For night blindness, young leaves are fried in a little ghee and taken every morning. For filariasis, 2 teaspoonful of leaf juice is mixed with sugarcane molasses and taken with water in the form of a sherbet.	*Asparagus racemosus*: Shotabori
14	Underweight	2g of seeds of *Hyptis suaveolens* (L.) Poit. (Lamiaceae) are soaked in water with mishri (crystalline sugar) for a whole day and then taken.	*Hyptis suaveolens*: Tokma
15	**Pitto jor** (symptoms: burning sensations in the body, redness in eyes, long-term fever with vomiting), rheumatic pain, waist pain	3 tablespoonful of juice obtained from macerated leaves of *Nyctanthes arbor-tristis* L. (Verbenaceae) are taken daily for pitto jor. 15-20 leaves are boiled in water followed by drinking of the water for rheumatic pain and waist pain.	*Nyctanthes arbor-tristis*: Sheuli
16	Paralysis of any organ of the body	2.5g roots of *Passiflora incarnata* L. (Passifloraceae) is macerated with black peppers and applied as poultice to paralyzed part.	*Passiflora incarnata*: Jhumkar gach
17	Helminthiasis, colic pain, flatulence, enlarged heart	2g pulp from seeds of *Benincasa hispida* (Thunb.) Cogn. (Cucurbitaceae) is macerated and taken in the morning with water on an empty stomach for helminthiasis. Pulp of seeds is dried and burnt and taken with warm water for colic pain. Juice obtained from squeezed fruit is massaged for 10-15 minutes in the stomach area for flatulence. Ripe fruits are cooked as halwa (a cooked dish of Bangladesh) with goat milk and taken for enlarged heart conditions.	*Benincasa hispida*: Chal kumra
18	Constipation, coughs	Juice obtained from macerated leaves of *Cassia sophera* L. (Fabaceae) is taken regularly with cold water for constipation. Leaves and stems are boiled in water. The water is strained through a piece of cloth and taken for coughs.	*Cassia sophera*: Kalo kashunde
19	Abscess, stoppage of urination, insect bite, snake bite, excessive bleeding during menstruation	Leaves of *Vitis trifolia* L. (Vitaceae) are crushed and applied to the sides of the abscess. Leaves exude a gum or saliva like substance, which helps in cure of the abscess. 40-50g roots are boiled in water till the volume is reduced by half. The water is then strained through a piece of clean and thin cloth. 1 tablespoon ghee (clarified butter) and 1 tablespoon sesame oil is added, and the mixture boiled. Cold cow milk is then added to the decoction. The decoction is then taken for stoppage of urination. Juice obtained from macerated leaves is applied to insect bites. Juice from macerated leaves is immediately applied to snake bites. Juice obtained from macerated roots is taken with cold water and cow milk twice daily for excessive bleeding during menstruation.	*Vitis trifolia*: Goale lota, Gai goala
20	Skin diseases, fever,	For treatment of skin diseases the roots of *Nerium*	*Nerium indicum*: Korobi

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	abortifacient	*indicum* Mill. (Apocynaceae) are lightly fried in sesame oil or coconut oil and then applied to affected parts of the skin. A little amount of bark is taken with honey during high fever. 1g powdered root is taken with cold water to induce abortion. *Note that roots are extremely poisonous and should be taken only in small amounts. Following taking of roots, 2 tablespoonful of ghee (clarified butter) is taken to negate the effect of root poisons.	
21	Epilepsy, gonorrhea, dry coughs	For epilepsy, 4 teaspoonful of juice obtained from fresh leaves of *Sesbania grandiflora* (L.) Pers. (Fabaceae) is taken with powdered black peppers twice daily for 15-20 days. For gonorrhea, oil obtained from whole plant is applied to the penis. For dry coughs, 2-3 flowers are fried in ghee (clarified butter) and taken.	*Sesbania grandiflora*: Bock phool
22	Infertility in women, tooth diseases, infections	For infertility, 1g root of *Glycosmis pentaphylla* (Retz.) Corr. (Rutaceae) is macerated with 7 and quarter cloves of garlic and 7 black peppers. Pills made from the macerated mix are taken thrice daily. For tooth diseases like toothache, stems are used for brushing teeth. For infections, roots are macerated with a small amount of hot peppers and coconut oil and applied.	*Glycosmis pentaphylla*: Aatimora
23	Low density of semen, abscess, infections of skin	For low density of semen, leaves of *Stephania japonica* (Thunb.) Miers (Menispermaceae) are squeezed in water. As a result a dense gum-like juice comes out which is taken. Leaves are rubbed on abscesses or skin infections.	*Stephania japonica*: Fote pata, Datashi
24	Abscess, dysentery	Roots of *Streblus asper* Lour. (Moraceae) are macerated in a small amount of water and applied to abscess. 3 teaspoonful of juice obtained from macerated bark is taken thrice daily for dysentery.	*Streblus asper*: Shaora
25	Abortifacient, leprosy, paralysis	Thoroughly macerated bark of roots of *Plumbago indica* L. (Plumbaginaceae) is applied to the opening of the vagina to induce abortion. Note that since the bark of root is very poisonous, a small amount of the bark is used. Macerated roots are applied to areas of the body affected by leprosy. 20g of roots are macerated, mixed with mustard oil and applied to paralyzed area twice daily.	*Plumbago indica*: Rokto chita
26	Antidote to poisoning from ingestion of *Datura metel* or *Datura stramonium* plant parts, piles, abscess/infections	To serve as antidote to poisoning from *Datura metel* or *Datura stramonium* plant parts, fresh leaves of *Oxalis corniculata* L. (Oxalidaceae) are collected and juice obtained through maceration. 30 ml of the juice is given to patients, followed by another 30 ml after 3-4 hours. If the patient is unconscious, the procedure is done following regaining consciousness. For piles, leaves are thoroughly fried in an iron pan with sesame oil and ghee (clarified butter) and fed to patients along with the thick layer that forms on sour yogurt. *Note that till cure, eating of beef is not advised. For any abscess/infections, fresh leaves are macerated in warm water and applied as poultice on abscess or infected area.	*Oxalis corniculata*: Amrul *Datura metel*: Kalo/Konok Dhutura *Datura stramonium*: Shada dhutura *Both *Datura metel* and *Datura stramonium* are poisonous plants and sometimes fed unknowingly to poison people because of enmity. Kalo means black, while shada means white.
27	Tuberculosis, underweight in children	6g powdered root of *Withania somnifera* (L.) Dunal (Solanaceae) is taken daily with honey for tuberculosis. 5g powdered root is fed to underweight children with milk or ghee (clarified butter) for 1 month.	*Withania somnifera*: Ashwogondha
28	To increase libido, burning sensations during urination, hydrocele	Roots of *Achyranthes aspera* L. (Amaranthaceae) are mixed with equal amounts of roots of *Amaranthus spinosus* L. (Amaranthaceae) and *Heliotropium indicum* L. (Boraginaceae) and macerated. 14 pills are made from the macerated mix. To increase libido, two pills are	*Achyranthes aspera*: Apang supang *Amaranthus spinosus*: Kanta khuira *Heliotropium indicum*:

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		to be taken on an empty stomach in the morning and night for 7 days. For burning sensations during urination, 1 chatak seeds of *Achyranthes aspera* are powdered and boiled in water for 15-20 min. Small amounts of the decoction that is formed is taken thrice daily. For hydrocele, 7g of roots of *Achyranthes aspera* are macerated with 7 slices of rhizomes of *Zingiber officinale* Roscoe (Zingiberaceae) and 21 black peppers. The mixture is applied to the swollen scrotum for 7 days as a poultice.	Hantishur *Zingiber officinale*: Ada
29	Piles, constriction of nerves leading to distortion in hands or feet, stoppage of urination, paralysis	For piles, 2 teaspoonful of juice obtained from fresh leaves of *Paederia foetida* L. (Rubiaceae) is taken with macerated rhizomes of *Curcuma longa* L. (Zingiberaceae). For constriction of nerves, macerated leaves of *Paederia foetida* are applied to hand or feet along with sesame oil. 3-4 teaspoonfuls of juice obtained from macerated leaves of *Paederia foetida* is taken with ½ poa raw cow milk for a few days if there is stoppage of urination. 4 teaspoonfuls of juice obtained from macerated leaves of *Paederia foetida* is taken twice daily for paralysis. At the same time, the juice is applied to the paralyzed area.	*Paederia foetida*: Gandal, Rajbala *Curcuma longa*: Holud
30	Sexual weakness in males	1g roots of *Eclipta alba* (L.) Hassk. (Asteraceae) is mixed with leaves of *Centella asiatica* (L.) Urb. (Umbelliferae), 1g roots of *Abroma augusta* L.f. (Sterculiaceae), roots of *Bombax ceiba* L. (Bombacaceae) and boiled in water. Fruits of *Croton tiglium* L. (Euphorbiaceae) and powdered seed husks of *Plantago ovata* Forssk. (Plantaginaceae) are then mixed with the decoction, and the decoction taken with ripe bananas, sugar, and cow milk.	*Eclipta alba*: Kalokeshi *Centella asiatica*: Thankuni *Abroma augusta*: Ulot kombol *Bombax ceiba*: Shimul *Croton tiglium*: Jaiphol *Plantago ovata*: Isabgul
31	Lesions on the tongue (white spots on the tongue, difficulty in eating)	4-5 young whole plants of *Ricinus communis* L. (Euphorbiaceae) are mixed with pulp from inner part of seeds of *Mangifera indica* L. (Anacardiaceae), skin of fruits of *Elettaria cardamomum* (L.) Maton (Zingiberaceae), small amount of skin of young fruits of *Benincasa hispida* (Thunb.) Cogn. (Cucurbitaceae). The mixture is macerated and applied to the tongue. Note that during this time eating of the following fish species are forbidden: *Wallago attu*, *Puntius puntius*, *Channa marulius*, and *Cirrhenus mrigala*.	*Ricinus communis*: Laal henda, Verenda *Mangifera indica*: Aam *Elettaria cardamomum*: Elach *Benincasa hispida*: Chal kumra
32	Pain	Leaves with roots of *Abroma augusta* L. (Sterculiaceae) are warmed and applied to painful areas.	*Abroma augusta*: Ulot kombol
33	Headache, conjunctivitis, bleeding from gums	For headache, wood scrapings of *Adenanthera pavonina* L. (Fabaceae) are wetted and rubbed onto the forehead. For conjunctivitis, kohl (local term: kajol) made from wood is applied to eyes. To stop bleeding from gums, 6-7 leaves are boiled in water and the water is used for gargling.	*Adenanthera pavonina*: Rokto chondon
34	Dysentery, appetite stimulant, bleeding from gums, insect bite	For dysentery, 4-5g roots of *Cyperus scariosus* R. Br. (Cyperaceae) are crushed and boiled in 4 cups water. When the water is reduced, it is strained through a piece of cloth and taken 4 times daily (note that this is claimed to treat stomach pain associated with dysentery). If any food is not digested resulting in constipation, then 3-4g roots of are mixed with ½ teaspoonfuls of fruits of *Carum copticum* (L.) C.B. Clarke (Umbelliferae), crushed and soaked in 1 cup of warm water. After soaking for 2 hours, the water is strained and taken twice daily. For bleeding from gums, juice obtained from crushed roots of *Cyperus scariosus* are mixed with	*Cyperus scariosus*: Mutho (roots are known locally as vadla mutho) *Carum copticum*: Joan

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		a little water and the mixture used for gargling. For bites from insect like wasps, crushed roots of *Cyperus scariosus* are applied to bitten area.	

number of plant formulations were taken or applied with other ingredients. For instance, macerated leaves of *Datura metel* were applied with ghee to abscesses. The ghee possibly helped in the even application of leaves, softening the skin, and further helped in absorption of phytochemicals because of its oily nature. For helmintic infections, leaves of the same plant were orally administered along with milk from which butter has been churned out. Other ingredients taken with plant parts included honey (e.g. with roots of *Clerodendrum indicum*, serial 3 in Table 1), cow milk or cold water (e.g. with stem juice of *Tinospora cordifolia*, seral 6 in Table 1), black peppers (e.g. with roots of *Acorus calamus*, serial 9, Table 1), or with mishri (crystalline sugar, see serial 11, table 1). Mishri was prepared at home by adding sugar to boiling water in a pot till sugar no longer dissolved. The boiling pot was then taken from the fire and allowed to cool during which time a string was suspended in the middle of the pot with a piece of stick. As the mixture cooled, crystallized sugar became attached to the string. When sugar has stopped accumulating, the string was taken out, dried, and sugar crystals were scraped off the string and stored in a container. Crystalline sugar, thus prepared, is known as mishri throughout Bangladesh and is considered by the traditional medicinal practitioners to possess medicinal properties of its own besides making a bitter tasting formulation more palatable.

Medical applications

Formulations of the Soren traditional medicinal practitioners were observed to be simple (i.e. containing a single plant part) or complex, involving the use of multiple plant parts. For helminthiasis, the seeds of *Centratherum anthelminticum* were slightly powdered and orally administered. For pitto jor, an ailment for which no known medical term could be found and whose symptoms included burning sensations in the body, redness in eyes and long-term fever with vomiting, juice obtained from macerated leaves of *Nyctanthes arbor-tristis* was orally administered. (Pitto is Bengali for bile, while jor is Bengali for fever so the combination might indicate fever arising from biliary disorders). For respiratory difficulties (usually associated with cold or mucus formation), a complex formulation of leaves of *Justicia adhatoda* and *Ocimum tenuiflorum* along with stems of *Tinospora cordifolia* and powdered turmeric (powdered dried rhizome of *Curcuma longa*) was used. One of the most complex formulation involved treatment of influenza. For treatment of this disease, leaves and stems of *Solanum barbisetum* were mixed with fruits of *Piper nigrum*, leaves of *Cinnamomum tamala*, fruits of *Piper longum*, bark of *Cinnamomum verum*, rock salt, and mishri and boiled in water till the water volume was reduced by three-quarters. The decoction was then cooled, strained through cloth, and orally administered (see serial 12, Table 1). Added to the complexity of the preparation was that the pot used for boiling had to be earthen.

Table 2: Comparative usage of medicinal plants between the Santals of Rajshahi (1), Rangpur (2) and Thakurgaon (3) districts.

Medicinal plant	Use		
	Rajshahi – Soren clan (1)	**Rangpur – Mixed clans (2)**	**Thakurgaon – Murmu clan (3)**
Amaranthus spinosus	To increase libido.		To increase lactation in cows.
Eclipta alba	Sexual weakness in males.		Diabetes.
Heliotropium indicum	To increase libido.		Cataract.
Coccinia grandis	Abscess, diabetes, lack of appetite, vomiting.		Mental depression, blood dysentery, pain.
Ocimum tenuiflorum	Respiratory difficulties.		Coughs, mucus.
Cinnamomum tamala	Influenza.		Coughs, bloating, biliary disorders, piles.
Cinnamomum verum	Influenza.		Low sperm count, rheumatism, biliary disorders.
Streblus asper	Abscess, dysentery.		Elephantiasis.
Mangifera indica	Lesions on the tongue.	Inflammation, jaundice, itches.	
Benincasa hispida	Helminthiasis, colic, flatulence, enlarged heart, lesions on the tongue.	Spermatorrhea, gastritis, infertility.	
Hyptis suaveolens	Underweight.	Malaria, headache, insect repellent.	
Stephania japonica	Low density of semen,	Infections, to ward off evil	

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	abscess, infections of skin.	spirits.	
Curcuma longa	Piles, passing of semen with urine, leucorrhea.	Hypotonia, scabies, leucoderma, infertility in women, acne.	

The major ailments treated by the Soren practitioners were skin disorders (abscess being the major problem), helminthiasis, respiratory problems (including asthma), gastrointestinal disorders, pain, urinary problems, sexual disorders, and paralysis. Complicated diseases treated included diabetes and enlarged heart conditions. The practitioners claimed that they can find out about enlarged heart by listening to the heart beat and certain symptoms of the patient like chest pain and labored breathing. The practitioners did not diagnose diabetes on the basis of any blood sugar tests; instead diabetes was diagnosed when the patient gradually became weak and suffered from frequent thirsts and frequent urges of urination, and when urine tasted sweet. Typhoid was diagnosed as prolonged high fever with remittance of fever followed by its returning at a higher state. State of fever was felt with the hand and not through a thermometer. Other diseases treated included dog bite, snake bite, chicken pox, piles, filariasis, night blindness, underweight, excessive bleeding during menstruation, epilepsy, leprosy, tuberculosis, hydrocele, lesions on tongue, conjunctivitis, and bleeding from gums.

Discussion

To our knowledge, this is the first instance of any study on the traditional medicinal practices of specifically the Soren clan of the Santals in Bangladesh. Earlier we have published two reports on Santal traditional medicinal usage of plants. The first study on Santal traditional medicine (seven traditional healers were interviewed) was conducted among a community of mixed clans of the Santal people in Rangpur district Rahmatullah et al, 2010), and a second study was conducted among the Murmu clan of the Santals (two traditional healers were interviewed) in Thakurgaon district (Rahmatullah et al, 2009). A comparison of the present survey results with the two previous surveys show that Santal traditional medicinal use of plants vary considerably between different clans of Santals among their scattered communities in Bangladesh. These differences may be clan-specific; in fact, a comparative analysis of medicinal plant usage between the Murmu and the Soren clan suggests that it is clan-specific (Table 2). However, more in-depth studies need to be conducted to ascertain whether this is so.

The Santal clans of Rangpur district used 52 plants belonging to 33 families versus the 47 plants divided into 29 families by the Murmu Santals of Thakurgaon, and 53 plants divided into 32 families by the Soren Santals of Rajshahi. Only five plants were found to be common between Rangpur and Rajshahi Santals. Even then, the ailments treated differed considerably. The same applies to the eight plants found in common between the Sorens and the Murmus. *Mangifera indica* was used by the Sorens for treatment of lesions of the tongue; the same plant was used by Rangpur Santals for treatment of inflammation, jaundice and itches. While lesions on the tongue can be considered as an inflammation, the other two diseases namely jaundice and itches are totally different. *Amaranthus spinosus* was used by the Sorens to increase libido but used by the Murmus to increase lactation in cows. A comparative analysis of the ailments treated by different groups of Santals using the same medicinal plant is shown in Table 2.

The rural population of Bangladesh is in general poor; the Soren Santals were poorer than neighboring Bengali-speaking communities, among whom they worked as day laborers at cheap wages. As a result, they lived under conditions, which were unhygienic. This has led to frequent appearance of diseases like skin disorders, helminthiasis, and gastrointestinal disorders resulting from poor life style and unsatisfactory sanitary conditions. The number of plants used to treat these disorders was also indicative that these diseases were more prevalent among the Sorens. Eight plants were used for treatment of skin disorders (including abscesses), 6 plants for helminthiasis and 9 plants for treatment of gastrointestinal disorders. Lymphatic filariasis caused by the parasitic nematode, *Wuchereria bancrofti*, is endemic in twelve districts of Bangladesh, affecting about 20 million people (Saha and Mohanta, 2011). This disease is more prevalent in the northern districts including Rajshahi where the Soren Santals live. The Sorens used leaf juice of *Asparagus racemosus* with sugarcane molasses to treat filariasis.

Some of the uses of medicinal plants by the Soren traditional medicinal practitioners have been validated by modern research findings. *Justicia adhatoda* is used by the Sorens for treatment of asthma; the beneficial effect of this plant in obstructive airway diseases like asthma has been reported (Dorsch and Wagner, 1991; Sharafkhaneh et al, 2007). *Benincasa hispida* is used in Soren traditional medicine for treatment of colic pain and flatulence, both of which can result from ulcers. The gastroprotective effect of this plant (anti-ulcer activity against ethanol-induced gastric mucosal damage, pylorus ligated gastric ulcers, and cold-restraint stress-induced gastric ulcer, aspirin plus restraint, swimming stress) has been shown (Grover et al, 2001; Rachch and Jain, 2008). Extract of fruits of this plant reportedly demonstrated healing effects mediated through an antioxidant role in indomethacin-induced ulcers in rats (Shetty et al, 2008). Antinociceptive effects have also been reported for the plant (Qadrie et al, 2009), which can be relevant to treatment of colic pain. Antiinflammatory effect has been reported for the plant, *Streblus asper* (Sripanidkulchai et al, 2009), which is used by the Soren healers for treatment of abscess.

Many of the plants used by the Soren traditional healers are yet to be studied through modern scientific methods. Such studies can prove beneficial to human beings, for the Soren healers treat diseases like diabetes, enlarged heart, and paralysis

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against which allopathic medicine has no known cures. Pain is also prevalent among vast sections of human beings every day due to a variety of causes. Modern drugs like aspirin or paracetamol, which are used against pain, have side-effects like ulceration of the stomach and hepatotoxicity. The Soren healers used 8 different plants for treatment of various types of pain, any of which can prove efficacious as an analgesic with less or no side-effects. In short, the medicinal plants used by the Soren healers merit further scientific studies towards discovery of more efficacious drugs against a variety of diseases than are currently available in allopathic medicine.

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