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Research Article

Uncommon Phytotherapeutic Practices in Hajiganj Upazila of Chandpur District, Bangladesh against Gastrointestinal Disorders

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Abstract

Gastrointestinal disorders like diarrhea and dysentery are fairly common in rural and urban slum areas of Bangladesh because of lack of quality water for drinking and cooking, poor sanitary facilities, and unhygienic conditions of living. Rural people also lack adequate access to modern medical facilities and so rely to a large extent on folk medicinal practitioners (FMPs) for treatment of various ailments. FMPs mainly use plants in their treatment (phytotherapy). Their phytotherapeutic knowledge is passed on orally from generation to generation, and over time, a FMP can possess remarkable knowledge on medicinal properties of various plants. Since documentation of such knowledge can prove useful to scientists towards discovery of better drugs, we conducted a random survey among various FMPs of Hajiganj Upazila (sub-district) in Chandpur district of Bangladesh to document their uses of previously unreported or less reported plants against mainly diarrhea and dysentery. A total of 12 such plants were observed to be used by the FMPs, which plants were distributed into 12 families. The FMPs used these plants both in monoherbal and polyherbal formulations. The preparation processes of formulations were also fairly simple; in most cases plant parts were crushed with quern stones and the juice obtained taken orally. The previously unreported or less reported uses of these plants or plant parts against diarrhea and dysentery present novel opportunities to scientists towards discovery of lead compounds or new drugs.

Keywords: *Diarrhea; Dysentery; Phytotherapy; Folk Medicine; Chandpur; Bangladesh*

Abbreviations

FMP: Folk Medicinal Practitioner; FM: Folk Medicine; TMP: Tribal Medicinal Practitioner; TM: Tribal Medicine

Introduction

Diarrhea is generally defined as having three or more liquid or loose bowel movements in a 24-hour period. Dysentery is essentially diarrhea with blood (that is passing of blood with stool), and which may or may not be accompanied with fever and abdominal pain. Diarrhea and dysentery can be caused by a variety of organisms including bacteria, viruses, parasitic worms, and protozoa. Diarrhea and dysentery prevail, particularly in rural Bangladesh, due to a combination of lack of quality water for drinking and cooking, poor sanitary facilities, and unhygienic conditions of living. Although a number of organisms can cause dysentery and diarrhea, the major pathogens responsible for these two conditions in Bangladesh are reportedly *Vibrio cholerae*, rota virus, enterotoxigenic *Escherichia coli,* and *Shigella* [1]. It has been found that moderate to severe malnutrition can result in children under 5-year old in rural Bangladesh suffering from

diarrhea and dysentery resulting from various enteric pathogens [2]. Antibiotic resistance and genetic diversity of *Shigella sonnei* has also been reported from diarrheal patients in Bangladesh [3]. Misuse of drugs has further been reported even in an urban area [4].

Traditional medicinal systems have in the past played, and even in the present time playing an important role in the health-care system of Bangladesh. There are many varieties of traditional medicinal systems in the country like Ayurveda, Unani, folk and tribal medicine, each of which dates back to thousands of years ago. Among these medicinal systems, Ayurveda and Unani have established institutions for conferring degrees, while folk medicine (FM) and tribal medicine (TM) are practiced (irrespective of any formal training), respectively, by folk medicinal practitioners (FMPs) and tribal medicinal practitioners (TMPs) among the mainstream population or the various tribes of the country. FMPs are possibly the most numerous in the country with practically every village, town or city of the country having one or more such practitioners. FMPs mainly use plants for therapeutic purposes (phytotherapy) and their practices or experiences are in general transmitted orally from generation to generation. As such, over the course of hundreds of years, any given FMP can acquire substantial knowledge (and which is further augmented with practical experiences) on the medicinal properties of plants.

Plants have always formed a source of new medicines and lead compounds [5-7]. However, to conduct scientific studies on plants, it is convenient to get as much medicinal information on plants, and an excellent source for this information are traditional medicine practitioners, who use plants for disease(s) treatment. Towards documenting the therapeutic practices of FMPs and TMPs of various regions and tribes of the country, we had been conducting ethnomedicinal surveys for a number of years [8-12]. As diarrhea and dysentery are fairly common problems in both rural and urban (slums) of Bangladesh among both adults and children, more so among the illiterate poor where medical facilities are not available or affordable, the objective of the present study was to document previously unreported plants and formulations used by FMPs in Hajiganj Upazila, Chandpur District, Bangladesh. The area was chosen because to our knowledge, no previous ethnomedicinal work has been reported from this area; consequently, the probability of finding new plants was greater. The reason behind documenting new plants was that they may prove better than already reported ethnomedicinal anti-diarrheal and anti-dysentery plants.

Materials and Methods

The survey was conducted over a period of about 18 months between March 2015 and August 2016. During this time period random trips were made by the authors (particularly SS and MSHM) to various villages in Hajiganj Upazila, which falls within Chandpur District, Bangladesh (area 189.90 square kilometers, located in between 23°12' and 23°20' north latitudes and in between 90°45' and 90°55' east longitudes). During these trips, contacts were made with the resident FMPs of various villages, who treated gastrointestinal disorders (including diarrhea and dysentery) among other diseases. Based on the uniqueness of plants and formulations used, three FMPs were selected from three villages for in-depth interviews during April to August 2016. The three FMPs were A. Mannan (male) from Kongail village, Md Ayub Ali (male) from Aliganj village, and Anwara Begum (female) from Dopolla village. At the same time, inquiries were made among the villagers treated by the FMPs as to the effectiveness of the FMPs' treatments. Prior Informed Consent was obtained from the FMPs before interviews to conduct interviews and disseminate any information obtained from them including their names. Actual interviews and collection of plant specimens were conducted through the guided field-walk method of Martin [13] and Maundu [14]. In this method, the FMPs took the interviewers through guided field-walks through areas from where they collected their plants or plant parts and the plant(s) were shown to the interviewers. Plant specimens were collected on the spot and brought back for identification by a trained botanist at the Medical Plant Collection Wing of the University of Development Alternative. Interviews of the FMPs and their patients or other villagers were conducted in Bengali, which was spoken fluently by all. Besides interviews, open-ended discussions also took place during visits, where miscellaneous things or events were discussed including medicinal plants, treatment, and other sundry matters. The purpose of these discussions were to build up a close rapport with the villagers and the FMPs; this being an integral feature of ethnomedicinal surveys and without which rapport, full information is seldom obtained on treatment, formulations, or medicinal plants.

There was no human trial over here done by the authors. Folk medicine is a traditional medicine system of Bangladesh. The plants used by the folk medicinal practitioners have been such used for unknown number of years, since folk medicinal knowledge is transmitted orally from generation to generation.

Results and Discussion

A total of 12 plant names were obtained from the FMPs, which were used singly or in polyherbal combinations. The plants were distributed into 12 families. The gastrointestinal ailments treated included dysentery, diarrhea, constipation, stomach ache, and presence of mucus with stool. The total number of formulations used was nine, out of which six were monoherbal (single plant) formulations and three polyherbal (more than one plant) formulations. The results are shown in table 1. Each formulation was used by itself and not with any other formulations at any given time. A possible reason behind multiple formulations to treat one single disease (like diarrhea or dysentery) could be that various plants or plant part(s) (to treat that disease) may not be available year around. Doses were selected by the folk medicinal practitioner(s) (FMPs) and the patients were also monitored by the FMPs. These formulations have been used for unknown number of years, and needs scientific studies to get further insights into any possible adverse effects. In the present survey, the FMPs did not select patients based on age or sex. In only one case, the plant used (*Piper nigrum*), doses varied between adults (over 18 years age) and children (below 18 years age). Inquiries among the villagers who received treatment from the FMPs for gastrointestinal disorders like diarrhea or dysentery showed considerable satisfaction with the phytotherapeutic treatment(s) and no complaint of any adverse effects.

FMPs do not carry out biochemical assessments to determine any adverse effects, toxicity, or any problems caused to any organs following partaking of their formulations. It was therefore of interest to peruse the literature as to whether the plants used by the FMPs have reported similar ethnomedicinal uses elsewhere, or scientific validations, as indicated by reported pharmacological activity studies, or relevant phytochemicals present. Agreement of ethnomedicinal uses together with or without scientific validation can greatly enhance the potential of discovering effective drugs or lead compounds from the plant as well as indicate the safety of the formulation(s).

Various solvent extracts from whole plants of *Amaranthus spinosus* (considered an anti-diarrheal plant in Thailand [15]) reportedly showed some inhibitory activity against the *in vitro* growth of fresh isolates of the intestinal protozoan parasite, *Blastocystis hominis* [16]. To the best of our knowledge, there are no ethnomedicinal or scientific reports on the use of *Mangifera odorata* to treat dysentery or diarrhea. However, crude extract of *Lens culinaris* (used by the FMP along with *Mangifera odorata*) has been shown to exhibit protective effect against castor oil-induced diarrhea in mice [17].

Roots of *Leucas aspera*, *Amaranthus spinosus*, and *Eclipta prostrata* were used by the FMP in combination to treat dysentery. Ethyl acetate, acetone and methanol extracts of leaves and seeds of *Eclipta prostrata* demonstrated anthelmintic activity against *Haemonchus contortus* [18]; to be noted is that helmintic infections can also cause diarrhea and dysentery. The FMP used roots (instead of leaves or seeds) of *Eclipta prostrata*. The novel use of this plant part thus merits further scientific studies. Leaves of *Leucas aspera* are used to treat stomach pain in Bellary district, Karnataka, India [19] and to treat dysentery by the Kani tribals of Tirunelveli hills of Western Ghats, India [20], but scientific or ethnomedicinal reports are absent on the use of roots. The combination of these three plant parts is unique and have the potential not only to be used as a polyherbal formulation against dysentery, but also towards discovery of lead compounds against dysentery or any one or more of its multiple causative factors (bacterial infections like *Shigella*, *Escherichia coli*, *Salmonella* or *Campylobacter* infections, protozoal infections like with *Entamoeba histolytica*).

Cuscuta reflexa is used by various communities residing in Garo Hills of Durgapur, Bangladesh, to treat jaundice [12]; recently, a novel use of the plant to treat bone fracture has been reported from Bangladesh [21]. There does not appear to be any previous ethnomedicinal report(s) from Bangladesh on the use of this plant against constipation by FMPs. A combination of leaves of *Kalanchoe pinnata* and fruits of *Piper nigrum* were used by the FMPs against diarrhea; *Kalanchoe pinnata* leaves, by themselves, were used to treat dysentery. Ethnomedicinal use of *Kalanchoe pinnata* against diarrhea has been reported from Orissa, India [22]. *Piper nigrum* fruits contain a phytochemical, namely piperine, which has been shown to have anti-diarrheal effect [23].

Serial Number	Scientific Name (English name)	Family Name	Local Name	Parts used	Ailments and mode of medicinal use
1	*Amaranthus spinosus* L. (Spiny Amaranth)	Amaranthaceae	Kanta khudira	Root	See *Leucas aspera*.
2	*Mangifera odorata* Griff (Saipan mango)	Anacardiaceae	Aam	Leaf	Dysentery. Tender leaves of *Mangifera odorata* and seeds of *Lens culinaris* are made into a paste using quern stones and fried in oil. The fried portions are taken orally.
3	*Eclipta prostrata* L. (False Daisy)	Asteraceae	Bhringoraj	Root	See *Leucas aspera*.
4	*Cuscuta reflexa* Roxb. (Giant dodder)	Convolvulaceae	Swarna lota	Stem	Constipation. Juice is obtained from crushed fresh stems and taken orally.
5	*Kalanchoe pinnata* (Lam.) Pers. (Air plant)	Crassulaceae	Pathorkuchi, Maittasituli	Leaf	Diarrhea. Juice is prepared from crushed leaves of *Kalanchoe pinnata* and fruits of *Piper nigrum* (2 and ½ fruits for adults and 1 fruit for children). The juice is taken once orally in the morning on an empty stomach for 3-4 consecutive days. Dysentery. Juice prepared from crushed leaves is taken once orally in the morning on an empty stomach for 3-4 consecutive days.
6	*Lens culinaris* Medik. (Common lentil)	Fabaceae	Masur dal	Seed	See *Mangifera odorata*.
7	*Leucas aspera* (Willd.) Link. (Common Leucas)	Lamiaceae	Dolon, Shoto dron	Root	Dysentery. Root juice is collected from a combination of roots of *Leucas aspera*, *Amaranthus spinosus*, and *Eclipta prostrata*. One cup of the juice is taken twice daily for one week.
8	*Punica granatum* L. (Pomegranate)	Lythraceae	Dalim	Leaf	Dysentery. Juice prepared from crushed tender leaves is mixed with molasses and taken orally twice daily before meals.
9	*Musa balbisiana* L. (Wild banana)	Musaceae	Bichi kola	Root	Dysentery. Roots are boiled in water. The decoction is filtered. One spoon of the decoction is taken orally thrice daily for one week.
10	*Psidium guajava* L. (Guava)	Myrtaceae	Peyara	Fruit	Dysentery. Juice is prepared from tender crushed fruits and taken orally twice daily on an empty stomach along with table salt and molasses.
11	*Piper nigrum* L. (Black pepper)	Piperaceae	Gol morich	Fruit	See *Kalanchoe pinnat*a.
12	*Scoparia dulcis* L. (Sweet broom weed)	Plantaginaceae	Misripana	Whole pant	Dysentery, stomach ache, presence of mucus with stool. Whole plants are dried and powdered. One table spoon of the powder is taken orally twice daily with water before meal.

Table 1: Medicinal plants and formulations of the FMPs of Hajiganj Upazila, Chandpur District, Bangladesh.

Anti-diarrheal effect has been reported for *Punica granatum* fruit peel extract [24] and treatment of dysentery reported with young leaves and flowers of *Punica granatum* combined with fruits of *Aegle marmelos* [25]. The roots of *Musa balbisiana* are used to treat di-

arrhea by the Bhoxa community of Dehradun district, Uttarakhand, India [26]; the FMPs used the roots to treat dysentery. The leaves of *Psidium guajava* are considered anti-diarrheal (fruits were used by the FMPs to treat dysentery); leaves contain quercetin (an anti-diarrheal compound) and leaf extract can inhibit several enteric pathogens [27]. Whole plants of *Scoparia dulcis* were used by the FMPs to treat dysentery, stomach ache, and presence of mucus with stool. Water extract of the plant reportedly has anti-ulcer activity, which could be beneficial for alleviating stomach ache (provided that the pain is caused by ulcer) [28].

Several things are evident from the survey and perusal of the relevant scientific literature. First, the plants and formulations used by the FMPs, mainly to treat diarrhea and dysentery, have not been to our knowledge, previously reported to be used by other FMPs in Bangladesh. *Centella asiatica* (whole plant or aerial parts) [29] and *Aegle marmelos* (fruits) are the most common plants or plant parts used in Bangladesh for alleviating gastrointestinal disorders [25,30]. In fact, such phytotherapeutic uses of most of the plants have not even been reported from other countries. Second, a fair amount of scientific data is available suggesting that the phytotherapeutic practices of the FMPs are quite valid, which in turn suggest that the FMPs were quite knowledgeable about the medicinal properties of the plants. Third, taken together, the plants merit attention from scientists for further research leading to possible discovery of lead compounds and more affordable and efficacious drugs. This is a necessity, for gastrointestinal disorders are prevalent more in underdeveloped countries and the poorer sections of the population, precisely the people who cannot afford modern health-care costs and live under unhygienic conditions.

Conclusion

An ethnomedicinal survey conducted among folk medicinal practitioners of three villages in Hajiganj Upazila, Chandpur District, Bangladesh resulted in collecting information on 12 plants (and the plant parts) used by the FMPs for treatment of gastrointestinal disorders, mainly diarrhea and dysentery. These plants are unique in that most of the plant parts and the monoherbal and polyherbal formulations prepared from the various plant parts have not been previously reported from Bangladesh or elsewhere as being used for anti-diarrheal and anti-dysentery purposes. At the same time, available scientific reports on the pharmacological properties of a number of these plants validate their traditional uses, indicating that the plants or plant parts merit further scientific research towards discovery of lead compounds and possibly novel drugs against diarrhea and dysentery.

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Conflict of Interest

The authors declare that they have no conflicts of interest.

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