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ORIGINAL ARTICLE

A Comparative Analysis of Medicinal Plants used to treat Gastrointestinal Disorders in two sub-districts of Greater Khulna Division, Bangladesh

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ABSTRACT

Folk medicinal practitioners (Kavirajes) form the primary health-care providers to a substantial section of the rural and urban population of Bangladesh. They utilize various medicinal plants for treatment of ailments. The knowledge attained by an individual Kaviraj is closely guarded and confined to the immediate members of the family and passed on from generation to generation. As a result, there is wide variation between the medicinal plants utilized by Kavirajes for treatment of any specific ailment or symptom, which variation can be observed in Kavirajes of adjoining areas or even villages. The objective of the present study was to conduct a comparative survey on medicinal plants for treatment of gastrointestinal disorders among Kavirajes of Paikgacha sub-district (which lies within Khulna district) and Rampal sub-district (which lies within Bagerhat district). The two areas are close to one another; possess identical flora and climatic conditions, and falls within the greater Khulna Division. Interviews of the Kavirajes were conducted with the help of a semi-structured questionnaire and the guided-field walk method. All plant samples shown by the Kavirajes were collected and identified at the Bangladesh National Herbarium. It was observed that although Paikgacha and Rampal are close to each other, the medicinal plants used to treat various types of gastrointestinal disorders differ totally among the Kavirajes of the two areas. A total of 38 plants were used by the Kavirajes of the two areas for gastrointestinal disorders, which included indigestion, constipation, diarrhea, flatulence, piles, helminthiasis, colic, and gastritis. The extensive differences between the medicinal plants used in the two areas were not only confined to species and genera, but also extended to plant family levels. Discussions with the Kavirajes indicated that the observed differences can be attributed partly to Kavirajes attaining their knowledge from different teachers (gurus) and partly to a Kavirajes' individual experimentation with plants and then keeping the knowledge to himself. The study suggests that to get a comprehensive view of the folk medicinal practices in Bangladesh, surveys need to be conducted at the village level throughout all the villages of the country.

Key words: Ethnomedicine, medicinal plants, Khulna, Bagerhat, Bangladesh

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Introduction

The Indian sub-continent, which comprises of India, Bangladesh and Pakistan have a rich tradition of medicinal practices. Besides the comparatively newer practices of allopathic and homeopathic medicines, traditional medicinal practices include Ayurvedic, Unani and the Sidha systems of medicine. Dating back thousands of years ago, these three systems have become institutionalized with their specific medicinal books and customized practices. Other than the before-mentioned systems, another system exists, which can be termed as folk medicine, which is practiced by folk medicinal practitioners of various villages and tribes who are known as Kavirajes, Vaidyas or Ojhas in Bangladesh (note that Ayurvedic medicinal practitioners are also known as Kavirajes or Vaidyas; Ojhas generally apply to practitioners of tribal groups like the Santals) depending on the region. The Kavirajes practice a much simpler form of treatment with medicinal plants where a simple decoction or paste of the plant is usually used orally or topically for treatment of a given ailment. As a general rule, the folk medicinal practitioners avoid complex mixtures of plants or plant parts as well as elaborate formulations and preparations. The medicinal plant knowledge of the Kavirajes is kept closely guarded and passed on from generation to generation within the immediate family.

The folk medicinal practitioners do not have their own medicinal books or follow any standardized customs. As a result, the selection of a medicinal plant by a Kaviraj for treatment of any specific ailment is unique to the Kavirajes, and varies considerably between Kavirajes of a particular area or even villages (Nawaz, A.H. Md., 2009; Mia, Md. M.K., 2009; Hossan, Md. S., 2009). To get a comprehensive view of the medicinal plants used in folk medicinal treatments, one has therefore, go to Kavirajes of a particular area and interview them on their choice of plants. The attainment of such knowledge is important for a number of reasons. The first is that any individual Kavirajes' knowledge of medicinal plants is the result of accumulation of such knowledge over successive generations; as a result, the Kaviraj comes to possess substantial expertise on medicinal plants that he or she uses in his or her routine practices. A second reason is that through interviewing Kavirajes of different regions, one can build up a data-base of various plants used to treat any specific ailment. This knowledge or data-base is important for it can provide valuable guidance for further modern scientific studies on any plant in question. It may be pointed out in this regard that even of to-date a number of modern drug discoveries have been based on medicinal plants used by indigenous people (Balick, J.M. and P.A. Cox, 1996). It has been further reported that about 64% of the total world population uses traditional medicine to satisfy their health-care needs (Cotton, C.M., 1996). The number of papers published in ethnobotanical or traditional medicinal scientific journals attest to the fact that scientists are getting increasingly interested in ethnobotanical practices of indigenous people as a strategy for discovery of novel drugs against both ancient and newly emerging diseases.

The objective of the present survey was to conduct an ethnomedicinal survey among the Kavirajes of Paikgacha and Rampal sub-districts (lying respectively in Khulna and Bagerhat districts of Khulna Division) on medicinal plants used for treatment of gastrointestinal disorders or symptoms. Khulna and Bagerhat district adjoins each other; in fact they were not too long ago considered as a single district. Both districts lie in the south-western part of Bangladesh, contains major portions of the Sunderbans forest (with its rich diversity of mangrove species), have similar floral and faunal species and similar climatic conditions. In other aspects, the districts are akin to each other in that they are in close proximity to the Bay of Bengal and contain substantial amount of estuarine areas. The livelihood of the people is similar in Paikgacha and Rampal, both being sub-districts with agriculture as the main occupation. A large number of people from both survey areas use the Sunderbans forest to collect wood, fish, honey, and other forest products. A second objective of the study was to analyze any differences noted in the medicinal plants used in the two areas surveyed.

Materials and Methods

Area of survey

Paikgacha sub-district is a part of Khulna district and lies approximately between 89°15 - 89°25 E and 22°28 - 22°43 N. The annual average temperature of Khulna district ranges between a minimum of 12.5°C to a maximum of 35.5°C. Annual rainfall of Khulna district averages 1710 mm. The main occupation is agriculture and agricultural laborer and the main crops are paddy, jute, and vegetables. Rampal sub-district is a part of Bagerhat district and lies approximately between 89°35 - 89°55 E and 22°30 - 22°42 N. The annual average temperature of Bagerhat district ranges between a minimum of 12.5°C to a maximum of 33.5°C. Annual rainfall of Bagerhat district averages 1710 mm. The main occupation is agriculture and agricultural laborer and the main crops are paddy, jute, sugar cane and potatoes.

Data collection and mode of survey

Extensive interviews were conducted of the Kavirajes with the help of a semi-structured questionnaire. A group of Kavirajes were chosen in both Paikgacha and Rampal area based on questioning common people of the two areas and noting down which Kavirajes were most frequently visited by them. Prior to the actual survey, in preliminary meetings with the Kavirajes, a list of gastrointestinal disorders or symptoms were prepared, which were the common gastrointestinal disorders treated by the Kavirajes in the two survey areas. Informed consent was obtained from each Kaviraj prior to the actual questioning. The Kavirajes were informed as to the purpose of the survey and consent obtained from them that the data may be disseminated in national or international conferences and scientific journals. The basic survey method followed was that of Martin (1995) and Maundu (1995), which is known as the guided field-walk method. In this method, the Kavirajes took the interviewers through guided field-walks to places from where they usually collected their medicinal plants. Plants were pointed out by the Kavirajes and local names and gastrointestinal disorders treated by the plants were given along with plant parts used and any other information, which the Kavirajes considered important. All data were cross-checked with the Kavirajes in later informal sessions attended by Kavirajes and any other interested people of the area. Plant specimens as pointed out by the Kavirajes were collected, pressed and dried on the field. All plant species collected were identified at the Bangladesh National Herbarium.

Results

The various gastrointestinal disorders or symptoms treated by the Kavirajes of Paikgacha and Rampal area can be generally categorized as follows: indigestion, constipation, diarrhea, flatulence, piles (hemorrhoids leading to passing of blood in stool), helminthiasis (presence of intestinal worms), colic, and gastritis. A total of 20 plant species distributed into 20 families were found to be used in Paikgacha area while 19 plants distributed into 12 families were used by Kavirajes of Rampal area for treatment of gastrointestinal disorders. The results are summarized in Table 1. Taking both areas under consideration, the Asteraceae and the Fabaceae families provided the largest number of plant species contributing four plants from each family.

Whole plants as well as plant parts like leaf, stem, root, bark, fruit, flower, seed, and gum were used for treatment. The usual mode of treatment was extracting juice from crushed whole plant or plant parts followed by administration of the juice orally till cure. The Kavirajes did not provide any information on the amount of juice to be administered from any particular plant or plant part on grounds that it would hurt their interests if this information is known by others. The percent of use of whole plant or plant parts differed somewhat between Paikgacha and Rampal and is shown in Table 2. The differences were not great for use of whole plant, leaf, fruit, or seed. However, the use of bark was 17.6% at Paikgacha and 9.7% at Rampal. Flowers constituted 2.9% of total use at Paikgacha, while it was 6.5% at Rampal. Interestingly, the Kavirajes of Paikgacha did not use roots or gum of any plant in their preparations; the Kavirajes of Rampal did not use the stem of any plant in their preparations.

The most significant finding of the present survey was that the plant species used for treatment of various gastrointestinal disorders differed totally between the Kavirajes of Paikgacha and Rampal even though the two areas are in close proximity to each other, contains identical floral species, and have similar climatic conditions. The one plant that was commonly used by Kavirajes of both regions was *Scoparia dulcis* (Family: Scrophulariaceae). Even then, the Kavirajes of Paikgacha used the leaves, roots and seeds of the plant to treat dysentery, diarrhea, and colic. Interestingly, the Kavirajes of Rampal used the whole plant to treat constipation, which is the opposite of diarrhea or dysentery. Other than that, the differences between uses of plants in the two areas surveyed differed to the extent of dissimilarity not only in plant species and genera but also continued to plant family level. For instance, the Kavirajes of Paikgacha used the plants *Pterocarpus santalinus*, *Moringa oleifera*, *Mirabilis jalapa*, *Zizyphus mauritiana*, *Nicotiana alata*, and *Cissus quadrangularis* for treatment of indigestion. The above plants belong, respectively, to Fabaceae, Moringaceae, Nyctaginaceae, Rhamnaceae, Solanaceae, and Vitaceae families. On the other hand, the Kavirajes of Rampal used the plants *Andrographis paniculata*, *Eclipta alba*, *Cuscuta reflexa*, and *Tamarindus indica* for treatment of indigestion. These plants belong, respectively, to the Acanthaceae, Asteraceae, Cuscutaceae, and Fabaceae families. The Fabaceae family was common in this instance; however, the plant species belonging to this family and used by the Kavirajes differed between Paikgacha and Rampal. With the exception of indigestion, the other gastrointestinal ailments treated by the Kavirajes of Paikgacha and Rampal did not demonstrate a single instance of the same family plant species being used in common, let alone same genera or same plant species. The results are shown in Table 3.

Table 1: Medicinal plants used by Kavirajes in Paikgacha area, Khulna district and Rampal area, Bagerhat district, Bangladesh for treatment of gastrointestinal disorders

Serial Number	Scientific Name	Family Name	Local Name	Plant part(s) utilized	Ailment(s) treated	Area of use
1	*Andrographis paniculata* (Burm. f.) Wall. ex Nees	Acanthaceae	Kalo-megh	Whole plant	Indigestion.	Rampal
2	*Hygrophila auriculata* (Schumach.) Heine	Acanthaceae	Kulekhara-shak	Whole plant	Constipation.	Rampal
3	*Ruellia ciliosa* Pursh.	Acanthaceae	Chot-poti	Whole plant	Constipation.	Rampal
4	*Thunbergia grandiflora* Roxb.	Acanthaceae	Mahi-lota	Whole plant	Intestinal disorders (colic, diarrhea).	Paikgacha
5	*Polyalthia mossambicensis* Vollesen	Annonaceae	Pankhi-raaz	Stem, bark	Helminthiasis (infection by parasitic worm in the intestines).	Paikgacha
6	*Philodendron selloum* K. Koch	Araceae	Gladiolus	Whole plant	Helminthiasis.	Paikgacha
7	*Calotropis gigantea* (L.) Ait.f.	Asclepiadaceae	Akondo	Leaf, bark, flower, gum	Piles (hemorrhoids).	Rampal
8	*Eclipta alba* (L.) Hassk.	Asteraceae	Khot-kushte	Whole plant	Indigestion.	Rampal
9	*Tagetes erecta* L.	Asteraceae	Gada-phool	Whole plant	Flatulence (presence of excessive gas in the digestive tract).	Rampal
10	*Vernonia cinerea* (L.) Less.	Asteraceae	Tula-urhi	Whole plant	Flatulence.	Paikgacha
11	*Xanthium italicum* Moretti	Asteraceae	Heghra	Leaf, fruit	Piles, colic (spasmodic pains in the abdomen).	Rampal
12	*Basella alba* L.	Basellaceae	Pui-shak	Leaf, seed	Flatulence.	Paikgacha
13	*Oroxylum indicum* (L.) Vent.	Bignoniaceae	Hanghoal	Leaf, bark	Diarrhea.	Rampal
14	*Kalanchoe pinnata* (Lam.) Pers.	Crassulaceae	Pathorkuchi	Leaf	Diarrhea.	Rampal
15	*Momordica cochinchinensis* (Lour.) Spreng.	Cucurbitaceae	Kakroal	Fruit, seed	Flatulence.	Paikgacha
16	*Cuscuta reflexa* Roxb.	Cuscutaceae	Swornolota	Whole plant	Indigestion.	Rampal
17	*Dioscorea bulbifera* L.	Dioscoreaceae	Matae-alu	Leaf, fruit	Diarrhea.	Rampal
18	*Acalypha indica* L.	Euphorbiaceae	Denari-shak	Leaf, root	Diarrhea.	Rampal
19	*Excoecaria agallocha* L.	Euphorbiaceae	Gewa	Leaf, bark	Piles.	Rampal
20	*Caesalpinia bonduc* (L.) Roxb.	Fabaceae	Nata	Leaf	Helminthiasis, constipation.	Rampal
21	*Cassia angustifolia* Vahl.	Fabaceae	Herangci	Whole plant	Flatulence.	Rampal
22	*Pterocarpus santalinus* L.f.	Fabaceae	Rokto-chondon	Leaf, bark	Indigestion.	Paikgacha
23	*Tamarindus indica* L.	Fabaceae	Tetul-gach	Fruit, seed	Gastritis (chronic or acute inflammation of the stomach), indigestion.	Rampal
24	*Hyptis suaveolens* (L.) Poit.	Lamiaceae	Tokma	Leaf, bark	Constipation.	Paikgacha
25	*Leucas aspera* (Willd.) Link	Lamiaceae	Dron-pusphe	Leaf, flower	Colic.	Rampal
26	*Cinnamomum tamala* (Buch.-Ham.) Nees & Eberm.	Lauraceae	Tej-pata	Leaf, bark	Colic.	Paikgacha
27	*Ficus carica* L.	Moraceae	Tri-muki	Whole plant	Flatulence.	Paikgacha
28	*Moringa oleifera* Lam.	Moringaceae	Sajna	Bark, fruit	Indigestion.	Paikgacha
29	*Ardisia solanacea* Roxb.	Myrsinaceae	Gota-gach	Leaf, fruit	Colic.	Paikgacha
30	*Mirabilis jalapa* L.	Nyctaginaceae	Shondha-maloti	Leaf, flower	Indigestion, constipation.	Paikgacha
31	*Peperomia pellucida* (L.) Kunth.	Piperaceae	Thosha-pata	Whole plant	Diarrhea.	Rampal
32	*Portulacaria afra* (L.) Jacq.	Portulacaceae	Jeet-gach	Whole plant	Stomach ache.	Paikgacha
33	*Zizyphus mauritiana* Lam.	Rhamnaceae	Borhoi	Leaf, fruit, seed	Indigestion.	Paikgacha
34	*Nauclea latifolia* Sm.	Rubiaceae	Jongli gulap-jam	Leaf, bark, fruit	Piles.	Paikgacha
35	*Murraya koenigii* (L.) Spreng	Rutaceae	Keri-pata	Leaf, fruit	Flatulence.	Paikgacha
36	*Scoparia dulcis* L.	Scrophulariaceae	1. Misri-dana 2. Jongli dhonia	1. Leaf, root, seed 2. Whole plant	1. Diarrhea, dysentery, colic. 2. Constipation.	1. Rampal 2. Paikgacha
37	*Nicotiana alata* Link & Otto	Solanaceae	Jongli-tamak	Whole plant	Indigestion.	Paikgacha
38	*Cissus quadrangularis* L.	Vitaceae	Haar-jora	Whole plant	Indigestion.	Paikgacha

Table 2: Comparative use of whole plant or plant parts in Paikgacha and Rampal for treatment of gastrointestinal disorders

Plant part	Percent (%) of use	
	Paikgacha	Rampal
Whole plant	23.5	25.8
Leaf	26.5	32.3
Stem	2.9	0
Root	0	6.5
Bark	17.6	9.7
Fruit	17.6	9.7
Flower	2.9	6.5
Seed	8.8	6.5
Gum	0	3.2

Table 3: Comparative analysis of medicinal plants and their families used by Kavirajes of Paikgacha and Rampal area for various types of gastrointestinal disorders and symptoms

Ailments/Symptoms	Paikgacha, Khulna district		Rampal, Bagerhat district	
	Plant	Family	Plant	Family
Indigestion			*Andrographis paniculata* (Burm. f.) Wall. ex Nees	Acanthaceae
			Eclipta alba (L.) Hassk.	Asteraceae
			Cuscuta reflexa Roxb.	Cuscutaceae
			Tamarindus indica L.	Fabaceae
	Pterocarpus santalinus L.f.	Fabaceae		
	Moringa oleifera Lam.	Moringaceae		
	Mirabilis jalapa L.	Nyctaginaceae		
	Zizyphus mauritiana Lam.	Rhamnaceae		
	Nicotiana alata Link & Otto	Solanaceae		
	Cissus quadrangularis L.	Vitaceae		
Constipation			*Hygrophila auriculata* (Schumach.) Heine	Acanthaceae
			Ruellia ciliosa Pursh.	Acanthaceae
			Caesalpinia bonduc (L.) Roxb.	Fabaceae
	Hyptis suaveolens (L.) Poit.	Lamiaceae		
	Mirabilis jalapa L.	Nyctaginaceae		
	Scoparia dulcis L.	Scrophulariaceae		
Dysentery, diarrhea	*Thunbergia grandiflora* Roxb.	Acanthaceae		
			Oroxylum indicum (L.) Vent.	Bignoniaceae
			Kalanchoe pinnata (Lam.) Pers.	Crassulaceae
			Dioscorea bulbifera L.	Dioscoreaceae
			Acalypha indica L.	Euphorbiaceae
			Peperomia pellucida (L.) Kunth.	Piperaceae
			Scoparia dulcis L.	Scrophulariaceae
Flatulence				
			Tagetes erecta L.	Asteraceae
	Vernonia cinerea (L.) Less.	Asteraceae		
	Basella alba L.	Basellaceae		
	Momordica cochinchinensis (Lour.) Spreng.	Cucurbitaceae		
			Cassia angustifolia Vahl.	Fabaceae
	Ficus carica L.	Moraceae		
	Murraya koenigii (L.) Spreng	Rutaceae		
Piles (hemorrhoids)			*Calotropis gigantea* (L.) Ait.f.	Asclepiadaceae
			Xanthium italicum Moretti	Asteraceae
			Excoecaria agallocha L.	Euphorbiaceae
	Nauclea latifolia Sm.	Rubiaceae		
Helminthiasis	*Polyalthia mossambicensis* Vollesen	Annonaceae		
	Philodendron selloum K. Koch	Araceae		
			Caesalpinia bonduc (L.) Roxb.	Fabaceae
Colic	*Thunbergia grandiflora* Roxb.	Acanthaceae		
			Xanthium italicum Moretti	Asteraceae
			Leucas aspera (Willd.) Link	Lamiaceae
	Cinnamomum tamala (Buch.-Ham.) Nees & Eberm.	Lauraceae		
	Ardisia solanacea Roxb.	Myrsinaceae		
	Portulacaria afra (L.) Jacq.	Portulacaceae		
			Scoparia dulcis L.	Scrophulariaceae
Gastritis			*Tamarindus indica* L.	Fabaceae

Discussion

A noteworthy feature of the present survey was the significant difference noticed between selections of plant species for treatment of the same ailment or symptom amongst Kavirajes of two areas in close proximity to each other. The expected finding would have been that given the similarities between geographical location, climatic conditions, socio-cultural factors, and common floral species, the plant species selected for treatment of any particular gastrointestinal disorder would be highly similar between Kavirajes of Paikgacha and Rampal. The actual findings indicate the contrary; not a single plant species was commonly used by the Kavirajes of Paikgacha and Rampal. Such differences have been observed before in other ethnobotanical studies. Etkins has also mentioned that even within small and apparently undifferentiated groups, heterogeneity exists as to perception of illness and mode of treatment (Etkins, N.L., 1993). Shepard demonstrated that the ethnobotany of two neighboring Amazonian peoples varies considerably in the use of essentially the same environment (Shepard, G., 2004). This brings forth the obvious question as to what leads a Kaviraj to select a plant in the first place for treatment of any ailment.

When queried on this point, the Kavirajes pointed to two possibilities. The first was that any individual Kaviraj would obtain his or her knowledge from somebody in his or her immediate family (usually father, mother, or uncle), who has practiced as a Kaviraj in the previous generation and this has continued for generations. Alternatively, the Kaviraj or his predecessor has obtained the requisite knowledge from a teacher whom they term as ‘guru’ in exchange for services or money. Once such knowledge is gained, it is closely guarded and not transferred to anybody except the children (who wishes to continue the generational practice) or to a disciple, who is also sworn to keep the knowledge exclusively to himself or herself. As a result, knowledge of medicinal plants becomes ‘specialized’ to a great extent. It is worth pointing out in this regard that the Kamba and Luo tribal traditional medicinal practitioners of Kenya also has been reported as owing their healing skills to training by knowledgeable kin, or buying such knowledge from a non-relative specialist (Owuor, B.O. and D.P. Kisangau, 2006). The second possibility behind the variations of medicinal plant selection between Kavirajes of different area that the Kavirajes pointed out is that they do not stop adding to their knowledge after their training period with a member of an earlier generation or a guru. They experiment with medicinal plants initially on cattle, later on upon their family members, and finally on patients. Thus the selection of medicinal plants is always an ongoing process, a fact also noted by other authors (Caniago, I. and S. Siebert, 1998; Garro, L.C., 1986; Trotter, R.T. and M.H. Logan, 1986). The basis for such experimentations is simple. For instance, bitter-tasting herbs or plants are usually experimented for treatment of diabetic patients. Red-leaved plants or red flowers are usually tested on women losing too much blood during menstruation. Occasionally, a plant may be chosen for its supposed similarity to a human organ, in which case the plant is experimented for any disorders related to that organ. It is not only that such experiments are conducted at present; the Kavirajes mentioned that their predecessors also experimented with plants and treatment of diseases. Over time, this has led to considerable diversification between plant species chosen by different Kavirajes for treatment of any given ailment.

The observed diversification of plant species between the Kavirajes of Paikgacha and Rampal to treat gastrointestinal disorders, which is a common occurrence throughout the country, highlights the importance of conducting ethnomedicinal surveys amongst Kavirajes of as many regions as possible throughout Bangladesh. It is possible that all plant species used by the Kavirajes may not prove suitable for treatment of the specific gastrointestinal ailment that they are used for by the Kavirajes. It is necessary to conduct proper scientific studies on the efficacy of a particular plant. On the other hand, the diversity of plant species used to treat gastrointestinal disorders provides a rich data-base from which potentially many lead compounds can be discovered to fight gastrointestinal disorders, which are prevalent throughout the world and particularly in developing countries like Bangladesh with improper hygienic conditions, poor sanitary systems, and lack of good quality potable water. If plants found in the common neighborhood or immediate vicinity can become a proven source for treatment of common sicknesses like gastrointestinal disorders, not only it can provide the patients with a cheap and accessible source of cure, but also spur efforts toward conservation of medicinal plants, which are fast becoming endangered throughout the world.

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