

## TRIBAL FORMULATIONS FOR TREATMENT OF PAIN: A STUDY OF THE BEDE COMMUNITY TRADITIONAL MEDICINAL PRACTITIONERS OF PORABARI VILLAGE IN DHAKA DISTRICT, BANGLADESH

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## Abstract

The Bedes form one of the largest tribal or indigenous communities in Bangladesh and are popularly known as the boat people or water gypsies because of their preference for living in boats. They travel almost throughout the whole year by boats on the numerous waterways of Bangladesh and earn their livelihood by selling sundry items, performing jugglery acts, catching snakes, and treating village people by the various riversides with their traditional medicinal formulations. Life is hard for the community, and both men and women toil day long. As a result of their strenuous lifestyle, they suffer from various types of pain, and have developed an assortment of formulations for treatment of pain in different parts of the body. Pain is the most common reason for physician consultation in all parts of the world including Bangladesh. Although a number of drugs are available to treat pain, including non-steroidal, steroidal, and narcotic drugs, such drugs usually have side-effects like causing bleeding in the stomach over prolonged use (as in the case of rheumatic pain), or can be addictive. Moreover, pain arising from causes like rheumatism has no proper treatment in allopathic medicine. It was the objective of the present study to document the formulations used by the Bede traditional practitioners for pain treatment, for they claim to have used these formulations over centuries with success. Surveys were conducted among a large Bede community, who reside in boats on the Bangshi River by Porabari village of Savar area in Dhaka district of Bangladesh. Interviews of 30 traditional practitioners were conducted with the help of a semi-structured questionnaire and the guided field-walk method. It was observed that the Bede practitioners used 53 formulations for treatment of various types of pain, the main ingredient of all formulations being medicinal plants. Out of the 53 formulations, 25 were for treatment of rheumatic pain, either exclusively, or along with other types of body pain. A total of 65 plants belonging to 39 families were used in the formulations. The Fabaceae family provided 7 plants followed by the Solanaceae family with 4 plants. 47 out of the 53 formulations were used topically, 5 formulations were orally administered, and 1 formulation had both topical and oral uses. 8 formulations for treatment of rheumatic pain contained *Calotropis gigantea*, suggesting that the plant has strong potential for further scientific studies leading to discovery of novel efficacious compounds for rheumatic pain treatment.

## Introduction

The International Association for the Study of Pain has defined pain as an “unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” (Bonica, 1979). Pain is the most common reason for physician consultation in the United States (Turk and Dworkin, 2004), and is probably the same in other countries of the world. Pain usually disappears after the noxious stimuli have been removed or any pathological damages caused by the pain have been healed. Examples of this type of pain are pain during childbirth, surgery, or bone fractures. However, some painful medical conditions can persist for years or even lifetime after they have developed. Rheumatoid arthritis, peripheral neuropathy, cancer and idiopathic pain are examples of such conditions. Depending on the time that the pain exists, physicians usually distinguish between acute pain (pain that does not stay long) or chronic pain (pain that lasts for years).

Various steroidal, non-steroidal and narcotic drugs are used to ameliorate pain. While steroidal drugs are usually not prescribed by a physician, non-steroidal drugs like ibuprofen and aspirin are commonly prescribed, and in many countries of the world, these drugs can be obtained without a physician’s prescription, and are referred to as ‘over the counter’ or OTC drugs. Bleeding in the stomach is the main side-effect of such medicines. Moreover, prolonged use of aspirin, which is also suggested by physicians for treatment of patients with cardiovascular disorders, act as ‘blood thinning agent’ and can lead to problems like delayed or very low blood clotting following injury, thus leading to considerable amounts of blood loss. Other pain-killing non-steroidal drugs like acetaminophen can cause liver or kidney damage. Narcotic drugs are rarely prescribed by a physician except

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in severe cases for their propensity to be addictive. A new class of non-steroidal drugs, namely COX-2 (cyclooxygenase-2) inhibitors have arrived on the market. However, apart from celecoxib, other drugs like valdecoxib and rofecoxib have been withdrawn because of increased risks of heart attack and severe skin toxicity. It is thus no surprise that pain is one of the most common reasons for people to use complementary or alternative medicines for their perceived lesser risks, easy availability and cheaper prices (Austin, 1998).

Bangladesh has a number of indigenous communities, each possessing their own traditional medicinal systems. For the most part, these traditional medicinal systems rely on medicinal plants for treatment of various disorders. The Bedes, otherwise known as the 'river gypsies' or 'boat people' are one of the largest indigenous communities in Bangladesh. The Bedes prefer living on boats and travel almost throughout the year on the numerous waterways of the country, seldom living more than a few days at any given place. Their main occupations are selling sundry items, performing jugglery acts, catching snakes, and treating village people by the various riversides with their traditional medicinal formulations. Their income level is poor and because of the nature of their occupation(s), they have to row boats for long distances or traverse various villages by walking on foot on a daily basis. As a result of their strenuous lifestyle, pain is a common feature of this community people. Recently, the Government of Bangladesh has been trying to settle the Bede people by various riversides for more accurate census of their population and providing them with some basic amenities of life like education and medical care. This has met with scant success since most Bede people still cling to their traditional way of life; however, a population of about 12,000 has settled by the Bangshi River in Porabari village of Savar Municipality in Dhaka district of Bangladesh. Because of their living close by Dhaka city, which is the capital of Bangladesh, the Bede community of Porabari is getting used to a semi-urban lifestyle, and is fast losing their traditional medicinal practitioners. Nevertheless, they still continue their old habits of traveling periodically on the rivers and their occupations have not changed to any substantial extent. Their traditional medicinal practitioners still exist, although they are getting old, and anecdotal evidence suggests that their practitioners are often visited by even the affluent sections of the Dhaka city population, who have access to the most modern treatments given by allopathic doctors.

We had been conducting ethnomedicinal surveys among various tribes of Bangladesh over the last few years (Rahmatullah et al, 2011 a-e; Rahmatullah et al, 2012 a,b). Our surveys over the past two years have also included the Bede communities residing, respectively, by the Bangshi and the Turag Rivers in Dhaka district of Bangladesh ((Rahmatullah et al, 2011f; Seraj et al, 2011 a,b), which documented, among other things, the use of gemstones and amulets among the Bede community by the Bangshi River for therapeutic purposes. During the course of these surveys, we observed that the larger Bede community by the Bangshi River has a number of traditional medicinal practitioners, whose formulations included quite a large number of formulations for treatment of various types of pain. Since pain is such a common affliction of human beings throughout the world, and better drugs can prove a boon to mankind, it was the objective of the present survey to conduct interviews among the Bede practitioners and document the various formulations specifically used for treatment of pain, which may arise from multiple causes. The other point of interest was to document the formulations used for treatment of rheumatic pain. Rheumatism is a disease which cannot be cured with allopathic treatment; the available drugs merely alleviate pain associated with the disease. Since such drugs are to be used following occurrence of the disease for the rest of one's lifetime and so can cause severe side-effects through prolonged use, any safe and efficacious drug resulting from the Bede formulations can be useful to millions of people worldwide who suffer from rheumatism.

## Materials and Methods

The present survey was conducted between 2009 and 2011 at Porabari village in Savar Municipality on the outskirts of Dhaka city in Dhaka district, Bangladesh. A large community of about 12,000 Bede people is settled there. Although they now possess their own homes by the bank of the Bangshi River, they still to a large extent maintain their lifestyle of periodic travelling by boats to various villages away from their homes and plying their various traditional occupational activities. By their own account, their life style is strenuous, giving rise to different types of pain, including pain in different parts of the body from toiling day till late night, and also including rheumatic pain. Over the centuries, they have developed a number of formulations for treating pain, and they claim that these formulations are effective.

A total of 30 practitioners were located among the Bede community who claimed to treat pain with their formulations. Of these 30 practitioners, 15 were men and 15 women. 14 practitioners (12 men and 2 women) claimed to be full time practitioners and treated an assortment of diseases. The other 16 practitioners treated pain as a side-occupation and were mainly engaged in other types of work like snake catching, selling items like pots, pans, trinkets and other sundry items to village people (particularly rural women), or performing various acts of jugglery and magic, as well as snake dances and monkey dances.

Interviews were conducted of the 30 practitioners with the help of a semi-structured questionnaire and the guided field-walk method of Martin (1995) and Maundu (1995). In this method, the Bede practitioners took the interviewers (mostly on boats) to various areas from where they collected their medicinal plants, pointed out the plants, and described their uses. It is to be noted that while data was collected on all medicinal plants used by the practitioners for treatment of an assortment of diseases, the present report will document only those plants and formulations used specifically for treatment of different types of pain. At first, the practitioners refused to divulge any details, but with time and familiarity, they started giving out their various formulations. Interviews were conducted in the Bengali language, which was spoken by both practitioners and the interviewers. Plant specimens as pointed out by the practitioners were photographed and collected on the spot, dried, and identified by Mr. Manjur-Ul-Kadir Mia, ex-Curator and Principal Scientific Officer of the Bangladesh National Herbarium at Dhaka. Voucher specimens were deposited at the Medicinal Plant Collection Wing of the University of Development Alternative.

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Table 1. Plants used for treatment of various types of pain by the Bede traditional medicinal practitioners of the Bede community at Savar, Dhaka

Serial Number	Types of pain and formulation(s)	Local name of plants/ingredients used
1	Rheumatic pain. Juice obtained from macerated leaves of <i>Justicia adhatoda</i> L. (Acanthaceae) is mixed with juice obtained from macerated leaves of <i>Calotropis gigantea</i> (L.) Ait.f. (Asclepiadaceae) and leaves of <i>Datura metel</i> (L.) (Solanaceae), and 1 tola (local measure, 80 tolas = 1 kg) oil of turpentine and applied to affected areas once daily for 7 days.	<i>Justicia adhatoda</i> : Bashok <i>Calotropis gigantea</i> : Dudh akondo <i>Datura metel</i> : Kalo dhutra
2	Severe body pain or pain in hand. For pain, leaves of <i>Justicia gendarussa</i> L. (Acanthaceae), leaves of <i>Clerodendrum viscosum</i> Vent. (Lamiaceae) and leaves of <i>Urena sinuata</i> L. (Malvaceae) are macerated and applied to affected areas twice daily for 7 days.	<i>Justicia gendarussa</i> : Nichinda pata <i>Clerodendrum viscosum</i> : Bhait pata <i>Urena sinuata</i> : Bilai achra
3	Severe pain in body. Leaves of <i>Ruellia tuberosa</i> L. (Acanthaceae) are macerated and applied for 2 hours to the body twice daily for 7 days.	<i>Ruellia tuberosa</i> : Mone lota
4	Severe rheumatic pain. Leaves of <i>Crinum asiaticum</i> L. (Liliaceae) are mixed with leaves of <i>Datura metel</i> L. (Solanaceae), leaves of <i>Calotropis gigantea</i> (L.) Ait.f. (Asclepiadaceae), roots of small plants of <i>Bombax ceiba</i> L. (Bombacaceae), bark of <i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn. (Combretaceae), leaves of <i>Hydrolea zeylanica</i> (L.) Vahl. (Hydrophyllaceae), camphor, and oil of turpentine (little amount) and macerated together. The mixture is then boiled with ½ cup mustard oil [oil obtained from seeds of <i>Brassica napus</i> L. (Cruciferae)] for 1 hour. The decoction is then massaged on painful areas.	<i>Crinum asiaticum</i> : Go-roshun <i>Datura metel</i> : Kalo dhutra <i>Calotropis gigantea</i> : Dudh akondo <i>Bombax ceiba</i> : Shimul <i>Terminalia arjuna</i> : Arjun <i>Hydrolea zeylanica</i> : Bish long <i>Brassica napus</i> : Shorisha
5	Waist pain. Leaves of <i>Sansevieria roxburghiana</i> Schult. & Schult. f. (Agavaceae) are crushed so that the thread like fibers within the leaves can be taken out. The fibers are tied to the waist for 7 days.	<i>Sansevieria roxburghiana</i> : Choch mukhi
6	Severe pain of any type including rheumatic pain. Macerated leaves of <i>Annona squamosa</i> L. (Annonaceae) are applied to painful areas for 1-2 hours twice daily in the morning and evening for 7 days.	<i>Annona squamosa</i> : Ata
7	Pain due to injury, body ache. Macerated leaves of <i>Carissa carandas</i> L. (Apocynaceae) are applied to painful areas twice daily for 7 days.	<i>Carissa carandas</i> : Koromcha
8	Rheumatic pain. Juice obtained from macerated leaves of <i>Thevetia peruviana</i> (Pers.) K. Schum. (Apocynaceae) are applied twice daily to painful areas in the morning and evening for 7 days.	<i>Thevetia peruviana</i> : Mon shila
9	Any type of severe pain (body ache, rheumatic pain). Leaves of <i>Calotropis gigantea</i> (L.) Ait.f. (Asclepiadaceae), <i>Datura stramonium</i> L. (Solanaceae) and <i>Crataeva magna</i> (Lour.) DC. (Capparaceae) are macerated together and the juice obtained applied to painful areas twice daily in the morning and evening for 7 days.	<i>Calotropis gigantea</i> : Dudh akondo <i>Datura stramonium</i> : Shada dhutra <i>Crataeva magna</i> : Bonya pata
10	Any type of body pain (rheumatic pain, pain due to injury, severe body ache). Leaves of <i>Calotropis gigantea</i> (L.) Ait.f. (Asclepiadaceae) and <i>Datura metel</i> L. (Solanaceae) are warmed and applied to painful areas. Alternately, leaves of the two plants are macerated together and applied as poultice to painful areas.	<i>Calotropis gigantea</i> : Dudh akondo <i>Datura metel</i> : Kalo dhutra
11	Rheumatic pain. Leaves of <i>Calotropis gigantea</i> (L.) Ait.f. (Asclepiadaceae) and <i>Datura metel</i> L. (Solanaceae) are mixed with 100g mustard oil [oil obtained from seeds of <i>Brassica napus</i> L. (Cruciferae)], 10g oil of turpentine, garlic [ <i>Allium sativum</i> L. (Liliaceae)] cloves and ginger [rhizomes of <i>Zingiber officinale</i> Roscoe (Zingiberaceae)] and boiled in water for 30 minutes. The decoction is thoroughly massaged on to painful areas twice daily for 7 days. Alternately, juice obtained from macerated leaves of <i>Calotropis gigantea</i> and <i>Datura metel</i> is mixed with a little amount of oil of turpentine and massaged on to painful areas in the morning and evening for 7 days. Alternately, leaves of <i>Calotropis gigantea</i> are slightly warmed and applied on to painful areas twice daily for 7 days or longer, if necessary.	<i>Calotropis gigantea</i> : Dudh akondo <i>Datura metel</i> : Kalo dhutra <i>Brassica napus</i> : Shorisha <i>Allium sativum</i> : Roshun <i>Zingiber officinale</i> : Ada
12	Pain due to injury. Warmed leaves of <i>Calotropis gigantea</i> (L.) Ait.f. (Asclepiadaceae) are applied to painful areas. At the same time 100g of mustard oil [oil obtained from seeds of <i>Brassica napus</i> L. (Cruciferae)] and	<i>Calotropis gigantea</i> : Dudh akondo <i>Brassica napus</i> : Shorisha

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	100g of kerosene are mixed together and applied to the painful areas. Alternately, warmed leaves of <i>Calotropis gigantea</i> are applied to painful areas twice daily for 7 days.	
13	Rheumatic pain, pain arising from gout. Juice obtained from 4-5 leaves of <i>Calotropis gigantea</i> (L.) Ait.f. (Asclepiadaceae) is mixed with old ghee (clarified butter) and applied on to painful areas twice daily for 7 days.	<i>Calotropis gigantea</i> : Dudh akondo
14	Rheumatic pain, joint pain. Macerated leaves of <i>Calotropis gigantea</i> (L.) Ait.f. (Asclepiadaceae) are mixed with mustard oil and massaged on to painful areas till the pain subsides.	<i>Calotropis gigantea</i> : Dudh akondo
15	Severe pain due to hurt or injury. Leaves of <i>Bixa orellana</i> L. (Bixaceae) are macerated on a <b>shil pata</b> (flat piece of stone) and massaged on to the painful area twice daily for 7 days.	<i>Bixa orellana</i> : Kalo jafran
16	Any type of pain (body ache, pain due to injury, rheumatic pain). Crushed leaves of <i>Crataeva magna</i> (Lour.) DC. (Capparaceae) are applied as poultice to painful areas for 2 hours twice daily in the morning and evening for 7 days.	<i>Crataeva magna</i> : Bonya pata
17	Stomach pain, severe body pain. Leaves of <i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn. (Combretaceae) are macerated with roots of <i>Glycyrrhiza glabra</i> L. (Fabaceae), fruits of <i>Elettaria cardamomum</i> (L.) Maton (Zingiberaceae), bark of <i>Cinnamomum verum</i> J. Presl. (Lauraceae), slight amount of sugar, rhizomes of <i>Zingiber officinale</i> Roscoe (Zingiberaceae), and leaves of <i>Vitis trifolia</i> L. (Vitaceae). Pills made from the macerated mix is taken twice daily (on pill each time) in the morning and evening till cure.	<i>Terminalia arjuna</i> : Arjun <i>Glycyrrhiza glabra</i> : Josti modhu <i>Elettaria cardamomum</i> : Elach <i>Cinnamomum verum</i> : Daruchini <i>Zingiber officinale</i> : Ada <i>Vitis trifolia</i> : Jongli telakucha
18	Headache, severe body pain. Leaves and stems of <i>Ageratum conyzoides</i> L. (Asteraceae) are crushed together with leaves of <i>Coccinia grandis</i> (L.) J. Voigt (Cucurbitaceae) and <i>Cycas rumphii</i> Miquel (Cycadaceae) and applied to painful areas twice daily for 7 days.	<i>Ageratum conyzoides</i> : Jongli shorpo lota <i>Coccinia grandis</i> : Telakucha <i>Cycas rumphii</i> : Moniraj
19	Pain in body, head and legs, severe rheumatic pain. Leaves of <i>Xanthium indicum</i> J. Koenig ex Roxb. (Asteraceae) are boiled with stems in water for 10 minutes. Then they are taken in the cooked form like chochori (Bangladeshi dish where the liquid has been mostly evaporated). Alternately, stems are slightly boiled in a little water and juice obtained from those crushed stems is taken. For severe rheumatic pain, the juice has to be taken twice daily in the morning and evening for straight 7 days or if the pain is severe then for straight 21 days.	<i>Xanthium indicum</i> : Hagra gach
20	Body ache. Juice from macerated leaves of <i>Codiaeum variegatum</i> (L.) A.Juss. (Euphorbiaceae) is mixed with molasses obtained from stem juice of sugarcane, <i>Saccharum officinarum</i> (L.) Poaceae) and taken twice daily on an empty stomach in the morning and evening for 7 days.	<i>Codiaeum variegatum</i> : Pata bahar <i>Saccharum officinarum</i> : Kush, Aakh
21	Body ache. Macerated leaves of <i>Croton bonplandianum</i> Baill. (Euphorbiaceae) are applied twice daily as poultice for 1-2 hours on painful areas. This is continued for 7 days.	<i>Croton bonplandianum</i> : Morich fuler gach, Morich gach
22	Rheumatic pain, pain from injury, severe body ache. Oil obtained from fruits of <i>Ricinus communis</i> L. (Euphorbiaceae) is applied to painful areas. Alternately, juice obtained from macerated fruits is massaged twice daily for 7 days onto painful areas.	<i>Ricinus communis</i> : Venna
23	Headache, rheumatic pain, severe body ache. Crushed leaves of <i>Cassia fistula</i> L. (Fabaceae) are applied to painful areas twice daily for 7 days.	<i>Cassia fistula</i> : Shonalu, Bador lathi
24	Severe body aches from any cause other than rheumatic pain. Crushed leaves of <i>Cassia occidentalis</i> L. (Fabaceae) are applied to painful areas at a time for 2 hours twice daily in the morning and evening for 7 days.	<i>Cassia occidentalis</i> : Jhonjhoni
25	Body ache, pain from injury. Crushed leaves of <i>Cassia sophera</i> L. (Fabaceae) are rubbed on to painful areas for 2 hours at a time twice daily in the morning and evening for 7 days.	<i>Cassia sophera</i> : Motmotae
26	Tooth ache. Roots of <i>Mimosa pudica</i> L. (Fabaceae) are boiled for some time in water and then the water is used for gargling twice daily till cure.	<i>Mimosa pudica</i> : Lal lojjaboti
27	Any type of pain. Crushed leaves of <i>Mucuna pruriens</i> (L.) DC. (Fabaceae) are applied to painful areas twice daily for 7 days.	<i>Mucuna pruriens</i> : Jongli shim, Alkushie

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28	Body ache. Juice obtained from macerated leaves of <i>Psidium guajava</i> L. (Myrtaceae) is taken twice daily for 7 days.	<i>Psidium guajava</i> : Peyara
29	Severe ear ache. A little amount of juice obtained from young leaf of <i>Lablab purpureus</i> (L.) Sweet (Fabaceae) is put once in the ears.	<i>Lablab purpureus</i> : Shim
30	Any type of severe body ache, rheumatic pain (pain in joints of hands or legs). Crushed leaves of <i>Sida acuta</i> Burm.f. (Malvaceae) is applied as a poultice twice daily in the morning and evening for 2 hours at a time for 7 days.	<i>Sida acuta</i> : Nakful gach
31	Body ache, pain in hand. Juice obtained from macerated leaves of <i>Cynodon dactylon</i> (L.) Pers. (Poaceae) is mixed with a handful of powdered sugarcane molasses [prepared from stem juice of <i>Saccharum officinarum</i> L. (Poaceae)] and taken twice daily in the morning and evening.	<i>Cynodon dactylon</i> : Dubla ghas <i>Saccharum officinarum</i> : Kush, Aakh
32	Any type of pain (severe body ache, rheumatic pain). Juice obtained from macerated leaves of <i>Leonurus sibiricus</i> L. (Lamiaceae) is applied twice daily in the morning and evening to painful areas for 7 days.	<i>Leonurus sibiricus</i> : Jongla bhang
33	Severe pain (like rheumatic pain), pain over the whole body. Juice obtained from leaves of <i>Barringtonia acutangula</i> (L.) Gaertn. (Lecythidaceae) is applied all over the body twice daily for 2-3 hours each time for 7 days.	<i>Barringtonia acutangula</i> : Hijol
34	Severe rheumatic pain (pain in joints of hands and legs). Leaves of <i>Careya arborea</i> Roxb. (Lecythidaceae), <i>Leea asiatica</i> (L.) Risdale (Leeaceae) and <i>Polygonum orientale</i> L. (Polygonaceae) are macerated together and applied to painful areas twice daily in the morning and evening for a period of 2 hours each time for 7 days.	<i>Careya arborea</i> : Bisholi koroli <i>Leea asiatica</i> : Shal bishal <i>Polygonum orientale</i> : Bish katali
35	Rheumatic pain. Crushed leaves and stems of <i>Lygodium flexuosum</i> (L.) Sw. (Lygodiaceae) is applied as poultice for 2 hours each time twice daily for 7 days.	<i>Lygodium flexuosum</i> : Pala dhepo
36	Severe body pain. Leaves of <i>Stephania japonica</i> (Thunb.) Miers (Menispermaceae) are crushed and applied to painful areas for 1 hour at a time twice daily for 7 days.	<i>Stephania japonica</i> : Bongsho lota
37	Any type of pain including body pain, rheumatic pain. Crushed leaves of <i>Tinospora crispa</i> (L.) Hook.f. & Thoms. (Menispermaceae) are applied to painful areas twice daily in the morning and evening for 7 days. For rheumatic pain, the external portions of the stems are removed followed by chewing of the green inner part.	<i>Tinospora crispa</i> : Aam buruj lota
38	Severe body pain. Crushed leaves of <i>Artocarpus lakoocha</i> Roxb. (Moraceae) are applied to painful areas as poultice for 2 hours at a time till cure.	<i>Artocarpus lakoocha</i> : Dewa
39	Any type of severe pain including pain from injury, body pain, rheumatic pain. Crushed leaves of <i>Ficus heterophylla</i> L.f. (Moraceae) are applied to painful areas twice daily in the morning and evening for 7 days. Applications are made for 2 hours at a time.	<i>Ficus heterophylla</i> : Bish basholi
40	Headache, body ache. Juice obtained from macerated leaves of <i>Mirabilis jalapa</i> L. (Nyctaginaceae) is massaged on to painful areas twice in the morning and evening for 1 day.	<i>Mirabilis jalapa</i> : Shondhya maloti
41	Any type of pain (body pain, pain due to injury, rheumatic pain). Crushed leaves of <i>Polygonum orientale</i> L. (Polygonaceae) are massaged on the painful areas twice daily in the morning and evening for 7 days.	<i>Polygonum orientale</i> : Bish kantali
42	Body pain. Leaves and stems of <i>Borreria articularis</i> (L.f.) F.N. Will. (Rubiaceae) are crushed and applied to painful areas twice daily in the morning and evening for 7 days.	<i>Borreria articularis</i> : Jongli dondo kolosh
43	Any type of pain (rheumatic pain, pain due to injury, body pain). Juice obtained from macerated leaves of <i>Zanthoxylum rhetsa</i> (Roxb.) DC. (Rutaceae) is massaged on to the painful areas twice daily for 7 days.	<i>Zanthoxylum rhetsa</i> : Tejbol
44	Headache, pain in the head. Juice obtained from macerated leaves and fruits of <i>Solanum violaceum</i> Orteg. (Solanaceae) is applied twice daily to the head in the morning and evening for 1-2 hours at a time for 7 days.	<i>Solanum violaceum</i> : Tith baegun, Dhol baegun
45	Headache, body pain, rheumatic pain. Crushed leaves of <i>Withania somnifera</i> (L.) Dunal (Solanaceae) are applied to painful areas twice daily in the morning and evening for 7 days.	<i>Withania somnifera</i> : Ashwo Gondha
46	Any type of severe pain (body pain, pain due to injury, rheumatic pain). Juice obtained from macerated leaves of	<i>Trema orientalis</i> : Pat pata



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	<i>Trema orientalis</i> (L.) Blume (Ulmaceae) is applied for 2 hours at a time twice daily for 7 days.	
47	Any type of pain (body pain, pain due to injury, rheumatic pain). Crushed leaves of <i>Eryngium foetidum</i> L. (Umbelliferae) are applied twice daily in the morning and evening for 2 hours at a time to painful areas for 7 days.	<i>Eryngium foetidum</i> : Shorpo lota
48	Severe pain in hands or body. Crushed leaves of <i>Streblus asper</i> Lour. (Moraceae) are applied to painful areas twice daily in the morning and evening for 7 days.	<i>Streblus asper</i> : Shaora
49	Severe pain (pain due to hurt or injury, body pain). Crushed leaves of <i>Pouzolzia zeylanica</i> (L.) Benn. & R.Br. (Urticaceae) are applied for 2 hours at a time twice daily for 7 days.	<i>Pouzolzia zeylanica</i> : Nila gach
50	Severe body pain. Macerated leaves of <i>Lantana camara</i> L. (Verbenaceae) are applied twice daily in the morning and evening to painful areas for 7 days.	<i>Lantana camara</i> : Jongli krishnochura
51	Any type of body pain (pain due to injury, headache, pain in any part of body). Macerated leaves of <i>Phyla nodiflora</i> (L.) Greene (Verbenaceae) are applied to painful areas twice daily for 7 days.	<i>Phyla nodiflora</i> : Koi okra, Swapna lota
52	Any type of pain. Macerated leaves of <i>Vitex negundo</i> L. (Verbenaceae) are applied to painful areas for 2 hours at a time twice daily for 7 days.	<i>Vitex negundo</i> : Nishinda
53	Any type of pain (body pain, headache, pain due to injury). Crushed leaves of <i>Parthenocissus quinquefolia</i> (L.) Planch. (Vitaceae) are applied to painful areas once daily for 7 days.	<i>Parthenocissus quinquefolia</i> : Gongga jol

## Results

Fifty three formulations were obtained from the 30 Bede traditional practitioners, which were used by them for treatment of various types of pain like rheumatic pain, body pain, pain in hands or legs, waist pain, pain due to injury, pain due to gout, joint pain, headache, toothache, and ear ache. Of the total 53 formulations for pain, 25 were for rheumatic pain and 36 formulations were for body pain (both severe and non-severe). A number of formulations were mentioned by the practitioners to be applicable for treatment of rheumatic pain as well as body pain. A total of 65 plant species were used in the 53 formulations, which plant species were distributed in to 39 families. The results are shown in Table 1.

Of the 53 formulations, 5 formulations had oral applications and 47 formulations had topical applications. One formulation was used either orally or topically depending on the type of pain. For body pain, crushed leaves of *Tinospora crispa* were applied topically to affected areas, while for rheumatic pain treatment, external portions of stems from the same plant was removed followed by chewing of the green inner part. Eight formulations contained the plant *Calotropis gigantea*, making it the most frequently used plant in the Bede formulations. It was further observed that within these 8 formulations using *C. gigantea*, 7 formulations could be used for rheumatic pain. The *Cassia* genera was also interesting; three plants from this genera, namely, *Cassia fistula*, *C. occidentalis*, and *C. sophera* were observed to be used by the Bede practitioners for treatment of pain, particularly body pain. Leaves constituted the major plant part used, forming 75.3% of total uses. Leaves were followed by stems at 7.5% of total uses. Other plant parts used in the formulations included roots, barks, fruits, seeds, cloves, and rhizomes.

Formulations could be both simple and complex. As an example, for treatment of severe pain in the body, leaves of only one plant *Ruellia tuberosa* were macerated and applied to the body. On the other hand, for treatment of rheumatic pain, several plant parts were used in combination like leaves of *Crinum asiaticum*, *Datura metel*, *C. gigantea*, and *Hydrolea zeylanica* along with roots of *Bombax ceiba* and bark of *Terminalia arjuna*. In addition, these plant parts were macerated with camphor and oil of turpentine and then boiled with oil obtained from seeds of *Brassica napus*. The ensuing decoction was then applied topically. Oil of turpentine, kerosene (paraffin oil), ghee (clarified butter), and mustard oil were occasionally used in formulations with topical applications. Oil can serve as an emollient, help absorption of lipid-soluble phytochemicals, and further help spread evenly complex mixtures on the skin. This suggests that the Bede practitioners had practical knowledge of the benefits of oil in topical formulations.

Although 30 practitioners were interviewed, none treated all sorts of pain, suggesting some sort of specialization within the practitioners for various types of pain treatment. The formulations for treatment of the same type of pain also differed between practitioners, and even within a single practitioner. For instance, in three formulations obtained from a single practitioner for treatment of rheumatic pain and all formulations using as common the same plant, namely *C. gigantea*, the first formulation contained leaves of the plant along with leaves of *Datura metel*, oil from seeds of *B. napus*, oil of turpentine, cloves of *Allium sativum* and rhizomes of *Zingiber officinale*. The second formulation contained leaves of *C. gigantea* and *D. metel* along with oil of turpentine, while in the third formulation, leaves of *C. gigantea* were simply slightly warmed and applied to painful areas (see Serial No. 11, Table 1). When queried, the practitioner replied that complex formulations usually were more effective, but simpler formulations were substituted if not all the ingredients were available during the time of need.

## Discussion

Indigenous communities or tribal people very often live separately from the mainstream population in isolated areas and so lack some basic civic amenities and comforts of life. Their lifestyle is also strenuous, necessitating hard work for their very existence. The Bedes are no exception to this rule; their occupation compels them to two types of hard work – rowing boats, and travelling long distances with heavy loads to sell various items to people living in villages, which may be scattered miles apart. Different types of pain, and possibly more so than the mainstream population, are a result of this strenuous life style and occupational needs of the indigenous people. As a result, various indigenous communities have developed their own traditional medicines to deal with pain. To cite a few instances, 37 species of plants are reportedly used in the traditional medicine of the Porvenir community in the Bajo Paraguá Indian Reservation of Bolivia (Hajdu and Hohmann, 2012). Chronic joint pains are treated with 37 plants in the traditional medicinal system of the Machakos and Makueni counties in Kenya (Wambugu et al, 2011). In traditional Uighur and Tibetan medicines, three plants are used for treatment of pain and inflammatory conditions (Yi et al, 2010). The traditional medicine of Lebanon also uses plants for treatment of pain arising from rheumatism (El Beyrouthy et al, 2008). Plants with analgesic properties are also in use in the traditional medicinal systems of India and Mexico (Malairajan et al, 2006; Deciga-Campos et al, 2005).

A number of *Cassia* genera plant species are known for their analgesic or antinociceptive properties. A piperidine alkaloid with antinociceptive property has been reported from *C. leptophylla* (Alexandre-Moreira et al, 2003). *C. singueana* is reportedly used during malaria for treatment of pain and fever arising from the disease (Adzu et al, 2003). Antinociceptive and smooth muscle contracting activities has been reported for methanolic extract of *Cassia tora* leaves (Chidume et al, 2002). Analgesic activity has been demonstrated for ethanolic extract of *C. fistula* stem bark (Ali et al, 2012). Analgesic and antipyretic activity of aqueous and ethanol extracts of *C. occidentalis* have been reported (Sini et al, 2010). Analgesic activity has also been reported for different plant part extracts of *C. sophera* (Nagore et al, 2010). Notably, the last three *Cassia* species mentioned

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above were used by the Bede practitioners for treatment of pain, and available scientific reports fully validate the use of these plants for analgesic purposes. Based on the available scientific reports, the *Cassia* genera might prove to be a valuable source for discovery of new and safer analgesic (pain-killing) drugs.

*C. gigantea* (synonym: *Calotropis procera*) was noted to be used by the Bede practitioners for treatment of pain in 8 different formulations, most of which included treatment of rheumatic pain. Notably, latex of the plant possesses antinociceptive properties (Soares et al, 2005); thus there is scientific validation for its traditional use by the Bedes as an analgesic. Rheumatism is a disease for which allopathic medicine has no curable treatment, and so persists life-long in a person, who has the disease. The disease is characterized by intensive pain persisting for years. Since long-term use of currently available analgesic drugs can have serious side-effects, *C. gigantea* merits further scientific research for its potential in the discovery of novel and safe pain-killing drugs, which, if necessary, can be used for long-term periods without side-effects. Taken together, the formulations obtained from the Bede practitioners can form the basis for scientific research on the plants used in the formulations, leading to discovery of lead compounds and more efficacious drugs.

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