

MEDICINAL PLANT DIVERSITY AND LOCAL HEALTHCARE AMONG THE PEOPLE LIVING IN AND AROUND A CONSERVATION AREA OF NORTHERN BANGLADESH

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Abstract

An ethno-medicinal investigation was carried out to understand the medicinal plants (MPs) diversity and local healthcare practice among the people living in and around a conservation area of northern Bangladesh. Study was conducted by interviewing 103 households; through a series of intensive field visits during February to June, 2006. Study revealed that, the area is very rich in MPs and peoples living in and proximity of the conservation area relies traditionally on these plants for their primary health care purpose. During the study a total of 40 species were identified having medicinal or curative value, including 15 tree, 11 shrub, 11 herb and 3 climbers. Among the identified MPs, local people's traditionally collected 60% species from the wild sources (i.e. from the conservation area) followed by cultivated (13%) and domestic (7%) sources. It was also observed that, local people used the identified MPs mostly for curing cold ailments followed by cough, cut and wounds, fever, dysentery, skin diseases and for other common ailments. Leaves were found to use heavily for medicinal preparations; other plant parts used to manufacture medicine were bark followed by fruit, root/rhizome, seed and whole plant.

Key words: Medicinal plants; Traditional uses; Satchari National Park; Bangladesh.

INTRODUCTION

Millions of people throughout the world traditionally use natural or herbal remedy for their primary health care since time immemorial. In fact, these natural products are readily available, environment friendly, cheap and without any side effects. Even now, many of the remoter areas of south-east Asia barely have been touched by 'modern' medicine; western health care provision is beyond the reach of many rural people, for whom traveling to urban centers for treatment is difficult, time consuming and costly (Young *et al.* 1988). Traditional medicine on the other hand, because of its decentralized nature, is generally easily and quickly available (Elliot *et al.* 1986). Yet again, in recent years, there has been a growth of interest on traditional natural

medicines in part driven by the interests in complementary medicine in industrial countries and in part resulting from the interests of the international pharmaceutical industry (Bodekar *et al.* 1997). The global demand for natural medicine is now growing day by day as almost 80% of the human population in developing countries relies chiefly on traditional, largely natural medicine to meet their primary healthcare needs (Farnsworth *et al.* 1985).

Bangladesh is a country considered to be rich in MPs genetic resources by virtue of its favorable agro-climatic condition and seasonal diversity. About 5 000 species of phanerogams and pteridophytes grows in the country's forests, wetlands, farms and even roadside as indigenous, naturally-

occurring or cultivated plants. Of these, more than a thousand have been claimed to possess medicinal or curative properties (Haque 2004). In recent years, like most other countries of the world these natural medicines have gained a wider recognition within the country. However, although the country is supposed to be a treasure house of various natural medicines; still there is a lack of systematic inventory or knowledge regarding its rich diversity of MPs and their traditional usage in various parts of the country (Dixie *et al.* 2003).

The linkage between biodiversity and human health is now well established (Bodeker, 2005). Conservation areas like protected area apart from their other conservation values contributing significantly to MP conservation. Yet again, people living in and around these conservation areas relies extensively on these areas to meet their primary health care needs like other subsistence requirements (i.e. fuelwood, fodder, weaving and building materials, bushmeat etc). Our study was aimed to assess the diversity and richness of MPs in and around a northern biodiversity rich conservation area of Bangladesh and their traditional usage for primary healthcare needs among the people living in and around that area, viz; Satchari National Park. The study will be helpful to reassess the invaluable role of conservation areas in MP conservation and to realize the local dependency and healthcare pattern through these natural medicinal products.

MATERIALS AND METHODS

The study area

We purposively selected Satchari National Park (Satchari NP) for the study considering its unique geo-physical

features and rich biological diversity. The park is newest among the eighteen protected areas (PAs) of Bangladesh and one among the four PAs of northern Bangladesh (Mukul *et al.* 2006). From various literatures it is evident that the park has been supported more than 241 species of local and exotic flora. Although, the area was previously classified as moist evergreen forest, but the large-scale conversion of the indigenous forest cover to plantations has changed it to just 200 ha of natural forest (Choudhury *et al.* 2004); the rest is secondary (raised plantation) forest.

The area of the park is about 243 ha which comprised the forests of Raghunandan Hills Reserve Forests within the Satchari Range. Administratively, the park is located in the Chunarughat Upazilla (sub-district) of Habiganj District and is situated nearly 130 km north-east of Dhaka. The Raghunandan Hill Reserve borders the park on its north-western part while India lies on the southern part of the park (**Figure 1**). Other adjacent areas are covered by tea estates, rubber gardens, agar plantations and paddy fields.

The topography of the park is undulating with slopes and hillocks, locally called *tilla*, ranging from 10 to 50 m in elevation. A number of small, sandy-bedded streams drain the forest, all of which dry out in the winter dry season after November. The total annual average rainfall is 4,162 mm. July is the wettest month having an average of about 1,250 mm of rain, while December is the driest with no rainfall. May and October, the hottest months, have an average maximum temperature around 32°C, while January is the coldest month when the minimum temperature drops to about 12°C. The relative

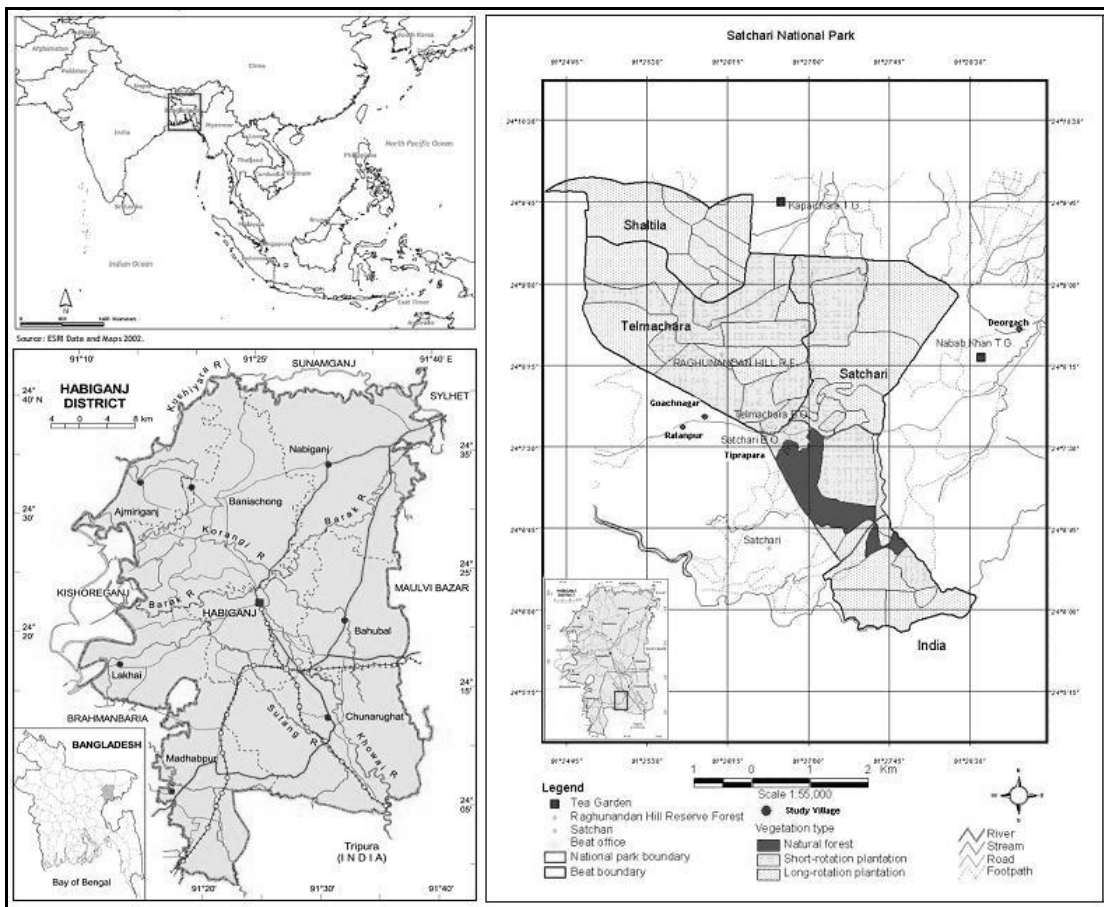
humidity of the area is about 74% during December while it is over 90% during July-August (Choudhury *et al.* 2004).

Brief summary of community livelihoods in the area

A total of 19 villages having varied degree of interests with the Satchari NP have so far been identified. Of them, one village is located within the national park area, which is inhabited by a tribal community, the ethnic Tripura tribe. The other

settlements that have stakes with the national park are located about 3-8 km away from the park. Local people have traditionally collected various resources from the Satchari NP and adjacent reserve forest. Many households, particularly poor households from the surrounding villages, rely entirely or partially on the national park for collecting fuelwood, timber, bamboo and natural remedies.

Figure 1. Location map of the study site



METHODOLOGY

We interviewed 103 households living in and outside villages of the national park. Respondents were selected randomly from four villages having different stakes with the park. The villages were also selected randomly from each of the first four forest dependency categories as identified by Mollah *et al.* (2004), including the only village inside the park—Tiprapara. Any villages with only minor dependency on the park were not selected.

We conducted intensive household surveys in our four sample villages—Tiprapara, Ratanpur, Deorgach and Goachnagar—from mid-February to late-June, 2006. Before household survey some random field visits were arranged on the

edge of this conservation area with local age old and resource person to assess and note the available MPs in the locality, specimens were collected in case of unidentified species.

In Tiprapara, we took a 100% sample, as villagers were highly dependent on the park for their subsistence. In other sample villages we took a 10% sample of households (**Table 1**). During the course of the household survey participant group meetings were conducted and semi-structured interviews were undertaken with members of the participating households to provide additional information regarding our field of interests.

Table 1. Study villages, location and sample size from the corresponding villages

Village	Location	Forest dependency	Population Size (HHs)	Sample size (n)	Forest Practices*
Tiprapara	Inside	Major	22	n = 22	Collect firewood, house building materials, fruits and other NTFPs, cultivate lemon and others
Ratanpur	Outside	Medium to major	156	n = 16	Mainly involved with illegal tree felling, and collecting firewood
Deorgach	Outside east	Medium	316	n = 32	Mainly collect firewood, some involved with illegal tree felling
Goachnagar	Outside west	Medium to minor	328	n = 33	Mainly collect firewood, some involved with illegal tree felling

* As described by Mollah *et al.* (2004)

For data collection we used a semi-structured questionnaire where the details about the MPs collected, their traditional usage, parts used for treating

various ailments, sources of collection and the ethnomedicinal preparation were recorded. Additional data were also gathered on the market potential of MPs.

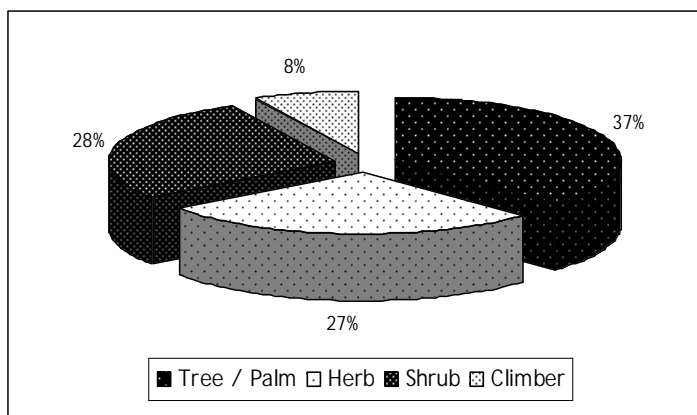
RESULTS AND DISCUSSION

Medicinal plant diversity in and around Satchari NP

Our study revealed a rich diversity of MPs in and around the Satchari NP. During our field investigations, a total of 40 plant species (Table 2) belonging to 29 families and distributed in 37 genera were recorded from the area which possesses some curative value. Many species of the family Rutaceae (4), Combretaceae (3), Euphorbiaceae (3) and Zingiberaceae (3) were found to frequently

use. All the MPs were found to collect by local users mainly for their own consumption (63%) followed by for commercial purpose (37%). Study also revealed that majority of the species used by the local inhabitants was tree followed by some shrub, herb and climber (Figure 2). It was also found that, 60% of species used by the local inhabitants of Satchari were collected through wild harvesting. Other collecting sources of MPs were rural homesteads (33%) and agricultural fields (7%).

Figure 2. Habit-wise distribution of medicinal plants in Satchari



Traditional usage of medicinal plants and their using pattern

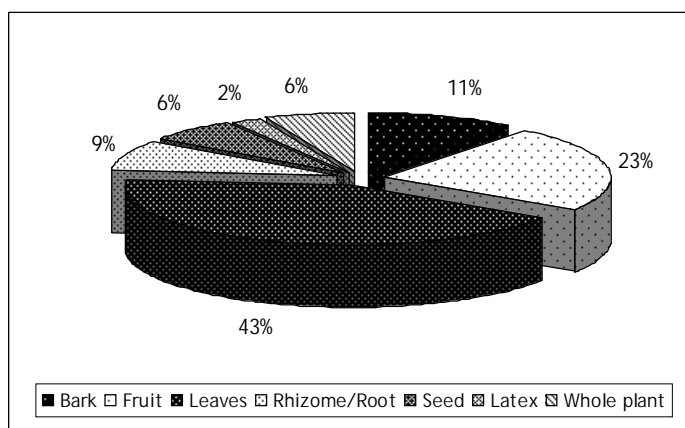
During our study approximately 74% respondents were found to use some sort of MPs in their every day life. However using of the MPs was not uniform in all of our studied villages. All the respondents of Tiprapra reported some kind of MP use in their primary healthcare purpose; however peoples from Ratanpur, Deorgach and Goachnagar used MPs at the percentage of 81%, 69% and 58%

respectively. It was also evident from our field investigation that, peoples of the area basically used the identified MPs for treating 29 different ailments which includes simple cut injury to highly complicated heart disease. In addition, some MPs were found to use to cure more than one ailment. As for example; *Terminalia chebula* and *Azadirachta indica* alone used to treat six different ailments. It was also revealed from the study that, 22.5% of MPs of the area were

used for treating cold ailments followed by cough (17.5%), cut and wounds (15%), fever (12.5%), dysentery (10%), skin diseases (10%) and other ailments. **Table 3** shows the different type of MP species used by the people of the Satchari area for treating various ailments and their frequency of use. The study also showed that, peoples were mostly used leaves (19

ailment) preferably in fresh and green condition for medicinal preparation; other plant parts used were fruits (11 ailments), bark (3 ailments), rhizome and root (4 ailments), seed (3 ailments), whole plants (2 ailments) and latex (1 ailments). **Figure 3** explains the percentage of different plant parts used for treating various ailments in Satchari area.

Figure 3. Medicinal plants break-up by parts used



Study suggests that, about 68.5% MPs in Satchari were taken orally followed by externally (21%) and both orally and externally (10.5%) used. In some cases different parts of an individual plant was found to use to cure different ailments in different ways. As for example; after boiling the fresh green leaves of *A. indica* the water is taken externally to treats skin disease and chicken pox and taken orally for curing fever, dysentery, diabetes and intestinal worm. Again, the green

leaves of *Calotropis gigantea* was found to putted on knee joint after heating on fire to relieve joint ache and the latex of the same species was used externally to treated cut injury. In addition, peoples often used the mixture of more than one plant to cure an ailment. They use the mixture of leave juice of *Adhatoda vasica* along with *Zingiber officinale* to relieve from cold ailments and cough. **Table 4** lists some ethno-medicinal preparations commonly used at Satchari area.



Figure 4. *C. gigantea*, *A. vasica* and *A. cardamomum* (clock wise); three widely used medicinal plants in Satchari area (Photographs: S. A. Mukul)

Again, although the people living in and around the Satchari NP were found to highly dependent on herbal remedies and have had a greater understanding on MPs. However, most of the species reported to use frequently against various ailments in that area were also evident from the study of many authors from different regions through out the world. *Aegle marmelos* (Kar *et al.* 2003); *A. indica* (Kar *et al.* 2003; Chattopadhyay, 1999) *C. gigantea* (Miah and Chowdhury, 2003); *Cymbidium aloifilium* (Sandhya *et al.* 2006); *Terminalia chebula* (Ignacimuthu *et al.* 2006); *Piper betel* (Miah and Chowdhury, 2003) are a few example.

Households' knowledge gathering pattern regarding ethnomedicinal plant usage

During our field survey it was observed that, the ethno-medicinal use of different

plant parts for treating various ailments is common among the ethnic Tripura community, whereas it is comparatively lesser in other outside villages. Perhaps, this is due the rich ethno-cultural background and forest dwelling nature of Tripura community. Throughout the study it was also found that, the elder persons (above 45 years of age) of the family possess more knowledge regarding MPs use and identification of than that of younger generations. Similar observation is also evident from the study of Uniyal *et al.* (2006); Ladio (2002) and Ladio & Lozada (2001, 2003) in various regions of the world. Data also showed that, females knew more about the usage of MPs than that of male. Most of the age-old female in our study area were found to familiar with the traditional uses of MPs growing in forest and in their vicinity.

CONCLUSION

Our study fairly accurately represents the local healthcare practice through locally available MPs in Satchari area. During the study, it was estimated that most of the supply (58%) of MPs in that area came through wild harvesting which generally collected from the national park area. This wild and sometimes unsustainable collection severely affected the existence of various important medicinal species, even, which may cause extinction of those species in near future. To stop this species extinction and cope with the vulnerable rural economy, domestication and cultivation of alternative supply sources of potential MPs outside the core conservation area is essential.

Besides, during the study we found that, in Satchari NP area collection and selling of some species like the medicinal bark of *Litsea monopetala* and the seed of *Ammomum aromaticum* play a significant role to household's cash income generation. Introducing and prioritizations of such species in Forest Department's buffer zone plantation strategy also with homestead agroforestry system might bring a positive impact in rural household economy as well as in forest conservation.

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Table2. Medicinal plants and their traditional uses of in and around Satchari NP

Family	Botanical name ¹	Local name	Parts used	Traditional use	Use frequency ² (%)	Habit	Occurrence	Remarks
Acanthaceae	<i>Adhatoda vasica</i> Nees	Basak	Fresh green leaves	Cough, cold ailments and asthma	84	Sh	C	W
Apiaceae	<i>Centella asiatica</i> (L.) Urban	Adamoni	Whole plant	Dysentery, diarrhoea, gastric pain	79	H	C	W
Apocynaceae	<i>Alstonia scholaris</i> (L.) R. Br.	Chatim	Leaves	Fever	54	Tr	R	D
Areaceae	<i>Cocos nucifera</i> L.	Narikel	Tender fruit	Hair falls, burns	62	Pa	C	W
Araceae	<i>Alocasia indica</i> (Lour.) Spach.	Harinpaya	Whole plant	Stomach trouble	38	H	R	W
Aslepiadaceae	<i>Calotropis gigantea</i> (L.) Ait. f.	Akanda	Leaves, latex	Joint pain, cut and wounds	66	Sh	C	W
Asteraceae	<i>Chromolaena odorata</i> (L.) King & H.E. Robins	Uzaru	Green leaves	Cut and wounds	71	H	C	W
	<i>Mikania scandens</i> (L.) Willd.	Assam lata	Green leaves	Cut and wounds	76	Cl	C	W
Bromeliaceae	<i>Ananas comosus</i> (L.) Merr.	Anaras	Fruit	Jaundice, intestinal worm	74	H	FC	D
Caricaceae	<i>Carica papaya</i> L.	Pepe	Fruit	Stomach trouble	68	Sh	C	D
Combretaceae	<i>Terminalia arjuna</i> W & A	Arjun	Bark	Heart disease, cold ailments, cough	68	Tr	R	W
	<i>Terminalia belerica</i> Roxb.	Bohera	Fruit	Constipation, stomach trouble, eye disease, loss of appetite	62	Tr	FC	W
	<i>Terminalia chebula</i> (Gaertn.) R etz.	Horitaki	Fruit	Constipation, fever, heart disease, cough, urinary problems, loss of appetite	58	Tr	FC	W

Convolvulaceae	<i>Ipomoea fistulosa</i> Roxb.	Donkalos	Whole plant	Cold ailments	54	Sh	C	W
Cucurbitaceae	<i>Coccinia cordifolia</i> Linn.	Telkucha pata	Green leaves	Cold ailments, diabetes	38	Cl	FC	W
Dilleniaceae	<i>Dillenia indica</i> Linn.	Chalta	Fruit	Hair falls	46	Tr	FC	D
Euphorbiaceae	<i>Phyllanthus emblica</i> Linn.	Amoloki	Fruit	Dysentery, skin diseases, hair falls, indigestion	38	Tr	FC	D
	<i>Trewia nudiflora</i> Linn.	Chagal ledi	Leaves	Fever	24	Tr	R	W
Fabaceae	<i>Cassia fistula</i> Linn.	Sonalu	Fruit, bark	Constipation	22	Tr	R	W
Lamiaceae	<i>Ocimum tenuiflorum</i> L.	Tulsi	Fresh green leaves	Cough, cold ailments, cut and wounds	62	H	FC	D
Lauraceae	<i>Litsea monopetala</i> (Roxb.) Pers.	Menda	Fresh green leaves and bark	Amoebic dysentery, diarrhoea, constipation	68	Tr	C	W
Meliaceae	<i>Azadirachta indica</i> Adr. Juss.	Neem	Fresh green leaves and seed	Skin diseases, chicken pox, fever, dysentery, diabetes, intestinal worm	76	Tr	FC	D
	<i>Melia azedarach</i> Linn.	Bokain	Green leaves	Skin diseases	38	Tr	FC	D
Mimosoideae	<i>Mimosa pudica</i> Linn.	Lazzabati	Roots	Not-specified	12	H	C	W
Moringaceae	<i>Moringa oleifera</i> Lamk.	Sajna	Bark	Cold ailments	22	Tr	C	D
Orchidaceae	<i>Cymbidium aloifolium</i> (L.) Sw.	Kuntus pata	Leaves, seeds	Ear ache, cut and wounds	08	H	C	W
Piperaceae	<i>Piper betel</i> Linn.	Paan	Fresh green leaves	Indigestion, loss of appetite	24	Cl	C	D
Poaceae	<i>Cymbopogon citratus</i> (DC. ex Nees) Stapf	Lemon ghass	Leaves	Not-specified	22	H	FC	W
	<i>Cynodon dactylon</i> (L.) Pers.	Durba ghass	Tender leaves	Tooth ache, cut and wounds	68	H	C	W
Polygonaceae	<i>Polygonum hydropiper</i> L.	Biskatali	Green leaves	Insect bites	32	H	C	W
Rutaceae	<i>Aegle marmelos</i> (L.) Corr. Serr.	Bel	Fruit	Weakness, colitis, diarrhoea	58	Tr	FC	D
	<i>Citrus acida</i> (Linn.)	Jambura	Fruit	Jaundice	62	Tr	C	D

	<i>Citrus limon</i> (Linn.) Burm. f.	Lebu	Fruit, Leaf	Indigestion	72	Sh	FC	D
	<i>Glycosmis pentaphylla</i> (Retz).	Fatikgila	Green leaves	Fever	18	Sh	C	W
Sterculiaceae	<i>Abroma augusta</i> (L.) Lf.	Ulatkambal	Bark, root	Female disorders	14	Sh	R	W
Theaceae	<i>Camellia sinensis</i> (L.) O. Kuntze	Chaa	Tender leaves	Heart disease, cold ailments, cough	46	Sh	C	C u
Verbenaceae	<i>Vitex negundo</i> Linn.	Nimunda	Green leaves	Tooth ache	38	H	C	W
Zingiberaceae	<i>Ammomum aromaticum</i> Roxb.	Taragota	Seed	Cough, cold ailments	68	Sh	C	W
	<i>Curcuma longa</i> Linn.	Holud	Rhizome	Skin diseases	52	Sh	FC	C u
	<i>Zingiber officinale</i> Roscoe	Ada	Rhizome	Cough, cold ailments	42	Sh	FC	C u

¹As per suggested by Bisby *et al.* (2007)

²Use frequency = number of people reported MPs use in relation to the total number of times that particular species was cited.

Key: Cl-climber, H-herb, Sh-Shrub, Tr-tree, Pa-palm

C-common, FC-fairly common, R-rare

Cu-cultivated, D-harvested from domestic sources, W-wild harvesting

Table 3. Traditional medicinal uses of different MPs for different ailments by the people of Satchari area

Name of ailments	Number of species reported				Total	Percentage of total (%)
	Tree / Palm	Herb	Shrub	Climber		
Asthma	-	-	1	-	1	2.5
Burns	1	-	-	-	1	2.5
Chicken pox	1	-	-	-	1	2.5
Cold ailments	2	1	5	1	9	22.5
Colitis	1	-	-	-	1	2.5
Constipation	4	-	-	-	4	10
Cough	2	1	4	-	7	17.5
Cut and wounds	-	4	1	1	6	15
Diabetes	1	-	-	1	2	5
Diarrhoea	2	1	-	-	3	7.5
Dysentery	3	1	-	-	4	10
Ear ache	-	1	-	-	1	2.5
Eye disease	1	-	-	-	1	2.5
Female disorders	-	-	1	-	1	2.5
Fever	4	-	1	-	5	12.5
Gastric pain	-	1	-	-	1	2.5
Hair falls	3	-	-	-	3	7.5
Heart disease	2	-	1	-	3	7.5
Indigestion	1	-	1	1	3	7.5
Insect bites	-	1	-	-	1	2.5
Intestinal worm	1	1	-	-	2	5
Jaundice	1	1	-	-	2	5
Joint pain	-	-	1	-	1	2.5
Loss of appetite	2	-	-	1	3	7.5
Skin diseases	3	-	1	-	4	10
Stomach trouble	1	1	1	-	3	7.5
Tooth ache	-	2	-	-	2	5
Urinary problems	1	-	-	-	1	2.5
Weakness	1	-	-	-	1	2.5
Not-specified	-	2	-	-	2	5

Table 4. Some common medicinal preparations of Satchari area

Local name	Used part	Therapeutic use	Using pattern
Ada	Rhizoime	Cough, cold ailments	The rhizomes are sliced and are taken with tea liquor or eaten directly with slight salt.
Adamoni	Whole plant	Dysentery	The whole plant along with the roots are crushed in pestle, mixed with salt and eaten with rice.
Akanda	Leaves	Joint ache	The leaves are warmed lightly over the fire and placed on the sprain joint.
Anaras	Fruit	Jaundice, intestinal worm	The fruit is eaten raw.
Arjun	Bark	Heart disease	After grinding the bark is soaked in water. The decanting water is then drunk mixed with 1-2 drop of honey.
Assam lata	Green leaves	Cut and wounds	The leaves are squeezed. After decanting the juice of leaves used externally on the cut injury.
Basak	Fresh green leaves	Cough, cold ailments	The juice of leaves with small slice of zinger is drunk with warm water.
Bel	Fruit	Weakness	The inner part of the fruit is rubbed with water, mixed with slight sugar and then drunk.
Durba ghass	Fresh green leaves	Tooth ache	Fresh clean leaves along with slight salt are crushed with teeth.
Menda	Fresh green leaves	Dysentery, diarrhoea,	The leaves are rubbed with slight water. The resulting slippery juice is drunk directly.
Neem	Fresh green leaves	Skin diseases, chicken pox,	The bark and leaves are boiled with water. After decanting the warm water is used externally on infected area.
Sajna	Bark	Cold ailments	The bark of the plant along with raw mustard, garlic and dried chilies are crushed in pestle and eaten with rice.
Taragota	Seed	Cough, cold ailments	The seeds boiled with tea liquor or water and then drunk.
Telakucha pata	Fresh green leaves	Cold ailments, diabetes	The leaves along with garlic are processed as vegetables and eaten with rice.
Tulsi	Fresh green leaves	Cough, cold ailments	The juice of leaves with 1-2 drop of honey is mixed with warm water. The resulting liquid is then drunk.