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ORIGINAL ARTICLE

Ethnomedicinal Knowledge among the Tribes of the Little Andaman Island, Andaman and Nicobar Islands, India

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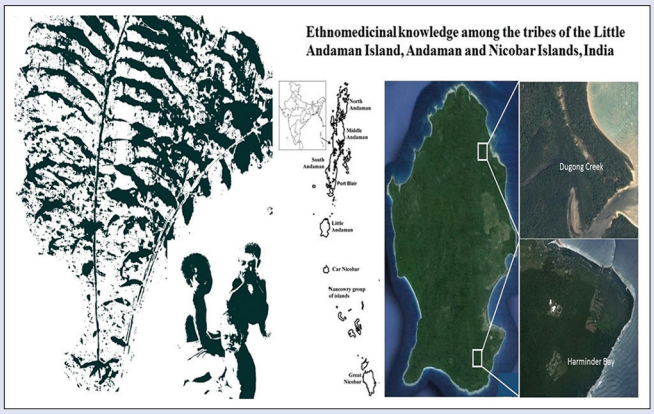
ABSTRACT

Background: In Little Andaman Island, Onges is one of the particularly vulnerable Tribal Groups settled in Dugong Creek, whereas the Nicobarese tribe resides at Harminder Bay village. Having abode in the vicinity of the forest, a strong ethnobotanical practice prevails in this Island since ancient time. **Objectives:** This study was an attempt to document the medicinal plants used in this Island, with a view to preserve the ethnobotanical knowledge and to protect the biodiversity of this area. **Materials and Methods:** Fieldwork was conducted during December 2012 and December 2014. Data were collected through interview, questionnaire, and group discussion with traditional knowledge practitioners residing in the study site. Data were analyzed to determine the informant consensus factor (ICF), family use value, and UV of the plants. **Results:** The study documented 42 medicinal plant species belonging to 26 families, which are used for the treatment of at least 25 different ailments. The highest ICF value (0.64) was observed for injuries and trauma. *Euphorbiaceae* family constituted the highest number of plant species. Plants with the highest UVs were *Ocimum tenuiflorum* L., *Morinda citrifolia* L., *Zingiber squarrosum* Roxb., and *Eupatorium odoratum* L. The most common growth form observed were shrubs (33.33%). Leaves were found to be the most frequently used plant part. **Conclusions:** The present study revealed the use of few endemic plants, extensively for medicinal preparation, demonstrating an effective ethnobotanical practice in the study area. In future, these plants can be subjected to bioassay-guided investigation, while other plants can be screened for their bioactivity, to determine their medicinal property.

Keywords: Family use values, herbal medicine, informant consensus form, Nicobarese, Onges

SUMMARY

- The study documented 42 medicinal plant species belonging to 26 families, which are used by Nicobarese and Onges for the treatment of at least 25 different ailments. The highest ICF value was observed for injuries and trauma. *Euphorbiaceae* family constituted the highest number of plant species. The most common growth form observed were shrubs. Leaves were found to be the most frequently used plant part. The present study revealed the use of few endemic plants, extensively for medicinal preparation, demonstrating an effective ethnobotanical practice in the study area. In future, these plants can be subjected to bioassay-guided investigation, while other plants can be screened for their bioactivity, to determine their medicinal property.



Abbreviations used: UV: Use value; FUV: Family use value; TKP: Traditional knowledge provider; ICF: Informant consent factor.

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INTRODUCTION

The Andaman and Nicobar Islands are the homeland of six aboriginal tribes. Those inhabiting the Andaman Islands are dark in color, short in stature with peppercorn hairs, belong to the Negrito stock and include: The Great Andamanese, the Onges, the Jarawas, and the Sentinelese. The Nicobarese and Shompens belong to the mongoloid race and inhabit the Nicobar group of Islands.[1] It has been recorded that the Negritos of Andamans is at least 2000 years old, but their origin cannot be explained with certainty due to the absence of sufficient archeological evidence.[2]

It is argued that descendants of the first man, who moved out of Africa nearly 70,000 years ago, migrated through the southern coastal route to reach India, Southeast Asia, and Australia. This startling conclusion is based on a genetic study of the indigenous tribes of Andamans.[3]

The Little Andaman Island was exclusively inhabited by the Onges tribe until 1968, after which it was opened for settlers.[4] The population of Onges was reported to decline since 1901, and this was attributed due to wars, disease outbreaks, high mortality exceeding fertility, and incompatible pairing of marriage partners which lead to unproductive marriages.[5] This downward trend was reversed since 1991, and their

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number started to increase.[6] At present, the population is 112 inhabiting a small settlement at Dugong Creek. The Onges are hunter-gatherers, who thrive on forest produce.[7,8]

The Nicobarese are inhabitants of the Nicobar group of Islands, who belong to the mongoloid race having short stature with stout and tough muscular body. The face generally has a scanty beard with thick lips and a small somewhat broadened and flattened nose.[9] The Nicobarese being coastal-dwellers, enjoy the vicinity of exuberant and verdant tropical forest.[10] Earlier, few families migrated to this Island for honey collection, which was not available in the Nicobar group of Islands, and also for plant wood for making *hodi* (wooden boats), and thereafter became permanent settlers of the Harminder Bay village at Little Andaman.

The invaluable knowledge and innovative traditional practices need to be protected from extinction, as also from the ruthless commercial exploitation. Although there have been several attempts to document the medicinal plants used by indigenous communities of the Andaman and Nicobar Islands; a comprehensive effort to document ethnomedicine and health care practices of the indigenous communities of these islands are lacking. The present study was carried out to document the indigenous knowledge on the use of medicinal plants and healthcare practices among the Onges and Nicobarese tribes of Little Andaman Island.

MATERIALS AND METHODS

Study area

The Little Andaman (Hut Bay) Island spans an area of 731.5 sq. km, which is situated between 10°30' and 10°56'N latitude and 92°28'-92°35'E longitude; at about 100 km from the state capital town of Port Blair. The Onges reside at Dugong creek on the Northeastern side of the island, whereas Nicobarese reside at Harminder Bay, on the Southeast coast [Figure 1].

Ethical approval and consent to participate

This study was ethically approved by the Institutional Human Ethics Committee of the Regional Medical Research Centre, Port Blair. The members of the field team met the tribal chieftains and explained the objectives of the survey. The tribal community was briefed in their native language and their consent to participate in the survey was obtained.

Data collection

Field survey was carried out between December 2012 and December 2014. After obtaining prior permission from the local authorities, traditional knowledge practitioners (TKPs) from each village were identified. Each TKP was interviewed separately, to generate data on disease prevalence, treatment methods using medicinal plants, it's mode of preparation, usage and dosage, etc., through a structured questionnaire. Members of the *Andaman Adim Janjati Vikas Samiti* (AAJVS) and Nicobarese teachers, well versed in Hindi language were included in the survey, for translating tribal languages (Onges and Nicobarese) and understand the dialect. The TKPs were enquired more than once for data confirmation.

The plants collected through TKPs, in and around the villages were photographed. Their GPS location along with other botanical field data was also recorded. Taxonomic status of the plant species was confirmed by the Botanical Survey of India, Andaman and Nicobar circle, Port Blair. An integrated floral checklist of the Andaman and Nicobar Islands, India, was used for the identification of plant specimens.[11] The binomial nomenclature was cross-checked with the help of International Plant Name Index,[12] and voucher specimens were deposited at the Regional Medical Research Centre (an institute under the aegis of Indian Council of Medical Research), Port Blair.

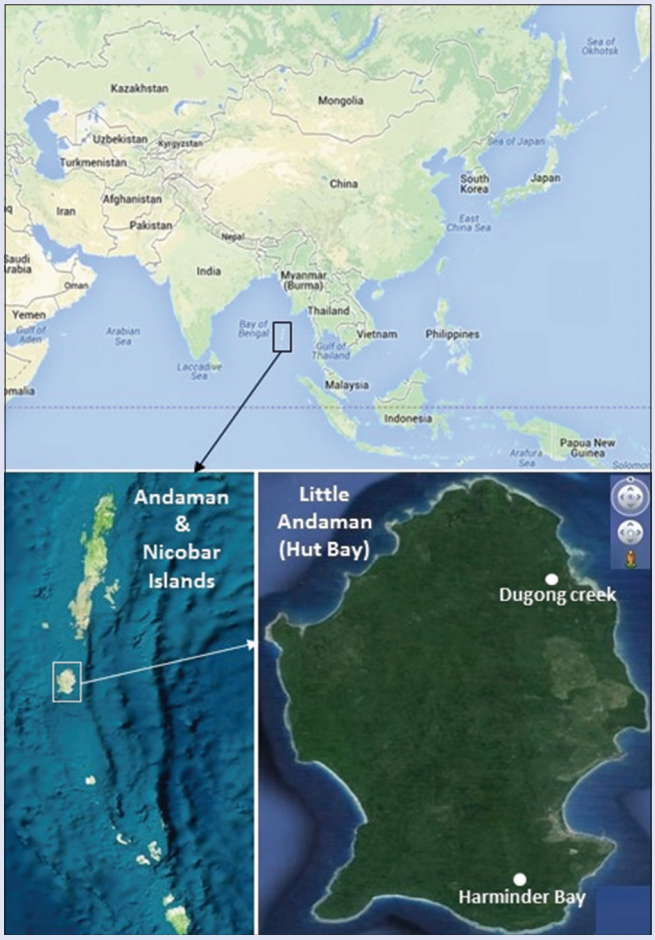

Figure 1: Map depicting Andaman and Nicobar Islands highlighting the study area – Little Andaman

Data analysis

Data were tabulated and analyzed using three ethnobotanical parameters, namely, use value (UV), family use value (FUV), and informant consensus factor (ICF).

The UV is a quantitative method that denotes the relative importance of plant species and their family, for a population. To calculate the UV, the formula UV = ΣU/n was used,[13] where U is the number of use-reports cited by each informant for a given plant species and *n* is the total number of TKPs.

FUV was calculated to identify the significance of medicinal plant families. It was calculated using the formula; FUV = UVs/(*ns*), where UVs represent the UVs of the species and *ns* refers to the total number of species within each family.[14]

To calculate ICF, the cited plant species were grouped into six categories of medicinal use based on the diseases reported by the TKPs [Table 1]. The ICF was calculated using the formula; ICF = *N*ur-*N*t/*N*ur-1, where *N*ur represents the number of use-reports for an ailment category and *N*t refers to the number of plant species used for an ailment category by all TKPs.[15]

RESULTS AND DISCUSSION

Demographic characteristics of the TKPs were recorded through face-to-face interviews. These variables collected from 8 TKPs are presented in Table 2. TKPs were more in the age group of 61–70 years, followed by 51–60 years and 31–40 years.

Table 1: Ailments included in each medicinal use category

Medicinal use categories	Ailments
II	Fever, malaria, tuberculosis
RS	Cough, breathing problems
GI	Blood vomiting, diarrhea, dysentery, gastritis, jaundice, piles, ulcer in mouth
IT	Skin injuries, snakebite, centipede bite, fracture of bone
GP	Back pain, body ache, headache, dental caries, earache, eye pain, chest pain
MI	Menstrual disorder, honeybee repellent

II: Infections and infestations; RS: Respiratory system; GI: Gastrointestinal system; IT: Injuries and trauma; GP: General aches and pains; MI: Miscellaneous

Table 2: Demographic characteristics of the traditional knowledge practitioners (*n*=08)

Demographical characteristics	Onges	Nicobarese
Gender		
Male	5	0
Female	0	3
Age groups		
31-40	1	0
41-50	0	0
51-60	1	1
61-70	3	2
Years of service		
<20	1	0
20-30	1	1
20-40	2	2
>40	1	0
Educational status		
Illiterate	2	2
Read and write	3	1
Occupation		
Females		
Cultivators	0	3
Males		
Cultivators	4	0
Government service	1	0

A total of 42 plant species belonging to 26 families and 41 genera were used by the TKPs for medicinal preparation. *Euphorbiaceae* family recorded the largest number of medicinal plant species (07 species; 16.67%). This family was observed frequently in the ethnobotanical surveys conducted in these Islands, and also in the mainland, India.[16-18]

The plants with greater UVs were "Likup" (*Ocimum tenuiflorum*) (UV = 1.13), "Luroń" (*Morinda citrifolia*) (UV = 1.00), "Toitonae" (*Zingiber squarrosum*) (UV = 0.88), and "Urehbes" (*Eupatorium odoratum* L.) (UV = 1.12). The plant families with greater UVs were *Euphorbiaceae* (FUV = 0.62) and *Annonaceae* (FUV = 0.58). Study results are presented in the alphabetical order of plant names, with their respective scientific name, family, local name, UV, plant parts used, therapeutic usage, mode of preparation, and route of administration [Table 3].

Among 42 plant species used for medicinal preparation, three plants, namely, *Myristica andamanica*, *Orophea katschallica*, and *Zingiber squarrosum* are endemic in these Islands. *M. andamanica* is also used by the Nicobarese of the Car Nicobar Island. The crude extract of this plant has been reported to show antimicrobial and antimalarial properties.[16,19] *O. katschallica* is known for its honeybee repellent property among the Onges tribe.[20] *Z. squarrosum* is an endemic plant used by the Onges for the treatment of different ailments. At present, there are no reports on the phytochemical or pharmacological characteristics of *O. katschallica* and *Z. squarrosum*.

For those plant species which recorded a higher UV in the present study, there are scientific reports on the phytochemical composition and pharmacological activities. Chemical constituents of *O. tenuiflorum* include; oleanolic acid, ursolic acid, rosmarinic acid, eugenol, carvacrol, linalool, and β-caryophyllene. They are used in food, perfumery, dental, and oral products.[21] Secondary metabolites of *M. citrifolia* fruit are known for their antimicrobial, anticancer, anti-inflammatory, and antioxidant property.[22] Root extract of *M. citrifolia* has antispasmodic, vasodilator, and cardiodepressant activities.[23] Aqueous and organic fractions of *E. odoratum* leaf and root were found to have significant inhibitory activity against all bacterial pathogens tested. Phytochemical studies showed the presence of different phenols, flavonoids, and alcohol derivatives.[24]

More number of plants were used for treating fever (9 species, 21.43%), followed by snakebite, skin injuries, and headache (7 species each, 16.67%). Each of the plants, namely, *E. odoratum*, *M. citrifolia*, *O. tenuiflorum*, and *Z. squarrosum* were used in medicinal preparation for the treatment of 6 ailments.

The study of the growth form of medicinal plants revealed that shrubs were the highest, representing 14 species (33.33%), followed by 13 trees (30.95%) and 9 herbs (21.43%). Leaves (37 species) were the most commonly used plant part, followed by the whole plant and stem.

Medicines were generally prepared using water as the excipient, as it was readily available and has a high solubility for leaf extracts. Similar observation was also found among the Karen community of these Islands.[25] Other excipient materials used were coconut oil and honey. Some of the medicinal preparations were used directly.

The preparations were administered either through oral, topical, or by other means. Topical application was the common method, followed by oral; while other method of administration was as ear drops.

Altogether, 42 plant species were used by the TKPs to treat 25 ailments. These were grouped into six categories of medicinal use. The highest ICF values of 0.64 and 0.52 were obtained for injuries and trauma (9 species and 23 reports of use), followed by general aches and pain (12 species and 24 reports of use), respectively [Table 4]. The main conditions included in the categories with higher ICF values were skin injuries, snakebite, centipede bite, fracture of bone, blood vomiting, diarrhea, dysentery, gastritis, jaundice, piles, and ulcer in the mouth. The high ICF values for these illnesses may be due to their common occurrence and their effortless detection by the TKPs.

CONCLUSIONS

The Onges and the Nicobarese aboriginal tribes of the Little Andaman Island make use of medicinal plants to treat various ailments. The former tribe inhabits the remote, less accessible, interior area of the island. The Andaman and Nicobar Administration, through the AAJVS provide all the basic necessities; such as food, housing, health, and education to the Onges. A health subcenter is functioning exclusively for them at Dugong Creek. After the implementation of various welfare measures, the Onges lost their habit of hunting and their traditional diet. The present study brings out a detailed documentation of ethnomedicinal practices of these tribal groups, to preserve the ethnobotanical knowledge, before it is lost, due to rapid transition by frequent exposure to modern amenities. These plants are worth exploring to determine their potential activity against various microbial pathogens. This can lead to the development of new potent drugs. The other plants collected could also be explored for their phytochemical and pharmacological aspects, to confirm their efficacy and safety.

Table 3: Plant species used by Onges and Nicobarese traditional knowledge practitioners of Little Andaman, Andaman and Nicobar Islands

Scientific name (voucher number)	Family	Local name	Used tribe	Habit	UV	Part used	Medicinal use (use category)*	Mode of preparation	Route of administration
Abrus precatorius L.	Fabaceae	Pan-nyőőmő	Nicobarese	Climber	0.13	Leaves	Ulcer in mouth (GI)	Paste	Topical
Abutilon indicum (L.) Sweet	Malvaceae	Marvalu	Nicobarese	Shrub	0.50	Leaves	Cough (RS)	Paste	Oral
							Gastritis (GI)	Paste	Oral
							Diarrhea (GI)	Paste	Oral
							Blood vomiting (GI)	Paste	Oral
Annona reticulata L.	Annonaceae	Olka	Nicobarese	Small tree	0.50	Leaves	Skin injuries (IT)	Maceration	Topical
							Snakebite (IT)	Maceration	Topical
							Centipede bite (IT)	Maceration	Topical
							Piles (GI)	Maceration	Topical
Annona squamosa L.	Annonaceae	Tőnyā ońg	Onges	Small tree	0.13	Leaves	Menstrual disorder	Paste	Oral
Blachia andamanica (Kurz) Hook. f.	Euphorbiaceae	Chanôh	Nicobarese	Tree	0.25	Leaves	Chest pain (GP)	Paste	Oral
							Dysentery (GI)	Paste	Oral
Calophyllum inophyllum L.	Clusiaceae	Ti-bae	Onges	Tree	0.63	Latex	Ear ache (GP)	Maceration	Ear drops
Casearia grewiaefolia Vent.	Flacourtiaceae	Tum-takong	Nicobarese	Tree	0.13	Leaves	Fever (II)	Paste	Topical
Cleome viscosa L.	Capparaceae	Kulching	Nicobarese	Herb	0.13	Leaves	Cough (RS)	Paste	Oral
Clerodendrum paniculatum L.	Verbenaceae	Tőngnā vońg	Nicobarese	Shrub	0.25	Leaves	Fever (II)	Paste	Topical
							Tuberculosis (II)	Paste	Topical
Dischidia major (Vahl.) Merr.	Asclepiadaceae	Tolarep	Nicobarese	Climber	0.13	Leaves	Headache (GP)	Paste	Topical
Drypetes assamica (Hk.f.) Pax. and Hoffm.	Euphorbiaceae	Tore-lu-lu	Onges	Shrub	0.75	Leaves	Dental caries (GP)	Directly applied	applied on Infected tooth
							Fever (II)	Paste	Oral
							Chest pain (GP)	Paste	Topical
Eupatorium odoratum L.	Asteraceae	Ureh bes	Nicobarese	Shrub	0.88	Leaves	Skin injuries (IT)	Maceration	Topical
							Body ache (GP)	Paste	Topical
							Piles (GI)	Maceration	Topical
							Centipede bite (IT)	Maceration	Topical
							Snakebite (IT)	Maceration	Topical
Euphorbia pallens Dillwyn	Euphorbiaceae	Mupētő	Nicobarese	Shrub	0.25	Leaves	Jaundice (GI)	Paste	Oral
							Ulcer in mouth (GI)	Paste	Topical
Ficus fulva Reinw. Ex. Bl.	Moraceae	Ham pam	Nicobarese	Tree	0.25	Leaves	Diarrhea (GI)	Paste	Oral
							blood vomiting (GI)	Paste	Oral
Ganophyllum falcatum Blume	Sapindaceae	Sanuk	Nicobarese	Tree	0.38	Leaves	Menstrual disorder	Paste	Oral
							Chest pain (GP)	Paste	Oral
							Diarrhea (GI)	Paste	Oral
Gossypium herbaceum L.	Malvaceae	Tusā	Nicobarese	Shrub	0.13	Leaves	Dysentery (GI)	Paste	Oral
Hernandia nymphaeifolia (C. Presl.) Kubitzki	Hernandiaceae	Tarōi	Nicobarese	Tree	0.13	Leaves	Blood vomiting (GI)	Paste	Oral
Hibiscus tiliaceus L. var. *tiliaceus*	Malvaceae	Ta-u-ku	Nicobarese	Shrub	0.13	Leaves	Gastritis (GI)	Paste	Oral
Jasminum syringifolia Wall. ex G. Don	Oleaceae	Panrāpő	Nicobarese	Shrub	0.25	Leaves	Dysentery (GI)	Paste	Oral
							Blood vomiting (GI)	Paste	Oral
Leea indica (Burm.f.) Merr.	Leeaceae	Tőkiteū nyu	Nicobarese	Shrub	0.63	Leaves	Skin injuries (IT)	Maceration	Topical
							Snakebite (IT)	Maceration	Topical
							Centipede bite (IT)	Maceration	Topical
							Piles (GI)	Maceration	Topical
Lepisanthes rubiginosa (Roxb.) Leenh.	Sapindaceae	Chamrēvő	Nicobarese	Small tree	0.13	Leaves	Menstrual disorder	Paste	Oral
Macaranga peltata (Roxb.) Muell.	Euphorbiaceae	Kinrul	Nicobarese	Shrub	0.13	Leave	Gastritis (GI)	Paste	Oral
Mallotus repandus (Willd.) Muell. - Arg.	Euphorbiaceae	Chinna tigale	Onges	Tree	0.38	Leaves	Cough	Paste	Oral
Miliusa andamanica (King) Finet et Gagnepain[E]	Annonaceae	Kobotilabae	Onges	Tree	0.75	Bark	Headache (GP)	Pilled off	Tie on the forehead
						Bark	Fracture of bone (IT)	Pilled off	Tie on the fracture

Contd...

Table 3: Contd...

Scientific name (voucher number)	Family	Local name	Used tribe	Habit	UV	Part used	Medicinal use (use category)*	Mode of preparation	Route of administration
Morinda citrifolia L.	Rubiaceae	Luroŋ́g	Nicobarese	Tree	1.00	Leaves	Skin injuries (IT)	Maceration	Topical
							Eye pain (GP)	Paste	Topical
							Fever (II)	Paste	Topical
							Piles (GI)	Maceration	Topical
							Snakebite (IT)	Maceration	Topical
							Centipede bite (IT)	Maceration	Topical
Ocimum tenuiflorum L.	Lamiaceae	Likup	Nicobarese	Herb	1.13	Leaves	Skin injuries (IT)	Maceration	Topical
							Centipede bite (IT)	Maceration	Topical
							Cough	Paste	Oral
							Fever (II)	Paste	Topical
							Piles (GI)	Maceration	Topical
							Snakebite (IT)	Maceration	Topical
Orophea katschallica Kurz[E]	Annonaceae	Piyangae/Tonyoge	Onges	Small tree	0.63	Leaves	Honey bee repellent	Maceration	Topical
Pajanelia longifolia (Wild.) K. Schum.	Bignoniaceae	Tumaha	Nicobarese	Tree	0.25	Leaves	Tuberculosis (II)	Paste	Topical
							Snakebite (IT)	Maceration	Topical
Phyllanthus amarus Schum. et Thonn.	Euphorbiaceae	Kinfiŏ hayŏm	Nicobarese	Herb	0.13	Whole plant	Jaundice (GI)	Paste	Oral
Physalis minima L.	Solanaceae	Linpŏp mal	Nicobarese	Herb	0.13	Leaves	Breathing problem (RS)	Paste	Oral
Planchonella obovata (R. Br.) Pierre	Sapotaceae	Makil	Nicobarese	Tree	0.13	Leave	Gastritis (GI)	Paste	Oral
Pongamia pinnata (L.) Pierre	Fabaceae	Oichunae	Onges	Tree	0.25	Leaves	Fever (II)	Paste	Oral
Premna corymbosa (Burm.f.) Rottl. et. Willd.	Verbenaceae	Thamoja	Onges	Shrub	0.25	Leaves	Back pain (GP)	Maceration	Topical
Ricinus communis L.	Euphorbiaceae	Tamakleh	Nicobarese	Tree	0.13	Leaves	Chest pain (GP)	Paste	Oral
Scaevola taccada (Gaertn.) Roxb.	Goodeniaceae	Kwyaye	Onges	Shrub	0.13	Fruit	Diarrhea (GI)	Direct	Oral
Scorpia dulcis L.	Scrophulariaceae	Tŏkŏpŏŏ roonti	Nicobarese	Herb	0.13	Whole plant	Ulcer in mouth (GI)	Paste	Topical
Senna occidentalis (L.) Link.	Caesalpiniaceae	Milum ań	Nicobarese	Herb	0.13	Leaves	Eye pain (GP)	Paste	Topical
Sida acuta Burm. f.	Malvaceae	Mēui tameūyŏ	Nicobarese	Herb	0.25	Leaves	Fever (II)	Paste	Topical
							Snakebite (IT)	Maceration	Topical
Sterculia guttata Roxb. ex.DC.	Sterculiaceae	Fūk	Nicobarese	Tree	0.25	Leaves	Gastritis (GI)	Paste	Oral
							Diarrhea (GI)	paste	Oral
Tabernaemontana crispa Roxb.	Apocynaceae	Tŏkurō tông	Nicobarese	Shrub	0.50	Leaves	Fever (II)	Paste	Topical
							Dysentery (GI)	Paste	Oral
							Blood vomiting (GI)	Paste	Oral
							Piles (GI)	Maceration	Topical
Urena lobata L.	Malvaceae	Kasinrih	Nicobarese	Herb	0.25	Leaves	Cough (RS)	Paste	Oral
							Piles (GI)	Maceration	Topical
Zingiber squarrosum Roxb.[E]	Zingiberaceae	Toitonae	Onges	Herb	0.88	Leaves	Malaria (II)	Paste	Topical
							Cough	Paste	Topical
							Fever (II)	Paste	Topical
							Skin injuries (IT)	Paste	Topical
						Stem	Headache (GP)	Pilled off	Tie on the forehead
							Fracture of bone (IT)	Pilled off	Tie on the fracture area

E: Endemic (Pandey and Diwakar, 2008). *II: Infections and infestations; RS: Respiratory system; GI: Gastrointestinal system; IT: Injuries and trauma; GP: General aches and pains; MI: Miscellaneous

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Table 4: Medicinal use categories and informant consensus factors

Medicinal use categories	Number of species	Number of use-reports	ICF
IT	9	23	0.64
GP	12	24	0.52
II	10	16	0.40
RS	7	10	0.33
GI	23	34	0.33
MI	3	3	0

II: Infections and infestations; RS: Respiratory system; GI: Gastrointestinal system; IT: Injuries and trauma; GP: General aches and pains; MI: Miscellaneous; ICF: Informant consensus factor

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Conflicts of interest

There are no conflicts of interest.

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