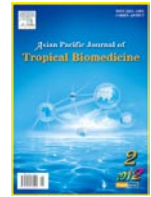




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## Asian Pacific Journal of Tropical Biomedicine

journal homepage: [www.elsevier.com/locate/apjtb](http://www.elsevier.com/locate/apjtb)



Document heading doi:10.1016/S2221-1691(12)60349-9 ©2012 by the Asian Pacific Journal of Tropical Biomedicine. All rights reserved.

# Traditional Herbal Practices by the Ethnic People of Kalahandi District of Odisha, India

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### ARTICLE INFO

#### Article history:

Received 25 June 2012

Received in revised form 5 July 2012

Accepted 7 August 2012

Available online 28 August 2012

#### Keywords:

Ethnobotany  
Kalahandi district  
Odisha, tribals  
Niyamagiri  
medicinal plants

### ABSTRACT

**Objective:** To record ethnobotanical information from a hill-dwelling aboriginal tribe of Odisha. **Methods:** Gathering information on medicinal uses of plants by moving door to door for conducting personal interviews with socio-economically backward tribals (aborigine people) of Niyamagiri hill area of Kalahandi district, Odisha state, India and recording the accumulated knowledge with the snowball technique. Plants were identified by the users on forest floor and were botanically classified. **Results:** This communication consists of uses of parts of 111 plant species belonging to 105 genera of 59 plant families, against 68 human ailments, diarrhoea, dysentery, scabies, intestinal worms, gastrointestinal disorders, venereal disease, gynecological disorders, gingivitis, rheumatism, joint pains, wounds, cut injuries, mouth troubles, ear diseases, acute eye infections, foot inflammation, foot crack and eczema, particularly. These plants are used as herbal healing sources, as a part of cultural practice of aborigines down the ages. Among these plants, many are specific to the climate identified zone of the hilly forest patches of the district. **Conclusions:** The present record of ethnomedicinal data indicated that the backward local ethnic people use plants from their surroundings, as healing sources for all possible ailments.

## 1. Introduction

Traditional medicine (TM) is often the major accessible and affordable means of treatment for ailments among the marginalized people in developing countries. In Latin America, it is reported that a 71% of the population in Chile and a 40% of the population in Colombia are in the practice of using TM. In Africa, about an 80% of the people use TM for their health care needs. In China, TM is used for about 40% of health care needs. Further, in many developed countries, plant products as complementary and alternative medicine (CAM) are popular. For example, a 48% of the population uses CAM in Australia, 70% in Canada, 42% in USA, 38% in Belgium and 75% in France [1]. In Malaysia, the reported use of CAM was US\$ 500 million, annually, compared to about US\$ 300 million on the use of allopathic medicines. In the USA, the CAM expenditure was reported as US\$ 2,700 million. In Australia, Canada and the United Kingdom, annual CAM expenditure was estimated as

US\$ 80 million, US\$ 2,400 million and US\$ 2,300 million, respectively [1]. Thus, not only in developing countries but also in developed countries, there has been a renewal of interest towards the use of herbal medicines for both health boosting and against some common/non-common ailment, albeit modern medicine is often readily available.

In India, many states have sizable populations of aborigines, who are economically marginalized and socially backward. The Odishan part of Indian eastern range of mountains, at which Kalahandi district is situated, has rich vegetations compared to other isolated hilly areas of the state, and around a 40% of the district population are aborigines living in forest. They depend on forest for all their needs; for example, the use of phytodiversity for house construction [2] and raw wild food [3] are described for an numerically important aborigine, the Kandha tribe, who have many commonality (in living) with other aborigine tribes of other hilly zones. Their cultural practices are typically archaic since down the centuries, and they live with a minimum intervention of modernity. Dearth in economy and education rules their living standard. Moreover, a disproportionately large number of marginalized aborigines are in the vicious state of 'poverty-consorts-illness', due to which people tend to lean to local crude

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plant extracts for health care needs. Now, modernism slowly creeps into their society due to governmental improvement measures, and migration of the young people from the area for their livelihood to urban too occurs. Eventually, younger mass slowly prefer to depend upon distant but affordable government hospitals, and the dependence on traditional herbal medicines becomes slowly redundant. Moreover, about 70% Indian medicinal plants are found in indigenous tropical forests. Kalahandi district had been recognized as homes for 500 medicinal plants as estimated, since two decades [4].

The objective of this study was the recording of the ethnomedicinal information of tribals of Kalahandi district, which would help to preserve the ethnomedicinal plants under threat and save the potential treasure of knowledge. The first paper from Kalahandi on ethnobotany of one aborigine Kandha tribe was published [5]. The present work described uses of plants by 7 aborigine castes. The recorded information is anticipated to generate new scope for work on antimicrobial activities of plants and biochemical work with active compounds of these plants.

## 2. Materials and methods

### 2.1 Study area and people

Twenty hamlets (villages) of Langigarh Block in Niyamagiri hill area of Kalahandi district were surveyed during 2008 to 2011. Niyamagiri is situated at 19°10' and 20°30' north latitude and 82°30' and 83°50' east longitude. The elevation ranges from 400 to 1200m; temperature varies from 2°C in winter to 46°C in summer and the district experiences an average rain fall of about 128cm and a rich biodiversity, typical to a sub-tropical forest. Kalahandi has people of a total of 65 different ethnic groups with several socio-economic categories of both backward castes (scheduled castes) and aborigine tribes (scheduled tribes) living together. The common and numerically important scheduled castes were Chamar, Dom, Ganda, Ghasi, Dhoba, Mahar and Panik, and the scheduled tribes were Bhunja, Kandha, Gand, Banjara, Sabar, Bhattada and Dal. They were originally a nomadic community, but they are today living in tribal hamlets, each consisting of 10–25 families disbursed in patches in the forest. They have upland agriculture of rice, corn and the finger-millet (*Elusine coracana*). These

people earn through selling non-timber forest products, honey, beeswax and a few more. Their language is not the Odishan language, Oriya. Their average heights is 5', 8" ± 3" and are usually dark skinned. Every tribal group has a tribal chief/head. As per the 2011 census, the population is 0.35% of the total population (district population — 5, 60,000 approximately) of Kalahandi district.

### 2.2 Data collection

During several visits to villages, interviews were taken and information recorded from head-men, traditional healers, priests, housewives and patients randomly irrespective of sex and castes or tribe. Selection of plants from Niyamagiri hills was based on interviews in hamlets with both schedule castes and schedule tribes. All the information on medicinal plants reported by them were collected taking the help of traditional healers, and were botanically identified with flora books of the state [4, 6]. Photographs and voucher specimens (herbaria) were preserved at Department of Botany, Govt. Junior College, Bhawanipatna. A survey of about 20 hamlets in the district was done with a questioner and personal interview, using the snowball technique in survey and sampling [7].

## 3. Results

Plants are arranged alphabetically with botanical, family and local vernacular names in Table 1. A brief note on the method of plant parts used as medicines and modes of administration against ailment(s) are given. The present record of ethnomedicinal data are of 111 plant species belonging to 105 genera of 59 families. These plants are used against diarrhoea, dysentery, scabies, tiny worm, hook worm, gastrointestinal disorder, venereal disease, gynae disorders, gingivitis, rheumatism, joint pains, wounds, cut injuries, climacteric troubles, ear diseases, acute eye infections, foot inflammation, foot crack and eczema, particularly. Herbal medicines, prepared by these tribes are of both single plants and parts of many plants, as combinations have better activity. Generally, fresh plants are used for preparation of medicine but in absence of fresh parts, sundried parts are used.

**Table 1**

Ethnobotanical information of plants of Niyamagiri hill.

Plant name	Family	Vernacular name	Ethno-medicinal uses
<i>Abrus precatorius</i> L.	Fabaceae	Gunja	Twenty or 25 black variety seeds of the plant are soaked in water overnight and pestled in the morning, and the paste is taken orally by a female for birth control.
<i>Acalypha indica</i> L.	Euphorbiaceae	Indramaris	A leaf petiole dipped in castor oil is inserted into anus of a child and is kept for 2 min for evacuation; it gives relief from constipation. Leaf juice is prescribed for treatment of cough and cold in children.
<i>Aerva lanata</i> . Juss-ex-Schult	Amaranthaceae	Kukrabocha	The paste of a whole plant is taken orally twice daily with water to treat spermatorrhoea; and leaf paste is applied externally on wounds for healing
<i>Alangium salvifolium</i> (L.F.) Wang.	Alangiaceae	Ankel	Equal amounts of seed and bark are ground to paste and small tablets are prepared. Only one tablet is taken to get relief from constipation. A cup of root paste is prescribed orally once to cure mad-dog-bite.
<i>Amaranthus spinosus</i> L.	Amaranthaceae	Kantabhaji	Seeds of this plant and leaves of <i>Datura metel</i> are boiled in til-oil ( <i>Sesamum indicum</i> ) and applied to cure eczema.
<i>Amorphophallus paeoniifolius</i> Derst. Nicolson	Araceae	Dhai	Equal amounts of corm of this plant, roots of <i>Rawolfia serpentina</i> , dried rhizome of <i>Zingiber officinale</i> , seeds of <i>Piper nigrum</i> and <i>Piper longum</i> are made into paste and small tablets are prepared and sun-dried. Tablets are taken orally for ten to fifteen days to cure piles.

<i>Andrographis paniculata</i> . Burn ex. Nees.	Acanthaceae	Bhuin limb	Two spoonful of fresh leaf paste with turmeric powder is taken orally for expelling intestinal worms. Shade-dried leaf powders with honey are prescribed for the treatment of fever; and the leaf juice is taken orally to cure constipation.
<i>Aristolochia bracteata</i> Retz.	Aristolochiaceae	Nagbela	The root juice is taken orally to cure dysmenorrhoea. Root paste is applied as a suppurating agent on boils. The leaf-paste is massaged on body of newborn infants up to the age of 21 days to prevent any skin infection.
<i>Artocarpus integrifolia</i> L.	Urticaceae	Panas	Smoke of dried leaves is inhaled to treat hiccup. Leaf juice is taken to reduce hang over due to alcohol. The pulp obtained by rubbing an unripe fruit stalk is applied locally to cure insect bites.
<i>Asparagus racemosus</i> Willd.	Liliaceae	Debadhun, Satabari	An extract of roots is taken orally to cure epilepsy. Root powders with cow milk are taken orally daily to enhance lactation in the nourishing mother. Root juice mixed with year old Ghee is massaged on whole body to cure paralysis. A piece of root is kept on the ear to relief from toothache.
<i>Asteracantha longifolia</i> Nees.	Acanthaceae	Kikiri	Fresh leaf juice is taken orally to cure jaundice. Whole plants are burnt in an earthen container and the ash obtained is mixed with cow-urine and is taken orally to cure odema. Fruits are burnt and ash is mixed with castor oil and applied externally on wounds for quick healing.
<i>Azadirachta indica</i> A. Juss	Meliaceae	Nim	Leaf paste made with <i>Curcuma longa</i> (turmeric, VN: Haldi) is used against measles and chicken pox. It is taken orally as well as applied locally.
<i>Barleria prionitis</i> L.	Acanthaceae	Kantamalati	Warmed leaf paste is applied externally to heal wounds.
<i>Bauhinia variegata</i> L.	Caesalpiniaceae	Kuler	Three to 4 leaves are chewed before food to cure any stomach disorder.
<i>Biophytum sensitivum</i> (L) DC	Oxalidaceae	Lajkuli	Whole plant is dried, made in to powders and are applied externally to heal wounds.
<i>Boerhaavia diffusa</i> L.	Nyctaginaceae	Purnisaga	Cooked leaves are eaten to overcome anemia.
<i>Bombax malabaricum</i> L(DC)	Bombaceae	Semel	Root paste mixed with sugar candy powders is taken orally for leucorrhoea. Small aliquotes of juice of stem bark is taken orally to arrest diarrhoea. Decoction of roots is taken to treat strangury.
<i>Buchhanania lanjan</i>	Anacardiaceae	Char	Aliquots of 5 ml juice of stem bark are taken orally to arrest diarrhoea.
<i>Byttneria herbacea</i> Roxb.	Sterculiaceae	Samarkhai	Root paste is taken orally to get relief from body pain.
<i>Butea monosperama</i> (Lam) Kuntz	Fabaceae	Phalsa	Flowers soaked in water for 6 hours and drained water is taken orally to get relief from inflammation of genital parts during urination. Paste of terminal bud with paste of 3 seeds of black pepper is mixed and taken with water to cure skin diseases.
<i>Caesalpinia bonduc</i> L.	Caesalpiniaceae	Gil	Endosperm along with seeds of <i>Piper nigrum</i> L (Piperaceae) is made into paste. It is taken with honey to cure fever.
<i>Calotropis procera</i> R. Br	Asclepiadaceae	Arakh	Leaf juice is dropped in to the nostril to treat epilepsy. Dried stem and leaf powders mixed with latex of the same plant and the mixture is applied locally to cure insect-bite. Root bark paste with opium is applied externally on nostrils to cure nasal sore.
<i>Cannabis sativa</i> L.	Cannabaceae	Ganjei	A fine piece of cloth soaked in the paste of leaf is inserted into the anus of infants to arrest diarrhoea. An aliquot of 250 ml of decoction of leaf powder and tea powder is mixed with sugar in 2:2: 5 ratios in 750ml of water and given to drink to check infantile diarrhoea. Fresh leaf fried in an iron pan is made into powder and mixed with coconut oil previously boiled with chilly. The mixture is applied externally to treat herpes.
<i>Capparis zeylanica</i> . L.	Capparidaceae	Biraankel	The leaf paste is taken orally with water for 5 days to check bed-wetting of children. A hole is made in fruit and is inserted around the nail to cure infected nail.
<i>Careya arborea</i> Roxb.	Lecythidaceae	Kum	Stem bark along with stem bark of <i>Holarrhena antidiysenterica</i> is pounded with water and is filtered. The filtered water is taken orally for treatment of dysentery.
<i>Cassia fistula</i> . L.	Caesalpiniaceae	Sunari	Pulp of fruit obtained by rubbing it on stone is applied on naval region of children to cure flatulence, stem bark along with fruit of <i>Terminalia chebula</i> is taken with honey for treatment of cough. The leaves along with seeds of <i>Raphanus sativus</i> , leaf of <i>Syzigium cumini</i> and garlic are made in to paste and applied externally to treat scabies.
<i>Celastrus paniculatus</i> Wild	Celastraceae	Pengu	Oil extracted from the seed is massaged on body to get relief from body pain and joint point.
<i>Chloroxylon weitenia</i> DC	Rutaceae	Bherun	The paste of leaves is applied on skin to cure leucoderma.
<i>Cipadessa baccifera</i> (Roth) Mig.	Meliaceae	Pitmari	Boiled leaves are tied in a cloth and placed on forehead to get relief from headache.
<i>Gardenia gummifera</i> L.	Rubiaceae	Kurudu	Two spoonful of stem bark paste is taken orally with water to expel intestinal worm. Resin obtained from stem is made into powder. It is sprinkled on sores of cattle to keep flies and maggots away.
<i>Gloriosa superba</i> L.	Liliaceae	Kulhia Kanda	Rhizome paste is applied on anus to cure piles. Extracted juice of the rhizome is massaged on joint to get relief from joint pain. The paste of the rhizome on a fine cloth is applied locally on the genital organ of a woman to induce abortion.
<i>Gmelina arborea</i> Roxb	Verbenaceae	Gambher	Extracted juice of ripe fruit is mixed with honey and taken orally to cure strangury. Leaves boiled with water and then knotted in a cloth and applied on joint pain. Fruits boiled with water is mixed with jaggery and taken orally as an antipyretic.
<i>Gossypium herbaceum</i> Mast.	Malvaceae	Kapa	Fruits are briskly shown on fire and then juice is extracted. It is poured in to the ear to relieve pain. Sun dried plants burnt into ashes are applied locally to cure eczema. Three grams of root bark ground with stale rice water is taken orally to treat leucorrhoea. Twig of the plant is first warmed on fire and then isolated juice is dropped on skin to heal warts.
<i>Guizotia abyssinica</i> (L.F.) Cass.	Asteraceae	Alsi	Two spoonful of leaf juice is taken orally as a vermifuge at 7 days interval. Seeds paste with tubers of <i>Cyperus rotundus</i> and roots of <i>Acorus calamus</i> are given with honey to arrest infantile diarrhoea.

<i>Helicteres isora</i> L.	Sterculiaceae	Murian Anthei	Decoction of fruits is boiled in til oil ( <i>Sesamum indicum</i> ) and the oil is massaged on the body of infants to relieve pain and give sound sleep. Decoction of fruits is taken orally by the tribal ladies to relieve waist pain immediately after childbirth. The paste of fruits with three seeds of black pepper is taken orally for growth of infants.
<i>Hemidesmus indicus</i> (L.)R.Br	Asclepiadaceae	Sugandhi	Decoction of dried root powder is taken orally to gain vital strength. Also dried root powder mixed with cow milk is taken against sexual debility. Roots ground with un-boiled cow milk is taken twice daily for 7 days to cure piles.
<i>Hibiscus cannabinus</i> L.	Malvaceae	Kaunria	Seeds are fed to cows to enhance lactation.
<i>Holarrhena antidysenterica</i> Wall Cat	Apocyanaceae	Kure	Shade-dried root powder is taken orally after taking tea in the morning act as a vermifuge. Stem bark along with roots of <i>Aristolochia bractiata</i> are ground with water. Two spoonful of this juice is fed to infants to arrest diarrhoea. Seeds along with leaves of <i>Tricosanthes dioica</i> are taken 8 gm each and are boiled with 500 ml water until it becomes 50 ml. This decoction is mixed with honey and taken orally to cure intermittent fever.
<i>Ipomoea nil</i> (L.) Roth	Convolvulaceae	Khat Khatia	Seed powder taken orally with water acts as a laxative but seed powder taken orally with stale-rice water arrest dysentery.
<i>Jatropha gossypifolia</i> L.	Euphorbiaceae	Ramjada	Roots ground with 6 ml of milk are mixed with stem bark powder of <i>Acacia catechu</i> . The paste is made into tablets and dried. Each tablet is taken orally to cure gonorrhoea. Dried leaf powder is sprinkled on wound caused by burns.
<i>Justicia adhatoda</i> L.	Acanthaceae	Basang	Leaf decoction with ginger juice is taken orally to cure fever. Dried leaf powder is sprinkled on wounds to heal up. Leaves dipped in castor oil are held over a flame to warm up and placed on eyelids for 5 to 10 minutes to cure eye infection. Leaf decoction is taken orally twice daily to cure asthma.
<i>Lawsonia inermis</i> L.	Lythraceae	Menjati	Leaf paste is applied externally on anus to cure eye infection. Leaf paste is applied over hands and legs to cure skin itch due to the fungus <i>Taenia</i> . Stem bark decoction is taken with jaggery to induce abortion.
<i>Leucas aspera</i> Spreng.	Lamiaceae	Gubi	Leaf juice is poured into ear to retrieve ear pain. It is applied locally on sores to heal speedily. Leaf juice is taken orally to cure complications due to non-poisonous snakebites. Leaves are rubbed on skin to get relief from itching sensation due to contact of caterpillars.
<i>Litsea glutinosa</i> (Lour) Robins	Lauraceae	Medha	Stem bark along with raw culms of bamboo ( <i>Bambusa vulgaris</i> ) are ground into fine paste and applied externally to boost the healing of a fractured bone and tied with 6 pieces of bamboo stick to set the bone.
<i>Loranthus longiflorus</i> var <i>falcatus</i>	Loranthaceae	Mahulmadang	Leaf juice is poured into ear to relieve earache. The paste of whole plant is applied on the whole body to get rid of skin-inflammation.
<i>Madhuca indica</i> Gmel	Sapotaceae	Mahul	Oil extracted from seeds is used locally to heal skin infections caused due to urination of a spider. It is also massaged to get relief from muscular cramp and sprain. Country liquor prepared from its flower is touched on tongue of infants for a better health. Leaf paste mixed with oil extracted from seeds of this plant is warmed to tolerable temperature and is applied externally to heal carbuncle. Root paste is applied externally to treat snakebite.
<i>Mallotus philippensis</i> (Lam.) Muell.	Euphorbiaceae	Kamala gundi	Powders on the fruit surface are collected, mixed with jaggery and is taken orally as a vermifuge.
<i>Mangifera indica</i> L.	Anacardiaceae	Amba	Latex of the plant is applied on foot to heal foot crack.
<i>Marsilea minuta</i> L. (Marsiliaceae),	Marsiliaceae	Sunsunia	Equal amount of spores of the plant, roots of <i>Smilax zeylanica</i> , root of <i>Lawsonia inermis</i> and white colored onion bulb is ground and the extracted juice is taken orally twice a day up to 7 days to cure jaundice. Leaves are cooked and taken to cure insomnia.
<i>Martynia anua</i> L.	Pedaliaceae	Baghnakhi	Seeds of the plant along with wood of <i>Dalbergia sisso</i> , node of <i>Bambusa vulgaris</i> and endocarp of <i>Cocos nucifera</i> are kept in an earthen container with a hole at its base. A bunch of thread immersed through the hole. This container is placed over another earthen container, which is tightly fixed with the lower part of first container. The joint is sealed with thick wetted clay. The upper container is again sealed with another earthen plate and the whole apparatus is placed on fire. The substance of first container melts and gets collected drop wise through the thread in the lower container. This liquid is collected and is used to cure eczema.
<i>Merremia gangetica</i> (L.) Cufo, syn. <i>Convolvulus gangeticus</i> L	Convolvulaceae	Musakani	Whole plant paste is applied on foot to cure inflammation. Its leaves with leaves of <i>Phyllanthus fraternus</i> are sealed in a leaf of <i>Musa paradisiaca</i> and warmed on fire. The juice of the enclosed leaves is extracted and mixed with bark powder of <i>Acacia catechu</i> . This mixture is prescribed to infants to arrest loose motion.
<i>Milletia auriculata</i> Baker. ex. Bran.	Fabaceae	Mankadmal	Leaf juice is taken orally as vermifuge.
<i>Mimosa pudica</i> L.	Mimosaceae	Lajkuli	Leaf paste is applied locally to cure eczema. Leaf and root paste are made into tablet form and dried. One tablet is taken orally at bed time to cure insomnia. 3 cm long root with seeds of <i>Piper nigrum</i> are ground to a paste and is mixed with curd. It is taken orally in empty stomach for 7 days to cure piles. Root decoction is taken to heal kidney stone and also to get relief from waist pain after delivery.
<i>Morinda tinctoria</i> Roxb.	Rubiaceae	Achhu	The decoction of root bark mixed with sugar is taken orally for 7 days to cure biliousness. Leaf juice mixed with juice of rhizomes of <i>Cyperus rotundus</i> is taken orally to arrest diarrhoea. Juice of fresh leaf is applied on skin as lice repellent in cattle. Fruits of this plant and tubers of <i>Cynodon dactylon</i> are crushed together and the juice is extracted and dropped into nostrils to cure epistaxis.
<i>Moringa oleifera</i> (Lam)	Moringaceae	Munga	Fresh stem bark is inhaled to cure cold. A cloth is soaked in the paste of bark and is inserted into the anus of child for bowl evacuation and for cure of constipation.

<i>Mucuna prurita</i> Hook.	Fabaceae	Baikhujen	The stinging hairs of the fruit are carefully removed and inserted into a banana with jaggery and the whole is swallowed to expel intestinal worms. Seed powder is taken with water to cure strangury. Equal amount of seed powder and sugar candy are mixed. The mixture is mixed with Ghee and taken orally as an aphrodisiac in male. The decoction of root with honey is taken orally to cure cholera. Pulp of seeds is applied topically on skin to cure insect bites.
<i>Musa paradisiaca</i> L.	Musaceae	Kadel	Half a liter juice of the stolon is taken orally for 11 days to check blood in urine. Fresh petiole juice is applied on burns.
<i>Nicotiana tabacum</i> L.	Solanaceae	Dhingia	Dried leaf powder is applied externally to stop bleeding. The leaves boiled with milk are made into a paste and is applied externally on anus to cure piles. Two spoonful of dried leaf powder is taken with milk to cure insanity.
<i>Oroxylum indicum</i> L. Vent.	Bignoniaceae	Phaphen	One spoonful of bark paste is taken orally with water to cure measles. Paste of the root is taken orally with water to expel intestinal worms.
<i>Pergularia daemia</i> (Forsk) Chiov.	Asclepiadaceae	Uturli	Leaf juice mixed with a half cup of curd is taken orally before sunrise in empty stomach for 7 days to cure jaundice. The juice of leaf is taken orally act as a vermifuge. Root powder is taken orally to induce abortion.
<i>Phyllanthus niruri</i> auct. Non L.	Euphorbiaceae	Bhuin amla	The seeds are pounded with un-boiled rice and water and taken orally to cure leucorrhoea.
<i>Plumbago zeylanica</i> L.	Plumbaginaceae	Chitapar	A lump of paste of roots with black pepper is taken orally with water to cure oedema and the paste is taken with banana to cure spleen diseases. Leaf paste is applied externally to relief from muscular pain. Root powder mixed with cow milk is taken orally for one month to regain vital power.
<i>Pongamia pinnata</i> L. (Pierre)	Fabaceae	Karanj	Oil extracted from the seeds is applied on skin for general skin diseases. Twigs used as toothbrush for dental care. Pulp of root collected by rubbing on stone is applied locally to cure heat boil. A lump of paste of seeds with black pepper is taken orally to cure intermittent fever. Decoction of bark is taken orally to cure fistula. Juice of stem bark boiled with til oil ( <i>Sesamum indicum</i> ) is massaged on skin to cure a paralyzed organ (leg/hand). Leaves with an equal amount of leaves of <i>Azadirachta indica</i> A. Juss and <i>Ocimum sanctum</i> are ground into fine paste and made into tablet forms. One tablet is taken in empty stomach to prevent malaria.
<i>Pueraria tuberosa</i> Wild. DC.	Fabaceae	Patalkundma	Tuber paste is applied externally on forehead to cure headache. Juice extracted from the tubers is taken orally to cure strangury. Five grams of tuber of this plant with same amount of <i>Curculigo orchoides</i> and <i>Bombax ceiba</i> are ground with cow milk and the paste is taken orally with warm milk twice daily up to seven days for a lactagogue in a nursing mother.
<i>Rawolfia serpentina</i> . Benth .ex.Kurtz	Apocyanaceae	Patal garud	Equal amount of roots of <i>R. serpentina</i> , <i>Aristolochia indica</i> and <i>Cissampelos pareira</i> are crushed together with water and juice is extracted. It is taken orally to cure fever. Root of this plant, stem and leaves of <i>Vitis auriculata</i> , leaves of <i>Capparis zeylanica</i> and tuber of <i>Pueraria tuberosa</i> are collected before sunrise and ground together into paste applied externally to quicken the healing of fractured bone.
<i>Schleichera oleosa</i> (Lour) Oken	Sapindaceae	Kusum	Extracted seed oil is used as a message to cure back pain and on joints to cure rheumatism and also to cure skin diseases.
<i>Selaginella rupestris</i> Spreng	Selaginellaceae	Tirupati	Whole plant paste prepared by pounding with rice washed water is taken orally to cure leucorrhoea.
<i>Shorea robusta</i> Gaertn. F.	Dipterocarpaceae	Shargi	Resin of the plant mixed with extracted oil of <i>Ricinus communis</i> is applied externally to cure foot crack.
<i>Smilax zeylanica</i> L.	Smilacaceae	Mutri	Twig is used as toothbrush for dental care. Dried root along with <i>Piper longum</i> and <i>Piper nigrum</i> is made into powder and taken orally twice daily to treat infertility.
<i>Solanum indicum</i>	Solanaceae	Denga Bhejri	One gm of root powder is taken with curd for 8 to 10 days to cure sprue; 2 spoonful of leaf juice mixed with a spoon of honey is taken orally to cure fever.
<i>Solanum nigrum</i> L.	Solanaceae	Bhejri	Whole plant paste is taken orally and also applied externally on chest to cure chest pain.
<i>Solanum surattense</i> Burm F.	Solanaceae	Kantabhejri	Anthers of the flower are fried with Ghee and taken orally as an expectorant. Whole plant crushed and sealed in banana leaf and is kept in fire for 15 to 20 minutes. The juice extracted from it is taken orally to expel coughs of infants. Juice extracted from crushed plant is taken with honey to cure fever. Six gm of root ground with 3 seeds of black pepper is taken in empty stomach as preventive to measles.
<i>Soymida febrifuga</i> (Roxb) A. Juss	Meliaceae	Raen	Paste of the stem bark is boiled with coconut oil till it turns to black. The filtrate of the oil is cooled and is massaged on head to cure insanity. Steam of boiled stem bark knotted in a cloth is applied locally to cure rheumatism.
<i>Streblus asper</i> Lours.	Moraceae	Sahada	The stem bark boiled and ground to paste is taken orally to cure enlarged spleen. Root ground with curd is taken orally to get relief from stomach pain.
<i>Terminalia arjuna</i> (Roxb.ex. DC) W & A	Combretaceae	Kha	Leaf juice is dropped in to the nostril to cure headache. Leaf ground with water is filtered and the filtered water is gargled to cure inflammation of mucous membrane of mouth. Dried stem bark powder is mixed with til oil ( <i>Sesamum indicum</i> ) is applied locally to cure burns. Paste of stem bark with black pepper powder is taken orally to arrest diarrhoea.
<i>Terminalia bellerica</i> Gaertn. (Roxb)	Combretaceae	Beheda	The paste of seed kernel is applied externally with honey to cure eye disease. One gm of powder of seed kernel with 3 ml of honey, 3ml of ghee, 2 gm of seed kernel powder of <i>Benincasa hispida</i> and 3gm sugar candy are mixed together. The mixture is taken orally to cure insanity. The juice of fruit is taken with honey to arrest diarrhoea.

<i>Terminalia chebula</i> Retz.	Combretaceae	Harda	A lump of warmed paste of fruits is applied externally on skin to cure fungal skin infection (Dhobi's itch). Fruit of the plant rubbed on the surface of an iron metal and the pulp collected is applied externally to get relief from inflammation of anal zone due to diarrhoea in infants
<i>Terminalia tomentosa</i> (DC) W & A.	Combretaceae	Sahaja	Dewdrops collected from the surface of the leaves are used to apply locally to cure crack lips. Oil extracted from seeds is used externally to get relief from joint pain.
<i>Tinospora cordifolia</i> (Wild.) Hook. f. and Thoms	Menispermaceae	Gulchi lata	Sixteen gm of roots along with 8 gm roots of <i>Vanda roxburghii</i> are fried with til oil ( <i>Sesamum indicum</i> ) and the paste is massaged on joint to get relief from joint pain. Dried root powder is taken orally with water to cure dysmenorrhoea. Leaf juice is taken orally to cure jaundice and it is taken with honey to cure fever.
<i>Tragia involucrata</i> L.	Euphorbiaceae	Bichuati	Stem and leaves are fried with Ghee and taken orally to cure rheumatism. Sun dried leaf powder mixed with til oil is applied externally to cure scabies and ringworm.
<i>Tribulus terrestris</i> L.	Zygophyllaceae	Gokhur	Infusion of seeds is taken orally to get relief from arthritis. Equal amount of whole plant of <i>Tribulus terrestris</i> , <i>Solanum surrantense</i> and <i>Coleus aromaticus</i> are ground with milk and the paste is taken orally to check miscarriage. Roots along with an equal amount of dried rhizomes of <i>Zingiber officinalis</i> are ground to powders and 5gm of the powder is taken twice daily to cure waist pain.
<i>Trichodesma indicum</i> L.	Boraginaceae	Hetamund	Leaf paste is applied externally to cure skin disease.
<i>Tricosanthes palmata</i> Roxb.	Cucurbitaceae	Mahakal	Mustard oil applied on the surface of leaf is warmed on fire and squeezed to extract juice. This juice is poured into the ear to cure ear sore. Fruits fried at luke-warm temperature are pounded and the juice extracted is dropped into the ear to get relief from ear sore. Smoke of leaf is inhaled to cure asthma. Root along with 20 black peppers grounds with urine of a child is applied on cheek to cure mumps.
<i>Vitex negundo</i> L.	Verbenaceae	Nirgundi	Decoction of leaves mixed with seed powder of <i>Piper nigrum</i> and honey is taken orally to cure cough. Leaves fried in an iron pan without oil are knotted in a cloth and applied as a hot message on joint to get relief form rheumatism.
<i>Vitis auriculata</i> Arn	Vitaceae	Dumalaha	Rhizome is cut into round pieces and sun-dried. These are ground into fine powder and sprinkled on wounds for quick healing. Rhizome along with the rhizome of <i>Costus speciosus</i> are ground and the paste is taken orally to cure rheumatism. Rhizome, roots of <i>Rauwolfia serpentina</i> and leaves of <i>Capparis horida</i> are ground together and the paste is applied externally for healing of fractured bones.
<i>Vitis quadrangularis</i> Wall Cat.	Vitaceae	Hadsangad	Stem ground with water is taken orally with cow milk to cure piles. Stem with leaves are crushed and the mixture is warmed and applied externally on affected area to cure sprain. Fine paste of stem and leaves along with roots of <i>Vanda roxburghil</i> , roots of <i>Wrightia tinctoria</i> and roots of <i>Cicer arietinum</i> are applied to heal quickly the fractured bone.
<i>Woodfordia fruticosa</i> (L.) Kurz	Lythraceae	Dhatu	A fine cloth is soaked in extracted juice of root. It is then inserted into the anus of child to expel intestinal worm. Two gm of Sun-dried flowers ground into fine powder is taken orally with honey to expel cough. Flowers are soaked in water and taken orally by the alcohol addicted persons for 7 days to give up alcohol. Warmed paste of flower is applied on open wounds to heal quickly.
<i>Zizyphus oenoplia</i> (L.) Mill	Rhamnaceae	Kantekoli	Leaves with leaves of <i>Calotropis gigantea</i> are fried in ghee and tied at the anus to cure piles. A root of 2 cm long with twenty-one black peppers is taken orally to cure rheumatism.

#### 4. Discussion

Medicinal plants used in the modern healthcare system are, obviously, from the accumulated knowledge on folk medicine of different sources, worldwide. WHO has listed about 21,000 plant species around the world that are used for in the healthcare systems [1]. Among 60,000 flowering plants in India, about 3,000 plants are identified to be used as ethnomedicine or folk-medicine, and of them about 1,500 plants are used in Indian Ayurveda, Unani and Siddho system [8]. Seven hundred more plants are investigated pharmacologically and chemically for their active principles, which are used in modern medicinal system [8].

It is especially poignant that, regular incidences of terrifying natural and often induced for the shifting cultivation, independent episodes of 'summer forest fire' land at inexorable and insurmountable loss of vegetations [9], entailing environment degradations at all angles at fire-catching zones; and further, as if adding fuel to fire, prodigious pressures of rich and high-heeled mass on several forest products in tide of nation development, cause a blasting diminution of biodiversity and simultaneous land degradation to an extent of shape-shifting of the total

forest that cannot contain the usual florae and faunae, any more. Creation of patches of forest-fallow is too common. Consequently, the learning of all about medicinal plants including the picking of clandestine modalities of healthcare from elders of society by young adults remains very unlikely. Thus, it turns out that ethnobotanical information of aged people must be recorded concomitantly with attempts on ex-situ preservation of rare plants. Obviously, it is easy to state this as an abstract idea, but it immediately prompts the question of how to do it, at resource limited settings. This nation has to develop a viable module of soil conservation and shifting cultivation at the forest-agriculture frontier. As a burning example, the tragicomic side of development is that the Niyamagiri hill of Kalahandi district is a massive store of bauxite ore with a promise for an initiated industrial development, which could devastate rich florae and faunae of the hill area and desolate the resident aborigines, who have a dovetail joint with nature in all aspect of their lives.

Medicinal plants are grown in patches in regions of Odisha and parts of India to supply to several plant-based pharmaceutical companies. This supply is based on 30 to 50 plants, which are unique to Odisha state. About 421 numbers of plants are listed in the review of medicinal

plants of Odisha [10]. Unfortunately, forest is under threat for reasons signposted: 1. The commercial utilization of forest resources in colossal scale; at times, over exploitation of particular plant through the uneducated rustics leads to great damage and extinction of a plant. 2. Utilization of forest lands for development of industry, 3. Displacement of indigenous communities from their resource bases for dam constructions and mineral ore procurement, and 4. Ignorance of agnostic elite mass about the indigenous art of primary health care practices. Thus, protection and conservation of forest resources are essential. Considering the current rate of deforestation and the concerned loss of biodiversity, it was essential to record these documents, the information from age old aborigines.

Of the species from Odisha that are in the red list, a compilation of endangered wildlife species by IUCN; the IUCN red list is the most comprehensive inventory of the global conservation status of plants and animals documented in the Botanical survey of India, Kolkata. They are *Abrus precatorius*, *Byttneria herbacea*, *Careya arborea*, *Helicteres isora* and *Schleichera oleosa* to note as important ones.

The first categories of plant–drugs are simple crude extracts, also recorded in the literature of folklore–medicines reported from different parts of the world [11]. These plant–extracts still await the validation of scientific evaluation, but many are very popular and are used by the elite mass without any evaluation. An example would be the use of decoction of internodes of the anti–diabetic, *Tinospora cordifolia* used in India. A formulation of this plant is commercially available. It is estimated that plant materials either are present in or have provided models, for further development of 50% of western/modern drugs used worldwide [11]. As it is known, the primary benefits of using plant based medicines are comparatively safer than synthetic alternatives, as pure chemicals have non–target adverse effects on health, whereas phytochemicals have instances of traditional uses as ethnic medicines. Nevertheless, several phytochemicals also have both known and unknown toxic effects on the human body.

It would not be out of place to give a European example. Raspberry (*Fragaria dulcis*, family Rosaceae) leaf tea with the active principle, fragine was much praised in Europe for pregnant women, as the tonic is effective in strengthening the muscles of the pelvic floor; this traditional brew, once popular has now been lost from the cultural memory of modern European women disciplined for hospital childbirth [12]. It could be that many similar plants and their uses in hands of Indian rustic tribals, for example, must have been lost due to both creeping of modernism to aborigine societies, and the diminution of diverse forest flora for multiple obvious reasons. In the developing world, useful lesser known or unknown wild plants and their traditional ethnomedicinal information must be at jeopardy. Thus, trials of gathering ethnomedicinal information must continue, as followed till date, along with possible scientific verifications.

## Conflict of interest statement

We declare that we have no conflict of interest.

## Acknowledgements

This work is a part of PhD thesis of B. K. Mallik of Utkal University, and was financed in part by a Research Project on ‘Antimicrobial activities of ethnomedicinal plants of Kalahandi district’, from DST (State council on Science & Technology), Govt. of Odisha, Bhubaneswar [2574/ST–(Bio)–60/May–2009/ST], and in part by Major Research Project in Botany, on ‘Alternative drug search from ethnomedicinal plants of Odisha against multidrug resistant bacteria’ (grant no.39–388/2010/SR), from University Grants Commission, New Delhi, awarded to R. N. Padhy.

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