RESEARCH ARTICLE

Ethnomedicines of Barnawapara Wildlife Sanctuary, Chhattisgarh, India

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Abstract

The present ethnomedicinal documentation of plant species was carried out among the traditional healers living inside the Barnawapara Wildlife Sanctuary, Baloda-Bazar district of Chhattisgarh, India. Providing knowledge about the ethnomedicinal plants traditionally used by the healers at the study site is the key objective of the present work. The ethnomedicinal information was collected from interviews with the healers in the local language. Identification of plants was done through taxonomic literature and local flora. The medicinal plants were listed, followed by botanical names, local names, family, habit, part/parts used, and mode of drug preparation and administration. Traditional uses of 100 plant species belonging to 94 genera and 56 families are described in this study. These species were found to be used by traditional healers for the treatment of 43 disorders/diseases of both humans and veterinarians. Largely used plant part as ethnomedicine was noted as root. Herbs are the dominant growth forms among trees, shrubs, and climbers, emphasizing that herbs are the key source of ethnomedicinal plants. This dominance highlights their importance in traditional therapeutic approaches and their ability to contribute to contemporary medicine. Ethnomedicinal studies safeguard traditional knowledge, providing crucial insights for future medication development and sustainable healthcare and safeguarding the survival of plant species and cultural legacy in an ever-changing world.

Keywords: Ethnomedicine, Traditional healers, Barnawapara Wildlife Sanctuary, Chhattisgarh.

Highlights

- The sanctuary, located at the heart of Chhattisgarh state, is almost representative of the state and is away from medicinal support.
- 100 plant species belonging to 94 genera and 56 families were recorded from the study site
- Ethnomedicinal practices were primarily directed at treating 43 disorders and diseases in both humans and animals.
- Among the plant parts the most used was the root.
- The present work will help in the conservation of traditional knowledge of the area, before it is lost.

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Introduction

One of the major ecosystems of the Indian subcontinent is found in central India, which includes a significant portion of both tropical moist and dry deciduous forests. India ranks as the world's 12th mega biodiversity center, with a rich flora that includes about 47 thousand plant species, a large variety of ethnobotanical plants, and a tradition of plant-based knowledge that is spread throughout a huge number of ethnic groups (Chandel *et al.*, 1996; Sikarwar, 2002). Ethnomedicine is the study of traditional medicine of ethnic communities, their knowledge and practices that were transmitted orally over centuries and evolved over millennia of human existence (Chattopadhyay, 2010; Jatin *et al.*, 2013; Sharma and Ekka, 2016).

In our country, as much as seventy percent of the indigenous population still relies on traditional medicine as their main source of healthcare, while they depend mostly on forests for their livelihood (Verma *et al.*, 1995; Kumar *et al.*, 2022). Ethnomedicinal uses of plants for health care have been an important part of human cultures throughout history and prehistoric times, but as modern civilization has grown, allopathic medicine use is on the rise while the use of traditional medicines is either limited to a small number of tribal community or places (Lewis and E. Lewis, 2003; Masih *et al.*, 2013).

Chhattisgarh is endowed with the most pristine and plentiful assets of nature in the country. The recorded forest area in the state is 59,772 km^2, which is 44.21 percent of its total geographical area (Tirkey, 2004). The state is dominated by various tribal communities and known for its rich traditional culture (Rajesh *et al.*, 2013; Sahu *et al.*, 2013). Besides, it provides a means of livelihood to a large population, especially the tribals who are involved in the collection of medicinal plants and other forest products (Ekka and Dixit, 2007; Bala and Sahoo, 2014; Patel *et al.*, 2022). The paper presents the findings of an ethnomedicinal investigation carried out in Barnawapara Wildlife Sanctuary of Chhattisgarh.

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Material And Methods

Study area

The present study was carried out in one of the eleven wildlife sanctuaries of Chhattisgarh state, which is Barnawapara Wildlife

Sanctuary, located between 21° 20′ 00″ to 21° 25′47″ North latitudes and 82° 21′ 17″ to 82° 26′ 27″ East longitudes (Fig. 1). The sanctuary is situated about 28 km away from Patewa town on the Mumbai-Kolkata highway (NH 53) in Baloda bazaar district. Sanctuary was notified in 1976 under the Wildlife (Protection) Act -1972. The sanctuary covers an area of about 244.66 km^2. The sanctuary's landscape consists of flat and hilly terrain with altitudes that vary from 265 to 440 m above mean sea level. The vegetation of the sanctuary is comprised primarily of tropical dry deciduous forest with dominant plant species viz. teak, sal, bamboo, and *Terminalia* spp. The socioeconomic framework of Barnawapara Wildlife Sanctuary is intimately connected to tribal communities, whose ethnomedicinal practices have significance to their healthcare and distinctive cultural identities, therefore contributing to protecting biological diversity.

Data collection

The plant species recorded in this study were only taken for the ethnomedicinal study. A well-structured questionnaire was prepared covering different questions regarding the use of plants for ethnomedicinal purposes (Jain, 1965; 1986; 1991). For the ethnomedicinal study, both two ranges of the sanctuary were observed, i.e., Barnawapara and Kothari. A total of 11 traditional healers were selected for questionnaire survey. Both formal and informal discussions covering a range of age groups were conducted. Mainly elders of both genders participated in the interview process. Standard protocol and literature were consulted for the collection and identification of the specimens (Subramanyam, 1974; Jain and Rao, 1977; Jain and Mudgal, 1999; Pal and Jain, 1999). Most of the plants were identified on the spot and the rests were identified through local flora (Verma *et al*., 1985) and data were arranged in standard table format.

Results And Discussion

Thus, information has been gathered and summarised in Table 1. Even the modern medical facilities are located close to the sanctuary, according to a study, but many local communities still favor using traditional medicines. A total of 100 species of medicinal plants belonging to 94 genera and 56 families were recorded from Barnawapara WS (Table 1), of which more than 50% of plants were commonly used by the local communities living inside the sanctuary. Most of the plant's species used by traditional healers to cure blood-related problems, body pain, cancer, constipation, cold, cough, sore throat, diabetes, anti-poison, drug addiction, dysentery, earache, exorcism and beliefs, eye related problems, fever, bone fracture, gastric problems, gout and gall, gynecological disorders, headache, blood pressure, cardiac disease, inflammation, insomnia, itching, jaundice, leprosy, mouth ulcer, nausea, respiratory disorder, sciatica, sexual disease, sickle cell anaemia, skin disease, smallpox, stomach ache, stone problem, testicles, toothache, tuberculosis, vomiting, weakness, wounds and some veterinary purposes. It was also found that a single plant may be used for curing many diseases. The present study reveals that the Barnawapara Wildlife Sanctuary is rich in plants with diversified ethnomedicinal values. Family Fabaceae was found to be the most dominant family among all recorded plants with 12 species, emphasizing its importance in traditional medicine, considering its diverse range of species with distinct therapeutic characteristics. Family Lamiaceae, Malvaceae, Solanaceae and Apocynaceae were represented by four species, respectively. Family Acanthaceae, Amaranthaceae, Asparagaceae, Lythraceae, Rubiaceae, Rutaceae and Zingiberaceae were represented by three species, respectively. Family Anacardiaceae, Cucurbitaceae, Euphorbiaceae, Meliaceae, Moraceae, Phyllanthaceae and Poaceae were represented by two species, respectively. About 37 families have a Monospecific family represented by one species only. Family-wise distribution of plants is shown in Table 2. Herbs are the primary source of ethnomedicinal plants in terms of the number of species (42), followed by trees (34), then climbers (13) and shrubs (11). Habit-wise distribution of plants has been shown in Fig. 2. Roots are the major part that traditional

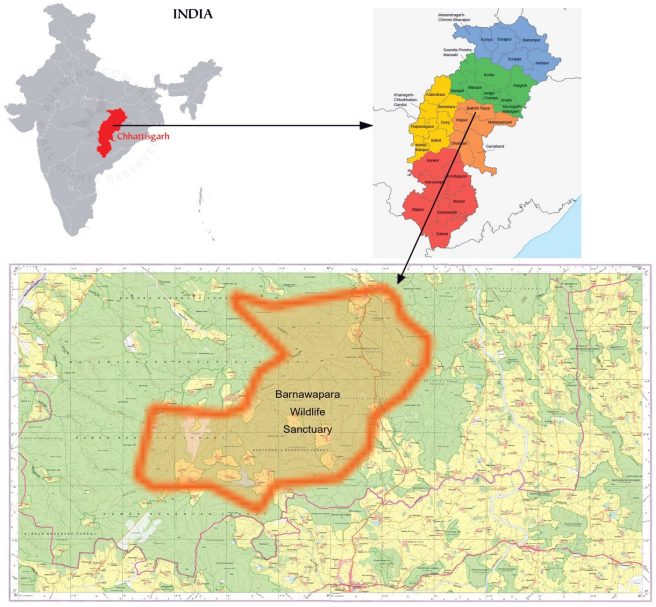

Fig. 1: Map showing Barnawapara Wildlife Sanctuary in Chhattisgarh state

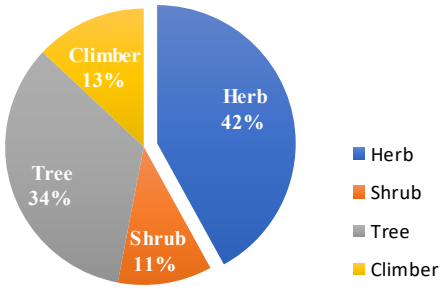

Fig. 2: Habitwise distribution of plants

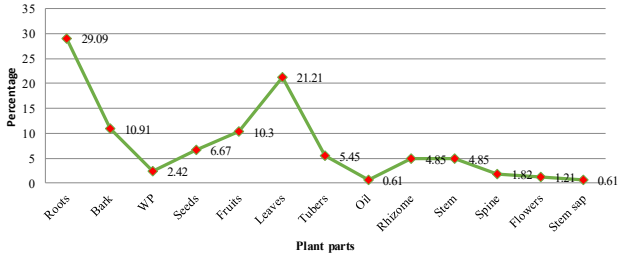

Fig. 3: Percentage of plant parts used in preparing medicines for various ailments

Table 1: List of ethno-medicinal plant species and their part used in various aliments

S. No.	*Name of disease /disorders*	*Botanical name of the plant*	*Local name of the plant*	*Family*	*Habit*	*Part/Parts used*	*Mode of drug preparation and administration*
1.	Blood related problems	*Clerodendrum indicum* (L.) Kuntze	Balraj	Lamiaceae	S	Roots	Juice is used for blood purification.
		Terminalia arjuna (Roxb. *ex* DC.) Wight & Arn.	Arjun	Combretaceae	T	Bark	Boiled with water and drink it for increases blood level.
		Wendlandiaheynei (Schult.) Santapau & Merchant	Tilai	Rubiaceae	T	Bark	Decoction of bark is useful to increase blood level.
2.	Body pain	*Achyranthes aspera* L.	Ban jeera	Amaranthaceae	H	Roots	Grinded roots with oil are applied in body ache.
		Andrographis paniculata (Burm.*f.*) Wall. *ex* Nees	Chirayata	Acanthaceae	H	Whole part	Juice of whole part with water is used to get relief from body pain.
		Hymenodicty onorixense (Roxb.) Mabb.	Bhanwarmaal	Rubiaceae	T	Roots	Juice of young plant's root is given in body pain.
		Lygodium flexuosum (L.) Sw.	Mahajaal	Schizaeaceae	C	Roots	Root is ground and fed with water in body pain.
		Semecarpus anacardium L.*f.*	Bhelwa	Anacardiaceae	T	Seeds	Boiled seeds with milk is used for chest pain.
		Soymida febrifuga (Roxb.) A.Juss.	Rohina	Meliaceae	T	Bark	Bark is boiled with oil and applied in waist pain.
3.	Cancer	*Cochlospermum religiosum* (L.) Alston	Galgala	Bixaceae	T	Bark	Boiled bark is given to the cancer patient.
4.	Constipation	*Citrus* × *limon* (L.) Osbeck	Neebu	Rutaceae	T	Fruits	Juice of ½ fruit + without-boiled milk is used to treat stomach cramps and constipation.
		Ficus benghalensis L.	Bar, Bargad	Moraceae	T	Leaves	Young leaves mixed with puffed rice is used in treatment of stomach cramps and constipation.
5.	Cough, Cold and Sore throat	*Curculigo orchioides* Gaertn.	Kali musli	Hypoxidaceae	H	Tubers	Roasted tubers are given in sore throat.
		Flemingia bracteata (Roxb.) Wight	Sabarbhanj	Fabaceae	H	Roots	Boiled with water and give it to drink in cough.
		Flemingia bracteata (Roxb.) Wight	Sabarbhanj	Fabaceae	H	Roots	Boiled roots with jagerry is useful in cold and cough.
		Tectona grandis L. *f.*	Sagon	Lamiaceae	T	Fruits	Boil these two components with stool of horse and jiggery, given in cold and cough.
		Grewia hirsuta Vahl	Gud-sakri	Malvaceae	S	Roots	
		Madhuca longifolia (L.) J.F.Macbr.	Mahua, Dori	Sapotaceae	T	Oil	Apply oil on the nails and warm them in the flame to get relief from cold.
		Pueraria tuberosa (Roxb. *ex*Willd.) DC.	Patalkumhada	Fabaceae	C	Tubers	Crush the dry tubers with Gotimarich for relief in cough with mucus.
		Piper nigrum L.	Kali mirch	Piperaceae	C	Fruits	
		Phanera vahlii (Wight & Arn.) Benth.	Siyalu, Mahul	Fabaceae	C	Roots	Decoction of roots is given in cough.
		Solanum virginianum L.	Bhatkataiya	Solanaceae	H	Roots	Decoction of root mixed with honey is given 3 times to get relief from cough.
6.	Diabetes	*Andrographis paniculata* (Burm.f.) Wall. *ex* Nees	Chirayata	Acanthaceae	H	Whole part	Powder of whole part with water is useful in diabetes.
		Pterocarpus marsupium Roxb.	Beeja	Fabaceae	T	Stem	Take a 2-3cm piece of stem or branch submerged in water in night. Take that water in morning will useful in diabetes.
		Pterocarpus marsupium Roxb.	Beeja	Fabaceae	T	Bark	Decoction of bark, given in morning (empty stomach) in diabetes.

7.	Dog bite	*Calotropis procera* (Aiton) W.T.Aiton	Aak, Madar	Apocynaceae	S	Leaves	Take 2½ - 2½ leaves of both with jaggery is given in case of dog bite.
		*Ocimum tenuiflorum*L.	Tulsi	Lamiaceae	H	Leaves	
8.	Drug addiction	*Cordia macleodii* (Griff.) Hook. *f.* & Thomson	Dahiman	Boraginaceae	T	Bark	Grinded bark is given for de-addiction of drugs.
9.	Dysentery	*Holarrhena pubescens* Wall. *ex*G. Don	Koriya, Kutaj	Apocynaceae	T	Bark	Paste of bark is given to the dysentery patient.
		Spondias pinnata (L.*f.*) Kurz	Amera	Anacardiaceae	T	Bark	Crushed bark is useful in treatment of dysentery.
		Zingiber roseum (Roxb.) Roscoe	Ban sonthi	Zingiberaceae	H	Rhizomes	Used in dysentery.
10.	Ear ache	*Tagetes erecta* L.	Genda	Asteraceae	H	Leaves	Juice of the leaves is instilled in the ear in ear pain.
11.	Exorcism and beliefs	*Acorus calamus* L.	Devnashan	Acoraceae	H	Rhizomes	Paste of rhizome is applied in whole body of divinities and tied in amulet.
		Acorus calamus L.	Devnashan	Acoraceae	H	Rhizomes	Useful in exorcism.
		Achyranthes aspera L.	Chirchita	Amaranthaceae	H	Fruits	Eat the pudding (Kheer) of fruits; don't feel hungry for a long time.
		Chloroxylon swietenia DC.	Bhirra	Rutaceae	T	Leaves	Mosquito repellent by burning the leaves.
		Dendrophthoe falcata (L.*f.*) Ettingsh.	Bandha	Loranthaceae	H	Stem outgrowth	Paste of outhgrowth (attached with *Ficus religiosa*) mixed with oil is used if the attraction between male and female has decreased. If a male applies it on his forehead, the female will be attracted and if a female applies it, the male will be attracted.
		Gloriosa superba L.	Kalihari, Jhagarhin	Colchicaceae	H	Tubers	Cut it into two pieces and give it to two person, they will start fighting.
		Zingiber roseum (Roxb.) Roscoe	Ban sonthi	Zingiberaceae	H	Rhizomes	Drops the juice in the nose of a person who is scared of ghosts.
12.	Eye related problems	*Diospyros melanoxylon* Roxb.	Tendu	Ebenaceae	T	Seeds	Mixed with water and use it like eye drop or lampblack.
13.	Fever and Malaria	*Aristolochia indica* L.	Seri	Aristolochiaceae	C	Roots	Grinded roots are used in fever.
		Azadirachta indica A.Juss.	Neem	Meliaceae	T	Leaves	Juice of leaves is used to treat fever.
		Moringa oleifera Lam.	Munga	Moringaceae	T	Bark	Boiled with water and given to malaria patient.
		Acorus calamus L.	Devnashan	Acoraceae	H	Rhizomes	
		Justicia adhatoda L.	Basan	Acanthaceae	S	Leaves	Decoction of leaves is used in treatment of fever.
		Vitex negundo L.	Nirgundi	Lamiaceae	S	Leaves	
		Ricinus communis L.	Arandi	Euphorbiaceae	T	Leaves	
		Solanum virginianum L.	Bhatkataiya	Solanaceae	H	Roots	Decoction of root mixed with honey is given 3 times to get relief from fever.
		Tinospora cordifolia (Willd.) Hook.*f.* & Thomson	Giloy	Menispermaceae	C	Leaves and Stem	Juice of Leaves with stem is useful in treatment of fever.
		Andrographis paniculata (Burm.*f.*) Wall. *ex* Nees	Chirayata	Acanthaceae	H	Whole part	Paste of whole part with water is used to treat fever.
		Asparagus racemosus Willd.	Dashmool	Asparagaceae	C	Tubers	Crushed tubers with water is given in fever for 2-3 days.
		Asparagus racemosus Willd.	Dashmool	Asparagaceae	C	Tubers	Paste mixed with milk give it and applies on the forehead for treatment of fever.
		Azadirachta indica A. Juss.	Neem	Meliaceae	T	Bark	
		Aristolochia indica L.	Chanairi	Aristolochiaceae	C	Roots	Grind the root and heat it slightly in oil and apply it on the body to get relief in fever.

		Hygrophila auriculata (Schumach.) Heine	Mokhla	Acanthaceae	H	Roots	Crushed root with ghee or honey is given to fever patient.
		Phyllanthus amarus Schumach. & Thonn.	Bhuiaaonla	Phyllanthaceae	H	Whole part	The whole plant is ground and mixed with water and given in case of fever and malaria.
		Senna alata (L.) Roxb.	Hinglaj	Fabaceae	S	Bark	Take 2½ spines of each with Hinglaj bark and Shahi pota (intestine of *Hystrix indica* Kerr, 1792) mix with jaggery, given it to malaria patient.
		Citrus × *limon* (L.) Osbeck	Neebu	Rutaceae	T	Spines	
		Hygrophila auriculata (Schumach.) Heine	Mokhla	Acanthaceae	H	Spines	
		Bombax ceiba L.	Semal	Malvaceae	T	Spines	
14.	Fracture	*Nyctanthesarbor-tristis* L.	Khirsali, Harsingar	Oleaceae	T	Bark	Grind the bark with spider web and apply in bone fracture.
		Mirabilis jalapa L.	Gulal	Nyctaginaceae	H	Roots	Crushed roots with 125ml milk for 4-5 days is used to treat gastric problem.
15.	Gastric problem	*Hellenia speciosa* (J. Koenig) S.R. Dutta	Keu kand	Costaceae	H	Rhizomes	Crushed paste is useful in gastric problems.
		Zingiber officinale Roscoe	Adrakh	Zingiberaceae	H	Rhizomes	
		Piper nigrum L.	Kali mirch	Piperaceae	C	Fruits	
		Aegle marmelos (L.) Corrêa	Bel	Rutaceae	T	Leaves	
16.	Gout and Gall disease	*Ouret lanata* (L.) Kuntze	Pitharu bhaji	Amaranthaceae	H	Leaves	Eaten as vegetable in Gout disease.
		Datura metel L.	Kala dhatura	Solanaceae	H	Seeds	Boiled with oil and apply in body pain, useful in Gout and Gall disease.
17.	Gynaecological problems	*Grewia hirsuta* Vahl	Gud-sakri	Malvaceae	S	Roots	Grinded root with rice water (Chaurhan) is used in treatment of white discharge in females.
		Vanda tessellata (Roxb.) Hook. *ex* G. Don	Bandha	Orchidaceae	H	Roots	If there is no child, the root is worn as a talisman.
		Gongronemopsis tenacissima (Roxb.) S. Reuss, Liede & Meve	Khudhar	Apocynaceae	C	Roots	Grinded root with water is given in the morning to the infant mother for high lactation.
		Momordica dioica Roxb. *ex* Willd.	Kheksi	Cucurbitaceae	C	Roots	2.5 cm Root of female plant is given to the female after take bath (in wet clothes) for birth control.
		Alangium salviifolium (L. *f.*) Wangerin	Akol, Aaket	Cornaceae	T	-	1 Betelnut + 7 rice grains + Jaggery. Take the name of woman having labour pain and offer to akol tree.
		Datura metel L.	Kala dhatura	Solanaceae	H	Roots	Juice is given to parturient female for easy delivery.
		Flemingia bracteata (Roxb.) Wight	Sabarbhanj	Fabaceae	H	Roots	Decoction of these three roots is given to mother just after delivery to decrease swelling of stitches and internal pain relief.
		Grewia hirsuta Vahl	Gud-sakri	Malvaceae	S	Roots	
		Corchorus aestuans L.	Ban chench	Malvaceae	H	Roots	
		Achyranthes aspera L.	Chirchita	Amaranthaceae	H	Roots	If delay in delivery, tie it in a thread and hang it from the neck to the navel. Delivery will be easily, remove after delivery.
		Cyperus exaltatus Retz.	Gondla	Cyperaceae	H	Roots	Paste is useful in treatment of white discharge and inflammation in urinary track.
		Lawsonia inermis L.	Mehandi	Lythraceae	S	Fruits	
		Euphorbia fusiformis Buch.-Ham. *ex* D.Don	Doodhmongra	Euphorbiaceae	H	Roots	In deficiency of lactation, the root has to be crushed and given to infant mother to increase lactation.
		Woodfordia fruticosa(L.) Kurz	Dhawai	Lythraceae	S	Roots	Juice of roots with water is given to females in case of leg pain.

		Leea macrophylla Roxb. *ex* Hornem.	Hansiyadafar	Vitaceae	S	Roots	Juice of roots is used to treat Fistula and white discharge in females.
		Adina cordifolia (Roxb.) Brandis	Kalami	Rubiaceae	T	Leaves	Make a bundle by crushing the leaves with the help of cloth and wrap them in head, useful in treatment of head-ache.
18.	Head-ache	*Aloe vera* (L.) Burm.*f.*	Gheekwar	Asphodelaceae	H	Leaves	Apply the leaf pulp on forehead to relief head-ache.
		Tinospora cordifolia (Willd.) Hook.*f.* & Thomson	Giloy	Menispermaceae	C	Leaves and Stem	Juice of Leaves with stem is useful in treatment of head-ache.
19.	High blood pressure and cardiac disease	*Rauvolfia serpentina* (L.) Benth. *ex* Kurz	Sarpgandha	Apocynaceae	H	Roots	Paste with water is used to treat high blood pressure and cardiac disease.
20.	Inflammation	*Helicteres isora* L.	Atayan, Ainthi	Malvaceae	T	Roots	Juice of roots is used to treat inflammation in legs.
21.	Insomnia	*Rauvolfia serpentina* (L.) Benth. *ex* Kurz	Sarpgandha	Apocynaceae	H	Roots	Paste with water is used to treat insomnia.
		Marsilea minuta L.	Sunsuniya	Marsileaceae	H	Leaves	Cook like vegetables, given to insomniac person. It cleans the intestine also.
22.	Itching	*Azadirachta indica* A.Juss.	Neem	Meliaceae	T	Leaves	Paste is applied in itching part.
23.	Jaundice	*Curcuma longa* L.	Haldi	Zingiberaceae	H	Flowers	Grinded flowers with alcohol (Daru) is given to the jaundice patient for regular 8 days.
24.	Leprosy	*Tephrosia purpurea* (L.) Pers.	Kulthiya, Sarfonk	Fabaceae	H	Roots	Grinder root paste is drink as well as applied in leprosy.
25.	Mouth ulcer	*Spondias pinnata* (L.*f.*) Kurz	Amera	Anacardiaceae	T	Fruits	Chew the fruit directly will helpful in mouth ulcers.
26.	Nausea	*Azadirachta indica* A. Juss.	Neem	Meliaceae	T	Leaves	Crushed 2½ piece of leaf petiole is given in distasteful and nausea.
		Eugenia caryophylla St.-Lag.	Laung	Myrtaceae	S	Flower buds	
		Piper nigrum L.	Kali mirch	Piperaceae	C	Fruits	
27.	Respiratory Disorder (Dama)	*Trachyspermum ammi* (L.) Sprague	Anjwain	Apiaceae	H	Seeds	Mix all ingredients with alum and black salt and make it a powder. 3 times/day for 15 days.
		Nigella sativa L.	Karayat, Kala jeera	Rannunculaceae	H	Seeds	
		Senna alexandrina Mill.	Sonamukhi	Fabaceae	S	Leaves	
		Zingiber roseum (Roxb.) Roscoe	Ban aada	Zingiberaceae	H	Rhizome	
28.	Sciatica	*Dillenia pentagyna* Roxb.	Korkat	Dilleniaceae	T	Bark	Crush the bark with the help of mortar and pestle and make it tablets. 1 tablet per night will helpful in sciatica.
		Pterocarpus marsupium Roxb.	Beeja	Fabaceae	T	Stem	Take a piece of stem or branch submerged in water in night. Take that water in morning will useful to get relief from pain of sciatica.
29.	Scorpion bite	*Flemingia strobilifera* (L.) W.T. Aiton	Dhekna	Fabaceae	H	Leaves	Apply the juice in scorpion bite.
		Tamarindus indica L.	Imli	Fabaceae	T	Seeds	By cracking and rubbing the seed and stick it on the bite area. Used in scorpion bite.
30.	Sexual disease	*Asparagus racemosus* Willd.	Dashmool	Asparagaceae	C	Tubers	Boiled rhizomes and jagerry is useful to enhance stamina.
		Chlorophytum tuberosum (Roxb.) Baker	Safed musli	Asparagaceae	H	Tubers	Powder of tubers is used to increase stamina.

		Clerodendrum indicum (L.) Kuntze	Balraj	Lamiaceae	S	Roots	Grind the root with water and drink it for blood purification and stamina.
		Flemingia bracteata (Roxb.) Wight	Sabarbhanj	Fabaceae	H	Roots	Decoction of roots is used for stamina.
		Mucuna pruriens (L.) DC.	Kewach	Fabaceae	C	Roots	Decoction of roots is given to impotent to increase stamina.
		Phanera vahlii (Wight & Arn.) Benth.	Siyalu, Mahul	Fabaceae	C	Roots	Decoction of roots is used to increase stamina.
		Wendlandia heynei (Schult.) Santapau & Merchant	Tilai	Rubiaceae	T	Bark	Decoction of bark is useful to increase stamina and blood level.
		Oryza sativa L.	Dhan	Poaceae	H	Seeds	5 seeds are eaten in the morning (empty stomach) for 1-2 months given to the sickle cell patient.
31.	Sickle cell anaemia	*Ventilago madraspatana* Gaertn.	Keonti	Rhamnaceae	C	Roots	Decoction is given to Sickle cell patient.
		Hygrophila auriculata (Schumach.) Heine	Mokhla	Acanthaceae	H	Leaves	
		Capparis zeylanica L.	Karrawa	Capparaceae	T	Roots, Fruits	Grinded root paste is used to treat skin disorders *(Alchi)* including heat boils.
		Datura metel L.	Kala dhatura	Solanaceae	H	Leaves	Paste of leaves is used to treat lumps in skin. Then after sometime cut the skin lightly and take out the lump.
32.	Skin disease	*Ficus hispida* L.*f.*	Bhuidoomar	Moraceae	T	Fruits	Powder of dried fruits is applied in wounds of atopic dermatitis (*Bemchi).*
		Haageocereus versicolor (Werderm. & Backeb.) Backeb.	Hanuman cactus	Cactaceae	H	Roots	Paste is used to treat skin disease *(Alchi).*
		Moringa oleifera Lam.	Munga	Moringaceae	T	Roots	Paste of peeled root with iron ash is used to treat atopic dermatitis (*Bemchi).*
		Dendrophthoe falcata (L.*f.*) Ettingsh.	Bandha	Loranthaceae	H	Stem	Attached with *Azadirachta indica*. Crushed branch is given to treat Typhoid, Pneumonia and Small pox patient.
		Careya arborea Roxb.	Kumhi	Lecythidaceae	T	Roots	Grind all three components and given with honey to the Small pox patient for relief in fever.
		Tamarindus indica L.	Imli	Fabaceae	T	Bark	
33.	Small pox	*Lagerstroemia parviflora* Roxb.	Senha	Lythraceae	T	Leaves	
		Bombax ceiba L.	Semal	Malvaceae	T	Roots	Grind and given with honey to treat the Small pox.
		Lagerstroemia parviflora Roxb.	Senha	Lythraceae	T	Leaves	
		Senna alata (L.) Roxb.	Hinglaj	Fabaceae	S	Bark	Paste of bark with ghee or honey is helps in treatment of small pox.
34.	Snake bite	*Dracaena angolensis* (Welw. *ex*Carrière) Byng & Christenh.	Junglimunga	Asparagaceae	H	Stem	Juice of stem is given to the patient in case of snake bite.
		Lablab purpureus (L.) Sweet	Sem	Fabaceae	C	Roots	Paste of roots is used in snake bite.
		Kalanchoe fedtschenkoi Raym.-Hamet & H.Perrier	Bhasampatri	Crassulaceae	H	Leaves	Grinded leaves mixed with sugar is used to treat stomach ache.
		Zingiber roseum (Roxb.) Roscoe	Ban aada	Zingiberaceae	H	Rhizomes	Paste with water is useful in stomach ache.
35.	Stomach ache	*Tectona grandis* L. *f.*	Sagon	Lamiaceae	T	Fruits	Boil the stool of horse with jiggery and given in stomach ache.
		Holarrhena pubescens Wall. *ex* G.Don	Koriya	Apocynaceae	T	Roots	Boiled root with *Cassia fistula* root have to drink in the morning in stomach problem.

		Chenopodium album L.	Bathua	Amaranthaceae	H	Leaves	Vegetables are fed in stone disease.
		Cucurbita maxima Duchesne	Kaddu	Cucurbitaceae	C	Leaves, Fruits	Vegetables are fed in stone disease.
36.	Stone problem	Ouret lanata (L.) Kuntze	Pathri	Amaranthaceae	H	Leaves	50 gm rice soaked and grind with leaves and make it paste. Bake the paste with *Butea monosperma* or *Madhuca longifolia* leaves. Give this roti in the morning (empty stomach) to the stone patient.
		Kalanchoe fedtschenkoi Raym.-Hamet & H. Perrier	Bhasampatri	Crassulaceae	H	Leaves	Crushed leaves are useful in stones.
37.	Testicles	*Capparis zeylanica* L.	Kawa	Capparaceae	T	Roots	Paste of roots and kali mirch is used to treat testicles.
		Piper nigrum L.	Kali mirch	Piperaceae	C	Fruit	
38.	Toothache	*Solanum nigrum* L.	Makoy	Solanaceae	H	Leaves	Rub the leaves in toothache.
		Argemone mexicana L.	Sarpin	Papaveraceae	H	Roots	In toothache, grind the root and chew it in the panic tooth.
39.	Tuberculosis (TB)	*Piper nigrum* L.	Kali mirch	Piperaceae	C	Fruits	Dried fruits are boiled with Ghee and given to the Tuberculosis (Chhai) patient.
40.	Veterinary	*Annona squamosa* L.	Sitafal	Annonaceae	T	Seeds	Grinded seeds applied in cattle having lice *(Juaa)*.
		Asparagus racemosus Willd.	Dashmool	Asparagaceae	H	Tubers	Tubers are fed to cattle in fever.
		Euphorbia fusiformis Buch.-Ham. *ex* D.Don	Doodhmogra	Euphorbiaceae	H	Tubers	Grinded tuber is given to cattle for high lactation.
		Wendlandia heynei (Schult.) Santapau & Merchant	Tilai	Rubiaceae	T	Leaves, Bark	Paste of leaves and bark is given to weak cattle.
41.	Vomiting	*Ficus benghalensis* L.	Bar, Bargad	Moraceae	T	Leaves	In case of vomiting, crushed young leaves are squeezed and given juice.
		Moringa oleifera Lam.	Munga	Moringaceae	T	Leaves	
		Macrotyloma uniflorum (Lam.) Verdc.	Hirwa, Kulthi	Fabaceae	H	Seeds	Boil and given to blood vomiting.
42.	Weakness	*Grewia hirsuta* Vahl	Gud-sakri	Malvaceae	S	Roots	Decoction of roots is given in weakness.
		Wendlandia heynei (Schult.) Santapau & Merchant	Tilai	Rubiaceae	T	Leaves, Bark	Paste of leaves and bark is given to weak person.
		Phyllanthus emblica L.	Aonla	Phyllanthaceae	T	Fruits	Crush both and make it in paste form is useful to get relief from intestinal worms.
		Capsicum annuum L.	Mirch	Solanaceae	H	Fruits	
43.	Worms/ Wounds	*Grewia hirsuta* Vahl	Gud-sakri	Malvaceae	S	Roots	Grinded roots are applied in folliculitis *(Bal tod)* for fast relief in wounds.
		Plumbago zeylanica L.	Chitawar	Plumbaginaceae	H	Roots	Grind with pigeon beats and apply in wounds for fast relief.
		Triticum aestivum L.	Gehu	Poaceae	H	Seeds	
		Boswellia serrata Roxb.	Saliha	Burseraceae	T	Stem sap	Chop the stem with the help of axe, collect the sap, dry in sunlight and make it powder. Apply in wounds for fast relief.
		Semecarpus anacardium L.*f.*	Bhelwa	Anacardiaceae	T	Seeds	Warm the seeds and apply it on wounds.
		Aloe vera (L.) Burm.*f.*	Gheekwar	Asphodelaceae	H	Leaves	Leaf pulp is applied in wounds for fast relief.
		Datura metel L.	Kala dhatura	Solanaceae	H	Fruits	Cut the fruit in 2 parts and rub on nail's wound.

Abbreviations: T=Tree, S=Shrub, H=Herb, C=Climber.

Table 2: Family wise distribution of ethnomedicinal plant species

Family	*No. of species*	*Family*	*No. of species*
Lamiaceae	4	Menispermaceae	1
Combretaceae	1	Asparagaceae	3
Rubiaceae	3	Phyllanthaceae	2
Amaranthaceae	3	Oleaceae	1
Acanthaceae	3	Nyctaginaceae	1
Schizaeaceae	1	Costaceae	1
Anacardiaceae	2	Orchidaceae	1
Meliaceae	2	Cucurbitaceae	2
Bixaceae	1	Cornaceae	1
Rutaceae	3	Cyperaceae	1
Moraceae	2	Lythraceae	3
Hypoxidaceae	1	Vitaceae	1
Fabaceae	12	Asphodelaceae	1
Malvaceae	4	Marsileaceae	1
Sapotaceae	1	Myrtaceae	1
Piperaceae	1	Apiaceae	1
Solanaceae	4	Rannunculaceae	1
Apocynaceae	4	Dilleniaceae	1
Boraginaceae	1	Poaceae	2
Zingiberaceae	3	Rhamnaceae	1
Asteraceae	1	Capparaceae	1
Acoraceae	1	Cactaceae	1
Loranthaceae	1	Lecythidaceae	1
Colchicaceae	1	Crassulaceae	1
Ebenaceae	1	Papaveraceae	1
Aristolochiaceae	1	Annonaceae	1
Moringaceae	1	Plumbaginaceae	1

healers use as a traditional medicine formulation because they contain compounds with strong medicinal properties.

Furthermore, roots are frequently available throughout the year, making them a consistent supply of medication even when other parts of the plant are unavailable. A comparative study of plant parts used has been shown in Fig. 3. It is noted that the variety of ethnomedicinal plants in the sanctuary is rapidly decreasing as a result of anthropogenic activities like grazing, deforestation, encroachment, and modernization. To preserve the ethnomedicinal resource foundation of the sanctuary, it is essential to develop community awareness about sustainable practices and encourage non-destructive collection methods. Strengthening legal enforcement against deforestation and encroachment, together with *ex-situ* conservation activities, can assist in protecting these critical species. Involving traditional healers in conservation initiatives allows the incorporation of indigenous knowledge, consequently protecting both biodiversity and cultural legacy.

Dependence on traditional healers is still the dominant method of health care. The use of medicinal plants for different diseases varies from place to place. The same medicinal plant being used for treating a particular disease may be different in another place. The difference may be that either the same plant is being used to treat some other disease, or some other plant may be being used to treat the same disease. This has necessitated the documentation of traditional knowledge for as many of the places as possible.

Conclusion

Focusing on the present scenario, where plants and natural resources are being exploited at an ever-increasing rate, ethnobotany is gaining popularity due to its vast range of applications that are advantageous to all living things. Nature has endowed us with a wide variety of plants that can be used in various ways that are sustainable. This study will provide various new insights regarding such applications and how to keep applying them in the future. As the traditional healers and local people of this area mostly depend on forests, they know how to make sustainable use of their plants and other resources but have little or no knowledge of how to conserve them. Training and awareness about conservation and the cultivation of significant ethnomedicinal plants are needed in the sanctuary for the long-term sustainability of the prevailing ethnomedicinal practices on the concerned study site.

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Author Contribution

M. L. Naik: Designs the experiments, methodology, and data collection. Sarvesh Kaushik Patel: Data analysis and MS writing. V. K. Kanungo: Direction and correction in MS and compilation. All authors approved the final manuscript.

Data Availability Statement

The article contains the unique contributions recorded in the study; additional queries should be directed to the corresponding author.

Conflict Of Interest

Authors declare that there are no conflicts of interest related to this study.

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