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Ethnomedicinal Practices of Plants in Danuwar Community of Dudhauli Municipality, Sindhuli District, Central Nepal

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Abstract

The study aimed to document the indigenous knowledge and practices of using plant materials for medicinal purposes by the Danuwar community in Dudhauli municipality of Sindhuli district, central Nepal. Primary data were collected between October 2016 to January 2017 through key informant interviews and focus group discussion using a semi-structured questionnaire among local healers and various aged groups of people. The information was used to prepare descriptive analysis of plant species. Among 161 plant species belonging to 153 genera and 78 families used for the treatment of different ailments, most dominant family was Fabaceae followed by Lamiaceae and Asteraceae respectively. About two-fifth plants species were used in medicinal purpose for the treatment of 47 different ailments and herbaceous plant habit was widely selected followed by trees and shrubs. The highest number of plant species was used to treat digestive system ailments, followed by skin and integumentary ailments. Common modes of application were oral and poultice, in the form of juice and paste. Among documented plants, two species were reported for the first time having any ethnomedicinal uses and eight species with novel medicinal uses in Nepal. This study showed that Danuwar people still have better traditional knowledge among local healers and elderly people. They preferred conventional medical methods using plant remedies to treat various ailments. Medicinally important plants are under threat from habitat loss and deforestation, and people know little about conservation. One third plant species were not protected by concerned people. However, modern medicine and urbanization have a minor impact on the health care system and lifestyles of Danuwars. Hence, it calls for the urgent initiation of conservation and sustainable harvesting of plants.

Keywords: Ailments, Ethnomedicinal use, Key informant, Sustainable harvest, Traditional knowledge

Introduction

Medicinal plants have become a significant source of traditional medicine for the local healers in the villages, as well as the basic raw materials for Ayurvedic, Tibetan, homeopathic, and allopathic medicines (Ghimire et al., 1999). The traditional healing practices differ from one ethnic group to another, and even within the *Traditional Healers, Jhakris* and *Amchies,* the way of administration for curing ailments using a particular plant widely varies (Manandhar, 2002; Shrestha & Dhillion, 2003). More than 75% of Nepalese people still use native herbal plants as a source of medication (Kalauni & Joshi, 2018). Due to the unavailability of trained manpower and the fact that modern health services have not been provided to the greater part of the rural areas, the rural people are largely dependent on traditional medicines. The World Health Organization (WHO, 2022) has estimated that about 80% of the population in developing countries depends on traditional medicine for their primary health care needs. As a result of globalization, industrialization, and market integration, 77% of research articles showed that local and indigenous knowledge has been lost globally, as reported by Aswani et al. (2018). In addition to this, the establishment of allopathic medicine has limited the value of traditional remedies. Thus, it is crucial that research into ethnobotany and ethnopharmacology should continue in order to protect traditional knowledge (Kurmi & Baral, 2004).

Nepal has been regarded as a storehouse of biodiversity resulting from its unique topography and contrasting climatic conditions. This diversity in the topography has resulted in a diversified climate, lifestyle and biosphere. Nepal has more than 126

ethnic groups and 123 languages (Central Bureau of Statistics [CBS], 2011). Indigenous knowledge (IK) is abundant among the ethnic groups and is firmly established in their traditions and cultures. Due to the differences in geographical characteristics, cultural and religious practices, the influence of other communities, and social differences, each ethnic group has its own tradition, culture and way of life (Shrestha, 1997). The documentation of medicinal plants and their uses inside Nepal was found in the fifth century as "Saushrut Nighantu", whereas later Chandra-Nighantu and Nepali Nighantu were published in the nineteenth and twentieth centuries (Kunwar et al., 2021). Similarly, various scientists are involved regarding the documentation of ethnomedicinal studies in different parts of Nepal, such as Singh et al. (2012) studied in western Nepal; Limbu and Rai (2013) in Limbu community, East Nepal; Rai and Singh (2015) in Rai community of Bhojpur district, Eastern Nepal; Bhattarai and Khadka (2016) in Ilam; and Adhikari et al. (2019) in Machhapuchhre Rural Municipality, Kaski district, Central Nepal.

The Danuwar are an indigenous Nepalese people who live primarily in the Doon hilly region and the inner Terai region. They have distinctive ways of living, cultures and traditions. Geographic isolation and severe socioeconomic marginalization characterize them (Danuwar, 2014). Due to easy accessibility and availability, Danuwar people are mostly dependent on natural resources to fulfill their daily needs and health care treatments. According to various literatures, traditional healers and local people have extensive knowledge in the use of plants as medicine. The available information and written documents on indigenous knowledge have been very limited. Several research studies have been conducted in Danuwar communities by Manandhar (1989) in Kamalakhonj, Sindhuli district; Basnet (1998) in Sindhuli district; Thapa (2000) in Lalitpur district; and Ghimire (2000) in Kavrepalanchowk district. However, there is no detailed survey on the current status of ethnomedicinal practices and the conservation of plants. Most of the research has only focused on the documentation of plants. The purpose of this research was to document the Danuwar community's traditional knowledge on medicinal plant uses, methods, and skills in Dudhauli Municipality, Sindhuli district, central Nepal. This research also focused on the status of the conservation of medicinal plants and the evaluation of traditional knowledge among the younger generations.

Materials and Methods

Study area

The research work was conducted in Dudhauli Municipality, Sindhuli district, Bagmati province. It is situated between geographic coordinates 26º58'10"N latitude and 86º16'15"E longitude. The Kamala River and Churiya Hills lie on the south, whereas the hills of Mahabharat lie on the northern side. A field survey was done in five wards, i.e., Kartha and Kogati (ward no. 10), Ghayalphora, Thulolakhanpur, Khiriyani, Jitpur, Kattilakhanpur,

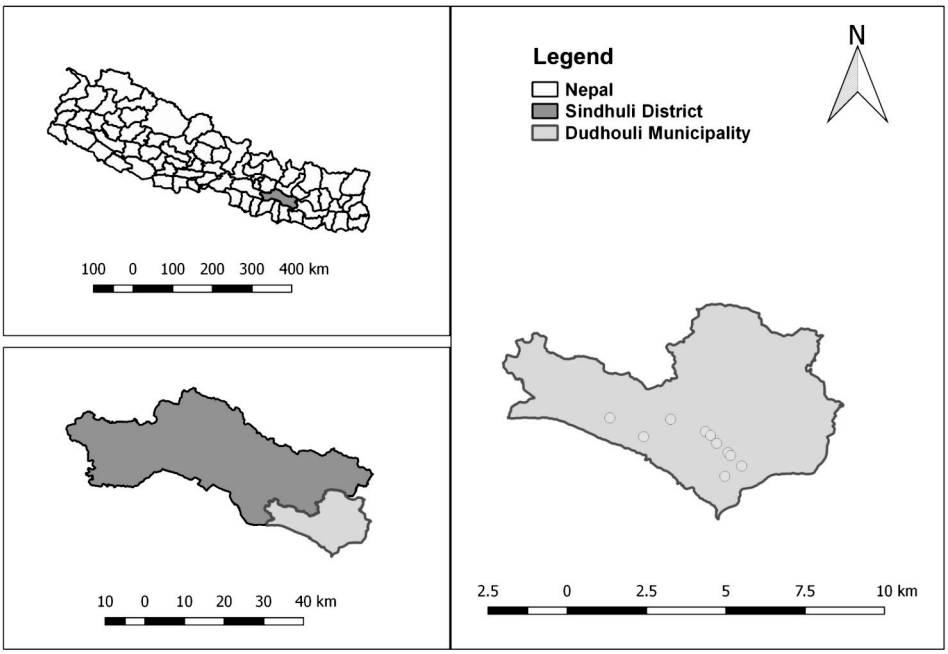

Figure 1: Map of the study area showing sampling sites

Dudhauli Bazar (ward no. 9), Sirthauli (ward no. 5), Harshahi (ward no. 6) and Dakaha (ward no. 4) (Figure 1). The study area lies in a tropical ecological region with warm and humid climatic conditions. The vegetation comprises two types of tropical forests, namely mixed deciduous forest and Sal forest. Among the diversity of 31 ethnic groups and castes in the total population of 8,568 in Dudhauli VDC, the Danuwar community comprised a high population (31%) (CBS, 2011).

Data collection and analysis

Primary data was collected through a field survey, which was done from October 2, 2016 to January 14, 2017, interviewing 106 people. The respondents were interviewed randomly to collect the information in the Danuwar community within five wards using a structured interview (key informant interview and focus group discussion of 6-8 people with the help of an open-ended and semi-structured questionnaire). Key informants were selected, and they managed the group discussion and individual conversations in every village of various wards (Table 1).

An unstructured interview with small groups that comprised of youth, local people and elderly people was conducted to obtain the relevant and necessary information on various subjects like the perception of local people, especially youth, on traditional medicine and modern medicine, sources of medicinal plants and their local status. Information on the status of plants was gathered from the local people and a vegetation survey was conducted as well. Each plant species was scored based on the priority assigned by the locals. Garmin eTrek 10 was used to collect topographical data, and audio clips were recorded using audio recorders.

Specimens were collected from the study area for their identification. The preparation of herbarium specimens was followed by the standard technique by Bridson and Forman (1992). The herbarium was identified with the help of reference materials from the National Herbarium and Plant Laboratories (KATH), Tribhuwan University Central Herbarium (TUCH) and experts. Siwakoti and Varma (1999), Manandhar (2002), Wu and Raven (1994-2000), Wu et al. (2001-2011) and few other checklists were consulted. Catalogue of Life (www.catalogueoflife.org/), Plants of the World Online (powo.science.kew.org) and Tropicos (www.tropicos.org/home) were also used. The data was analysed in Microsoft Excel to compile taxonomic information about plant species, parts used, medication processes, mode of use, and other ethnobotanical practices. Herbarium specimens were deposited at the Botany Department of Trichandra Multiple Campus, Ghantaghar, Kathmandu.

Results and Discussion

A total of 161 plant species representing 153 genera and 58 families, which comprised 130 dicots, 27 monocots, 3 pteridophytes and 1 mushroom species, were used to treat different ailments by the Danuwar community in the study area (Table 2 and 3). The highest recorded plant species used in different ailments belongs to the family Fabaceae (19 spp.), followed by Lamiaceae (11 spp.), Asteraceae (7 spp.), Euphorbiaceae (7 spp.), Poaceae (6 spp.) etc.

Among the collected species, herbs (50%) were the most commonly used medicinal plants, followed by trees (22%), shrubs (21%) and climbers (7%) (Figure 2). Different plant parts such as root, leaf, seed, bark, rhizome, bulb, flower, young shoots, thallus, latex, and sporocarp, were used either in their raw form or through processing into various forms such as decoction, juice etc. The leaf (19%) is the most commonly used plant part, followed by fruit (14%), seed (12%), stem (11%), root (11%), bark (7%),

Table 1: The list of respondent categories with the number from the study areas

Respondents	Number of respondents	Respondents	Number of respondents
Intern doctors & nurses	3	Herbalists	17
Health Assistants	3	House wives	22
Community and social leaders	7	Traditional healers	10
Teachers and students	21	Other knowledgeable people	23

shoot (7%), whole plant (7%), latex (5%), rhizome (4%) and flower (3%) (Figure 3).

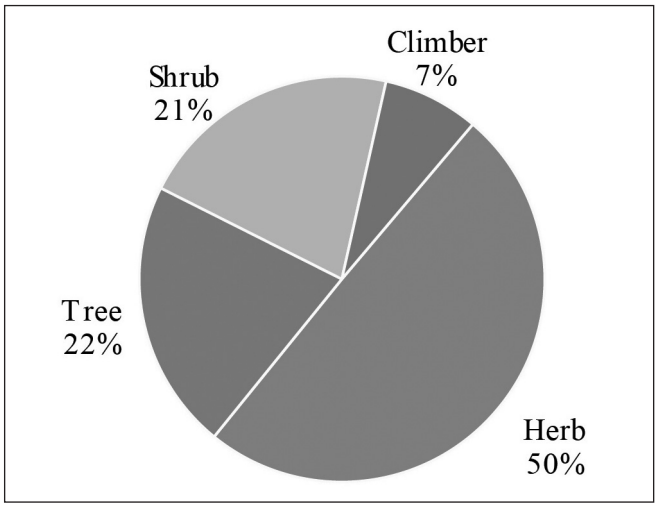

Figure 2: Habit of plants

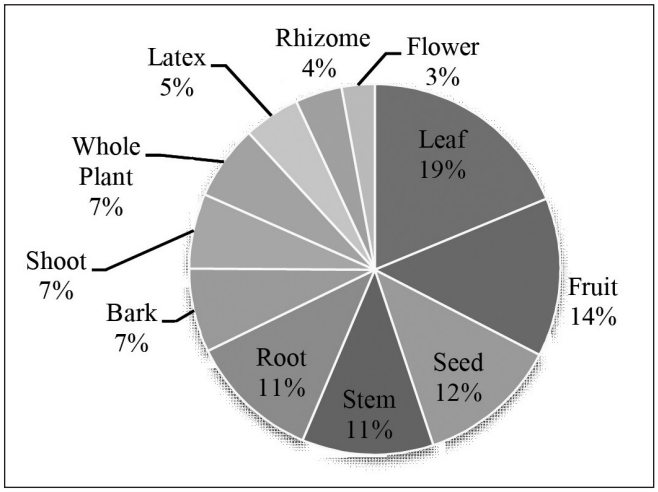

Figure 3: Plant parts used in ethnomedicine

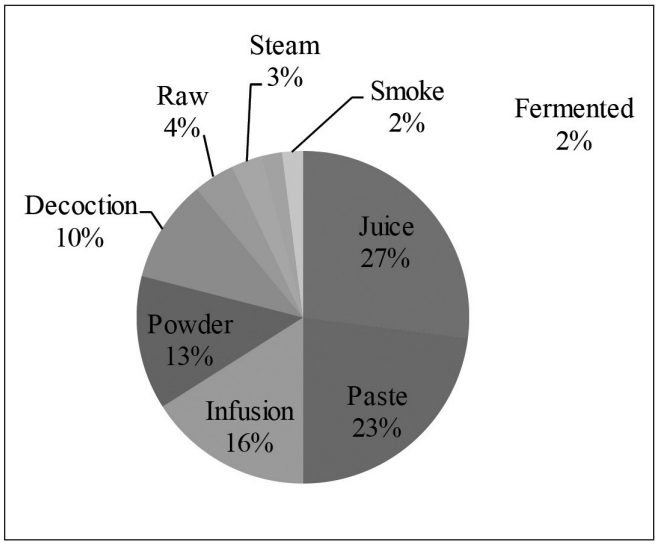

Figure 4: Forms of medication

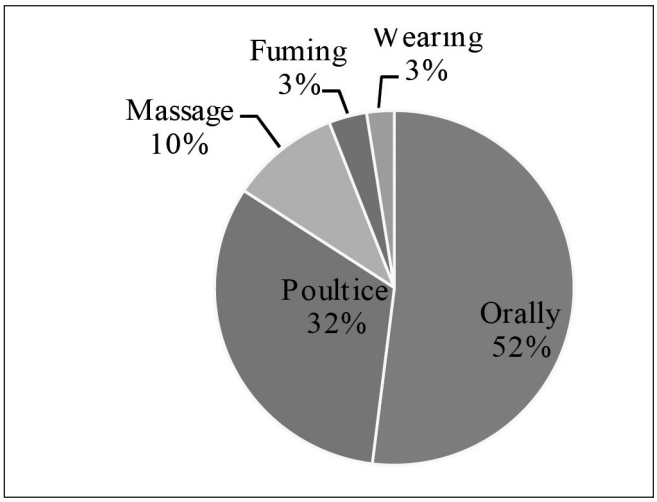

Figure 5: Mode of application

The most common mode of use was juice, which accounts for 27% of plant species, followed by paste (23%), infusion (16%), powder (13%), decoction (10%), raw (4%), steam (3%), fermented form (2%), and smoke (2%) (Figure 4).

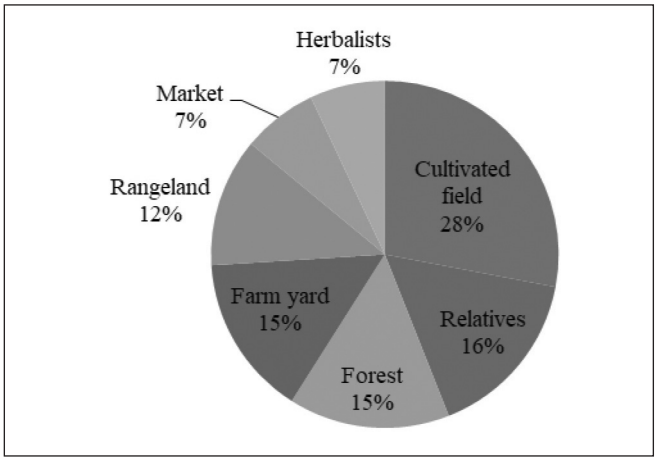

Figure 6: Sources of collection of plant remedies

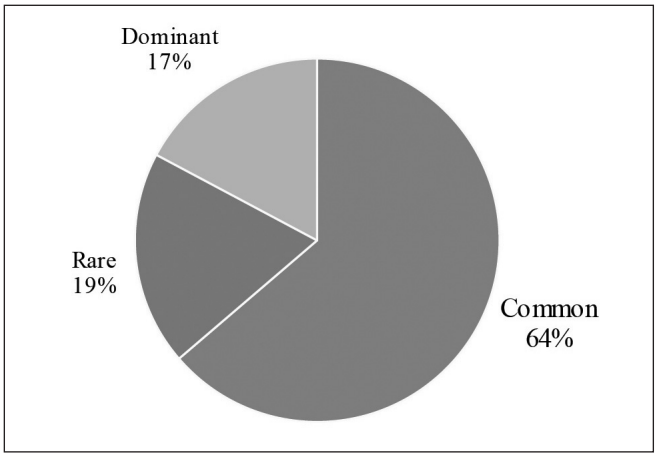

Figure 7: Local status of plant species

Table 2: Summarization of application of recorded plant species in various ailments

Scientific name	Family	Danuwari name	Ailments	Preparation/additives	Dose & medication forms	Mode of application	Time requirement
Plants applications in unspecified ailments							
Achyranthes aspera L.	Amaranthaceae	ठन्टा चिरिचिरी/ दत्मिन	Typhoid	Fresh root + *Equisetum* sp.& powder of *Piper nigrum*	½ cup of juice	Oral	Early morning &evening; until cure
Aegle marmelos (L.) Correa	Rutaceae	बेल	Fever/Cooling agent	Fruit/ leaf	½ cup of juice	Oral	2-3 times;1-2 days
Aleuritopteris bicolor (Roxb.) Fraser-Jenk	Pteridaceae	रत्जरा	Fever/Cooling agent	Whole plant	½cup of juice	Oral	Early morning & evening;2-3 days
Ananas comosus (L). Merr.	Bromeliaceae	भुइकटर	Typhoid	Fruit	½ cup of decoction	Oral	Morning;1-2 days
Azadirachta indica A. Juss	Meliaceae	नीम	Fever	Dry/fresh leaf	2-3tsp infusion	Oral	Morning/evening; 2-3 days
Centella asiatica L. Urban	Apiaceae	घोरतापा	Fever/Cooling agent	Fresh root with water & sugar	1 cup juice	Oral	Morning or, evening; 2-3 days
Hellenia speciosa (J.Koenig) S.R.Dutta	Costaceae	बेत्लौरी	Fever	Root + water + honey & sugar	A cup of decoction	Oral	Morning /evening; 2-3 days
Opuntia monacanthos (Willd.) Haw.	Euphorbiaceae	बगिया काँडा	Fever/Cooling agent	Fresh stem & water	1 cup juice	Oral	Morning / Night; 1-2 days
Oroxylum indicum (L.) Kurz.	Bignoniaceae	टोटेला	Fever	seeds paste with water	3 tsp juice	Oral	Morning & Night; 1-2days
Piper nigrum L.	Piperaceae	मरिच	Fever	5gm powder+root juice of *Mimosa pudica*	3 tsp juice	Oral	Early morning & evening; Until cure
Pogostemon benghalensis (Burm.F.) Kuntze	Lamiaceae	ठत्जरा	Fever	Fresh root	½ cup of juice	Oral	Early morning & evening; 2-3days
Premna serratifolia L.	Lamiaceae	गिनेरी	Typhoid	25 ml Fresh bark juice+root of *Capsicum fruetescens* & tomato + *Cyanodon dactylon* + rice seeds	½ cup of juice	Oral	Early morning & evening; Until cure
Senna tora (L.) Roxb.	Fabaceae	चेकोर	Fever	Seed+fresh root of *Ziziphus mauritiana*	5-6tsp juice	Oral	Morning & evening; until cure
Tagetes erecta L.	Asteraceae	सैपत्री	Fever/Typhoid	Leaves	½ cup of decoction	Oral	Morning & Night; 2-3days
Terminalia chebula Retz.	Combretaceae	हर्रा	Fever	5gm powder+water	1-2 tsp Infusion	Oral	Morning & evening; 2-3days
Trachyspermum ammi (L.) Sprague	Apiaceae	जमाइन	Measles	Rosted seed powder	As required	Topical	Anytime, as per requirement

Scientific name	Family	Danuwari name	Ailments	Preparation/additives	Dose & medication forms	Mode of application	Time requirement
Ziziphus mauritiana Lam.	Rhamnaceae	बैर	Measles, fever	Endocarp	As required	Topical/oral	Anytime, Until cure
Plants applications in Respiratory system ailments							
Achyranthes aspera L.	Amaranthaceae	उन्टा चिरिचिरी / दत्मिन	Pina (Sinusitis)	Crushed seeds	As required	Partly inhalation through nostril to cause sneezing	As required; until cure
Acorus calamus L.	Acoraceae	बोझो	Cough	Burned rhizome	Small piece	Oral	Any time; until cure
Euphorbia royleana Boiss.	Euphorbiaceae	प्रसुध पट्टा / सिधा	Pina (Sinusitis)	Cut stem	1-2 spoon	Oral	Any time; 2-3 days
Euphorbia royleana Boiss.	Euphorbiaceae	प्रसुधिक पट्टा	Common cold/Cough	Heated leaf	As required	Warm up on head & stomach	Night; Until cure
Glycyrrhiza glabra L.	Fabaceae	जेठिमधु	Tonsillitis	Dried root	Small piece	Oral	Any time; until cure
Justicia adhatoda L.	Acanthaceae	हर्शा	Common cold/ Cough	Leaves, turmeric powder & salts	A cup of decoction	Oral	Morning & night; until cure
Leucas cephalotes (Roth) Spreng.	Lamiaceae	डुल्फी	Pina (Sinusitis)	Whole plant	As required	Massage in forehead	Any time; until cure
Musa balbisiana Colla	Musaceae	बोन केरा	Asthma	Fruit	As required	Oral (Given with Spiritual mantra)	Once a day; until cure
Myristica fragrans Houtt.	Myristicaceae	जाइफाल	Pneumonia	Fruit powder of Cardamom, Clove mix with Camphor & Geru maato (Orange-red colored soil) (roasted in Cow ghee	4-5 tsp paste/juice	Oral/ topical	Once a day; 2-3 days
Ocimum basilicum L.	Lamiaceae	बाब्री	Common cold/ Cough	Leaves mix with Piper, Ginger, turmeric powder & salts	A cup of decoction	Oral	Morning/night; Until cure
Ocimum tenuiflorum L.	Lamiaceae	तुल्सी	Common cold/	Leaves mix with Piper, Ginger, turmeric powder & salts	A cup of decoction	Oral	Morning/night; 2-3 days
Piper longum L.	Piperaceae	पिप्रोता	Common cold/cough	Ripen fruits	As required	Oral	Morning & Night; Until cure
Phyllanthus emblica L.	Phyllanthaceae	रिखिया	Common cold/cough	Fruit pulp	As required	Oral	Morning &evening; 2-3 days

Scientific name	Family	Danuwari name	Ailments	Preparation/additives	Dose & medication forms	Mode of application	Time requirement
Senegalia catechu (L.f) P.J.H Hurter & Mabb.	Fabaceae	खैरा	Cough	Core stem+ bark of *Shorea robusta*, seed powder of *Piper nigrum* L. equally	5-6 tsp juice as expectorant	Oral	Morning & evening;2-3 days
Spondias pinnata (L.f.) Kurz	Anacardiaceae	अमार	Common cold/cough	Burned fruit pulp	Small piece	Oral	Morning & evening; 2-3days
Maianthemum purpureum (Wall.) LaFrankie	Asparagaceae	तिता पिडार	Tonsilitis	Bulb	Small piece	Oral	Any time; until cure
Syzygium nervosum A. Cunn ex DC.	Myrtaceae	ठुम्की जाम	Pina (Sinusitis)	Fresh leaves heated on fire	As required	Fumigation over nostril	3-4 times a day; Until cure
Vitex neguno L.	Lamiaceae	सिम्ली	Pina (Sinusitis)	Leaves	As required	Massage in forehead	Any time; until cure
Zingiber officinale Roscoe.	Zingiberaceae	आदी	Common cold/cough	Rhizome + leaves of Holy basil & *Nyctanthes arbortristis*, Cumin seeds, Turmeric powder & salts	A small cup of Decoction	Oral	Morning & night; Until cure
Plants applications in Reproductive system ailments							
Alstonia scholaris (L.) R.Br	Apocynaceae	छट्मिन	Sterility & abortion/Weakness	latex + latex of *Holarrhena pubescens*	½ cup of latex	Oral	Any time: As required
Anethum graveolens L.	Apiaceae	सोन्प	Tonic for Pregnant woman	seeds + root powder of *Berginia ciliata* & *Astilbe rivularis* + sugar& rice flour	Puwa (Rice flour dish) As required	Oral	Once a day; As required
Asparagus racemosus Willd.	Asparagaceae	सतावरि	Milk production	Fresh rhizome, sugar & water	½ cup of juice	Oral	Morning; Few weeks
Clerodendrum infortunatum L.	Lamiaceae	अगियाठी	Menstrual cramp/worms	Young shoot	3-4tsp juice	Oral	Morning/Night; Until cure
Hibiscus sabdariffaa L.	Malvaceae	चन्ना	Blood purification in woman	Leaves curry	As required	Oral	Twice a day; 2-3 days
Ichnocarpous frutescens (L.) W.T.Aiton	Apocynaceae	दुध्या लट्टी	Agalactia	Root paste	3-4 tsp juice	Oral	Morning; Few weeks
Nerium oleander L.	Apocynaceae	हर्दयाना फुला	Over bleeding in woman	Latex & Suplungbhasi (herbal powder)	3-4 tsp juice	Oral	Morning; until cure
Trachyspermum ammi (L.) Sprague.	Apiaceae	जमाइन	Tonic for pregnant woman	with Fenugreek seeds	Soup	Oral	Twice a day; Few weeks
Unidentified sp.		माहुर	Blood purification in woman	Stem & root +water	A cup of juice	Oral	Morning; Few weeks

Scientific name	Family	Danuwari name	Ailments	Preparation/additives	Dose & medication forms	Mode of application	Time requirement
Plants applications in Nervous system ailments							
Millettia glaucescens Kurz.	Fabaceae	चाम्या / चिल्मिल	Paralysis	Seed oil of Chamre, Mustard & *Entada phaseoloides*, Gandhak equally	As required	Massage in sunlight	Morning & night; Until cure
Drimia indica (Roxb.) Jessop	Asparagaceae	बोन प्याज	Headache	Rhizome paste	As required	Massage in forehead	1-2 times; 1-2 days
Calotropis gigantea (L.) W.T. Aiton	Apocynaceae	अकोन	Paralysis	Fresh leaves heated on fire	As required	Massage	Twice a day; until cure
			Pina (Sinusitis)	Dried stem	As required	Fumigation over nostril	3-4 times a day; Until cure
Capsicum annum L.	Solanaceae	बडका सिर्सिर्या	Headache	Fruits heated on fire	As required	Fumigation over nostril	3-4 times a day; Until cure
Cyperus rotundus L.	Cyperaceae	मोथा	Headache	Fresh floral part	As required	Massage in forehead	Any time; until cure
Eclipta prostrata (L.) L.	Asteraceae	भङ्गोरिया	Headache/cuts	Fresh leaves	As required	Topical	Any time; until cure
Zanthoxylum armatum DC.	Rutaceae	टिमुर	Paralysis	5 gm seeds + 5 gm fruit paste of Chilli + 10 gm bulb paste of Onion + 10gm of *Plumbago zeylanica* + 5gm of Garlic	5-6 tsp paste	Massage	Twice a day; until cure
Plants applications in Muscular-skeletal system ailments							
Amorphophallus paeoniifolius (Dennst.) Nicolson	Araceae	ओल	Swollen body	Flower	3-4 tsp juice	Oral	Once a day; 1-2 days
Equisetum sp.	Equisetaceae	पेप्नी	Swollen body	Whole plant	1/2cup of juice	Oral	Once a day; until cure
Eleusine corocana (L.) Gaertn.	Poaceae	मरुवा	Body pain/Relaxation	Seeds of Millet /Wheat/ Maize/Rice	Fermented alcohol	Oral	Any time; 1-2 days
Mallotus philippensis (Lam.) Müll.Arg.	Euphorbiaceae	सिन्दुरे / रैनी	Body pain/Relaxation	Bark/ stem	5-6tsp juice	Oral	Morning; 2-3 days
Orchid sp. (Epiphytic)	Orchidaceae	सुनाखरी	Bone breakage	Root/leaves of orchid + *Cuscuta reflexa* + core stem of *Senegalia catechu* paste	As required	Poultice	Any time;3-4 weeks

Scientific name	Family	Danuwari name	Ailments	Preparation/additives	Dose & medication forms	Mode of application	Time requirement
Phoenix sylvestris (L.) Roxb.	Arecaceae	तारि / ताडी	Body pain/Relaxation	Latex/sap	Fermented alcohol	Oral	Any time; 1-2 days
Syzygium cumini (L.) Skeels	Myrtaceae	जाम	Swollen body	Turmeric flower +bark of Guava+ rhizome paste of *Curcuma caesia* equally	Steam solution	Fumigation/Topical	Night; 2-3 days
Plants applications in Urinary system ailments							
Senegalia pennata (L.) Maslin	Fabaceae	अरार / दरार	Kidney stone	Root + Stem & root of *Croton roxburghii* + water & sugar	1/2tsp of juice	Oral	Once a day; until cure
Cassia fistula L.	Fabaceae	बनरसोत	Retention of Urine	Fruit/seeds, water & sugar	4-5 spoon	Oral	Thrice a day; Until cure
Centella asiatica L. Urb.	Apiaceae	डोकनी	Burn urination	Whole plant	1 cup of juice	Oral	Twice a day; until cure
Citrus × *limon* (L.) Osbeck	Rutaceae	कागटी	Burn urination	Fruit juice, water& Black rock sugar	As required	Oral	Thrice a day; until cure
Coix lacryma-jobi L.	Poaceae	भिरकाउलो /	Urinary troubles	25 gm seed paste + water & sugar/honey	5-6tsp juice	Oral	Twice a day; until cure
Hellenia speciosa (J.Koenig) S.R.Dutta	Costaceae	बेत्लौरि	Burn urination	Root	½ cup of juice	Oral	Twice a day; until cure
Croton persimilis Müll.Arg.	Euphorbiaceae	मासोन	धाद (Dan.)/Hematuria	Root + Lemon +water +Sabkol ko Bhusi (Suplungbhasi) rock sugar	½ cup of juice	Oral	Twice a day; until cure
Cyanodon dactylon (L.) Pers.	Poaceae	दुब	Burn urination	Whole plant, sugar & water	½ cup of juice	Oral	Thrice a day; until cure
Macrotyloma uniflorum (Lam.) Verdc.	Fabaceae	कुर्थी	Stone in Urinary tract	Seed (As a curry)	A cup of soup	Oral	Morning & evening;
Nyctanthes arbor-tristis L.	Oleaceae	पारिजात	Rheumatic disorder & Uric acid	Leaves, water, salt, turmeric powder	½ cup of decoction	Oral	Early morning; Until cure
Piper longum L.	Piperaceae	पिप्रोता	Urinary infections	Leaves	3-4 tsp. of juice	Oral	Twice a day; until cure
Plants applications in Digestive system ailments							
Azadirachta indica A. Juss.	Meliaceae	नीम	Tooth brush	Leaf twig	As required	Brush	Morning
Bambusa bambos (L.) Voss.	Poaceae	बास	Tooth brush	Leaf twig	As required	Brush	Morning
Butea monosperma (Lam) Taub.	Fabaceae	पलास	Intestinal worm/Blood Dysentery	Flower	3-4tsp. juice	Oral	Twice a day; 2-3 days

Scientific name	Family	Danuwari name	Ailments	Preparation/additives	Dose & medication forms	Mode of application	Time requirement
Cannabis sativa L.	Cannabaceae	गँजा	Suluhai (Diarrhea/Dysentery)	Leaves	2-3 tsp. juice	Oral	Twice a day; 1-2 days
Cantharellus odoratus (Schwein.) Fr.	Cantharellaceae	चम्पे च्याउ /हर्दयाना छाती	Stomach disorder/Diet	Fruiting body	Curry	Oral	As required
Cassia fistula L.	Fabaceae	बनरसोत	Constipation	Fruit/seed	5-6 tsp. juice	Oral	As required
Celosia argentea L. var. argentea	Amaranthaceae	सुरुवाले साग	Stomach disorder/Diet	Fresh root, water & sugar	4-5tsp. juice	Oral	Twice; 2-3 days
Centella asiatica (L.) Urb.	Apiaceae	घोरतापा	Blood dysentery	Fresh plant + water	1/2cup of juice	Oral	Thrice a day; 2-3 days
Clerodendrum indicum (L.) Kuntze.	Lamiaceae	अगियाठी	Antihelmintic/Ulcer	Young shoot /leaves	2-3 tsp. juice	Oral	Early morning; Until cure
Curcuma caesia Roxb.	Zingiberaceae	कारी हर्दी / गनपसार	Gaha/ Madigaha (Dan.)/Foodpoisoning/ Appetizer	Small piece/juice	1-2 tsp. juice, *Overdose can cause vomiting	Oral and Topical	Day time; 2-3 days
Cuscuta reflexa Roxb.	Convolvulaceae	अमरलट्टी	Jaundice	15ml plant juice + 5gm seed paste of *Oroxylum indicum* + water+sugar/Plant paste	½ cup of juice	Oral/Bath	Early morning & evening; Until cure
Dalbergia sissoo DC.	Fabaceae	सिसो	Gaha/ Madigaha (Dan.) / Teeth	Fresh leaves of Sissoo + young twig of Bamboo	Paste/ twig	Poultice & Wash/ brush	Any time; 2-3 days
Desmostachya bipinnata (L.) Stapf.	Poaceae	कुश	Stomach pain	Fresh root, water & sugar	4-5tsp juice	Oral	3-4 times; 1-2 days
Equisetum sp.	Equisetaceae	पेप्नी	Jaundice	*Centella asiatica* + *Cuscuta reflexa* + water & sugar	A cup of juice	Oral	Early morning & evening; Until cure
Flemingia strobilifera (L.) Aiton	Fabaceae	जोगबिरो	Dysentery/Diarrhea	Stem & water	4-5tsp. juice	Oral	Twice; until cure
Jatropha curcas L.	Euphorbiaceae	बगन्डी	Tooth brush	Leaf twig	As required	Brush	Morning
Mangifera indica L.	Anacardiaceae	आम	गह/माडी गह	Bark of Mango & Sissoo, leaves of Neem, *Cyanodon dactylon* and ash (Chhaur Dan.) of mustard seeds equally	Paste	Poultice (face & chest of Children)	Any time; until cure
Mimosa pudica L.	Fabaceae	लजोनी	Toothache	Root paste	As required	Put in teeth	Any time; until cure

Scientific name	Family	Danuwari name	Ailments	Preparation/additives	Dose & medication forms	Mode of application	Time requirement
Musa balbisiana Colla	Musaceae	बोन केरा /पजेर फोर केरा	Fish bone/Bone pricking	Fruit	As required	Oral	Any time; until cure
Ophioglossum reticulatum L.	Ophioglossaceae	एक पतिया /जिबिया साग	Dysentery/Diarrhea	Whole plant	3-4tsp. juice	Oral	Thrice; 1-2 days
Oxalis corniculata L.	Oxalidaceae	अम्टि	Stomach disorder/	Whole plant, sugar/honey & water	4-5tsp. juice	Oral	3-4 times; until cure
Paederia foetida L.	Rubiaceae	गुलट्टी	Appetizer	Fresh root/stem	2-3 tsp. juice	Oral	Morning; until cure
Psidium guajava L.	Myrtaceae	बिलोकी	Blood dysentery and diarrhea/ Tooth brush	Bark of Guava+ Mango & water/ twig	4-5tsp. juice/ twig	Oral	2-3 times; 2-3 days
Ricinus communis L.	Euphorbiaceae	अडेर / अन्डी	Amoebic Dysentery	Root & latex	3-4tsp. juice	Oral	Thrice; 1-2 days
Rhododendron arboreum Sm.	Ericaceae	गुराँस	Fish bone/bone pricking	Flower	As required	Oral	Any time; until cure
Scoparia dulcis L.	Plantaginaceae	बलयारी	सुलुहाई(Dan.) /Diarrhea)	Fresh stem/root	½ cup of juice	Oral	Morning/ evening; 1-2 days
Shorea robusta Gaertn.	Dipterocarpaceae	सखुवा / साल	सुलुहाई (Dan.)	10 gm latex + curd+ sugar/honey with beaten rice	As required	Oral	Thrice; 2-3 days
Solanum aculeatissimum Jacq.	Solanaceae	रेग्नी	Toothache	Smoke from fruits	As required	Put on teeth	Any time; Until cure
Syzygium aromaticum (L.) Merrill & Perry	Myrtaceae	नोङ्ग	Toothache	Fruit/Fruit oil	As required	Put in teeth	Any time; Until cure
Terminalia chebula Retz.	Combretaceae	हर्रा	Gastritis	Fruit powder of Harro, Amala & Barro equally + Luke warm water	3-4tsp. juice	Oral	Early morning; Until cure
Tinospora sinensis (Lour.) Merril.	Menispermaceae	गुजी	Jaundice	4 inches stem dissolved into warm water left overnight	½ cup of infusion	Oral	Early morning; Until cure
Tinospora sinensis (Lour.) Merrill.	Menispermiaceae	गुजी	Gastritis	Fruit powder + Cardamom powder & water	3-4tsp. juice	Oral	Early morning; Until cure
Trichosanthes cucumerina subsp. *cucumerina*	Cucurbitaceae	बोन घिरा	Jaundice	2-3gm fruit/seed (overdose have side effect) + water	1-2tsp.	Oral (Patient vomit yellowish pigment after inhalation)	2-3 times; Until cure
Uraria picta (Jacq.) Desv. ex DC.	Fabaceae	चत्री	Blood Dysentery	Plant juice	4-5tsp. juice	Oral	Twice; 2-3 days

Scientific name	Family	Danuwari name	Ailments	Preparation/additives	Dose & medication forms	Mode of application	Time requirement
Woodfordia fruticosa (L.) Kurz.	Lythraceae	च्युहुवा	Dysentery	Flower+bark paste of *Syzygium cumini* & Guava	½ cup of juice	Oral	Twice; 2-3 days
Catunaregam spinosa (Thunb.) Tirveng.	Rubiaceae	मैनार	Blood Dysentery	Core stem + bark paste of *Syzygium cumini*	½ cup of juice	Oral	Twice; 2-3 days
Plants applications in Endocrine system ailments							
Artocarpous lacucha Buch.-Ham. ex D. Don	Moraceae	बरहर	Mumps/Dan. गलसोत	Latex	As required	Applied externally	Once; Until cure
Crinum asiaticum L.	Amaryllidaceae	बोन लसोन /हाडे लसोन	Mumps/Dan. गलसोत	Rhizome paste	As required	Applied externally	Once; Until cure
Syzygium cumini (L.) Skeels.	Myrtaceae	जाम	Diabetes	Bark	3-4 tsp. juice	Oral	Early morning; 1-2 weeks
Tinospora sinensis (Lour.) Merril.	Menispermaceae	गुजी	Diabetes/Tonic	4 inches stem dissolved into warm water left overnight/soup with other herbs	½ cup of infusion/decoction	Oral	Early morning; Until cure
Plants applications in Skin and Integumentary system							
Adina cordifolia (Roxb.) Brandis	Rubiaceae	करम	Athlete's foot/Wounds	Bark/Leaf paste	As required	Poultice	Any time; until cure
Ageratina adenophora (Spreng.) R. King & H. Rob.	Lamiaceae	गनिया बोन /गन्हेरी	Cut/Wound	Leaf paste	As required	Poultice	Any time; until cure
Allium sativum L.	Amaryllidaceae	लसोन	Scorpion bite	Bulb paste	As required	Poultice	Any time; until cure
Aloe vera (L.) Burm.F.	Liliaceae	घीदानी /घिउकुमारी	Burn	Leaves	As required	Poultice	Any time; until cure
Amaranthus spinosus L.	Amaranthaceae	कट्काइन	Boils	Root paste	As required	Applied on boils except mouth	1-2 time
Areca catechu L.	Arecaceae	सुपारी	Scar removing	Raw seed paste	As required	Poultice	Any time; until cure
Artemisia vulgaris L.	Asteraceae	तितेपाती	Allergy/worm	Leaf paste	As required	Poultice	Any time; until cure
Artocarpous lacucha Buch.-Ham.	Moraceae	बरहर	Wound/Boils	Latex	As required	Topical	Once; until care
Bambusa bambos (L.) Voss	Poaceae	बाँस	Cut/Wound	Slice piece	As required	Topical	Once; until cure

Scientific name	Family	Danuwari name	Ailments	Preparation/additives	Dose & medication forms	Mode of application	Time requirement
Brassica juncea (L.) Czern.	Brassicaceae	राइ	Skin allergy (Blister/rashes)	Oil	As required	Massage	Any time; until cure
Brassica spp.	Brassicaceae	तोरी	Hair tonic/Hair bath	Seed oil/Seed oil extract	As required	Applied on hair	Any time; until cure
Calotropis gigantea (L). W.T.Aiton	Apocynaceae	अकोन	Boils	Latex	Small amount	Applied on boils except mouth	Any time; until cure
Carica papaya L.	Caricaceae	लेवा / मेवा	Fungal infection	Latex	Small amount	Topical	Any time; until cure
Chromolaena odorata (L.) R. King & H. Rob.	Asteraceae	बोन मारा	Cut/Wound	Leaf paste	As required	Poultice	Any time; until cure
Citrus maxima (Burn.) Merr.	Rutaceae	निमु	Skin infection	Seed paste	As required	Poultice	Any time; until cure
Clerodendrum indicum (L.) Kuntze	Lamiaceae	अगियाठी	Agiya	Leaf paste	Small amount	Poultice	Any time; until cure
Cocos nucifera L.	Arecaceae	नरिवल	Hair tonic	Seed oil	As required	Applied on hair	Any time; until cure
Crotalaria prostrata Rottler ex Willd.	Fabaceae	धोकरीया	Dhokre	Plant paste	As required	Poultice	Any time; until cure
Datura metel L.	Solanaceae	धुतुर	Dhokre	Drilled fruit /leaf	As required	Wear as ring	Any time; until cure
Elephantopus scaber L.	Asteraceae	मन्चा झार	Hair growth	Root juice	As required	Poultice	As required
Elsholtzia fruticosa (D.Don) Rehder	Lythraceae	धुर्सी	Skin infection	Fresh leaf paste	As required	Poultice	Any time; until cure
Eclipta prostrata (L.) L.	Asteraceae	भङ्गोरिया	Cut/Wound	Leaf paste	As required	Poultice	Any time; until cure
Iresine diffusa f. *herbstii* (Hook.)	Amaranthaceae	रत्फुला	Cut/Wound	Leaf paste	As required	Poultice	Any time; until cure
Jatropha curcas L.	Euphorbiaceae	बगन्डी / सजिवन	Foot/Hand Crack & fissures	Seed oil	As required	Topical	Any time; until cure
Lablab purpureus (L.) Sweet	Fabaceae	छिमी	Fungal infection	Fresh leaves paste+few amounts of Lime, Urine of Cow, Stem juice of Banana	As required	Topical	Any time; until cure
Lawsonia inermis L.	Lythraceae	मेदी / मेहेन्दी	Athlete's foot/ Hair color	Leaf paste	As required	Topical/ hair	Any time; until cure
Leucas cephalotes (Roth) Spreng.	Lamiaceae	डुल्फी	Scabies	Leaf paste	As required	Topical	Any time; until cure
Lagenaria siceraria (Molina) Standl.	Cucurbitaceae	लौकी	Burn	Fruit paste	Small piece	Poultice	Any time; until cure
Nerium oleander L.	Apocynaceae	हर्दयाना फुला	Cut/Wound	Latex	Small amount	Poultice	Any time; until cure

Scientific name	Family	Danuwari name	Ailments	Preparation/additives	Dose & medication forms	Mode of application	Time requirement
Marcha (Nepali)		मन्चा	Boils	Paste	Small amount	Applied on boils except mouth	Any time
Melia azedarach L.	Meliaceae	बकैन	Skin infection	Leaves paste	Small amount	Topical	Any time; until cure
Mimosa pudica L.	Fabaceae	लजोनी	Boils	Leaf/root paste	Small amount	Applied on boils except mouth	Any time; until cure
Mucuna interrupta Gagnep.	Fabaceae	झउवा	Cut/Wound	Bark paste	Small amount	Applied on boils except mouth	Any time; until cure
Nicotiana tabacum L.	Solanaceae	सुर्ती	Remove leech	Dried leaves	As required	Topical	Any time; until cure
Oryza sativa L.	Poaceae	धान	Scorpion bite	Rhizome paste	Small amount	Poultice	Any time; until cure
Plumbago zeylanica L.	Plumbaginaceae	चितु	Fungal infection	Leaf paste + *Polygonum barbatum* L. equally	As required	Topical	Any time; until cure
Ricinus communis L.	Euphorbiaceae	अडेर / अन्डी	Foot/Hand Crack & fissures	Seed oil	As required	Topical	Any time; until cure
Schima wallichii (DC.) Korth.	Theaceae	चिलउनिया	Skin rashes/wounds	Bark/leaf paste	As required	Poultice	Any time; until cure
Semecarpus anacardium L.F.	Anacardiaceae	भला	Skin irritation due to latex	Fruit ash (Chhaur, Dan)	As required	Topical	Any time; until cure
Sesamum indicum L.	Pedaliaceae	तिल	Miliaria (Dan. घमघोरी)	Seed oil/	As required	Topical	Any time; until cure
Tridax procumbens L.	Asteraceae	ठिकुरी	Wound (To stop bleeding)	Plant paste	As required	Poultice	Any time; until cure
Plants used in Protection of Body system							
Clerodendrum indicum (L.) Kuntze.	Lamiaceae	अगियाठी	Protection	Dried stem	As required	Bead	Any time; until cure
Premna serratifolia L.	Lamiaceae	गिनेरी	Protection	Dried stem/Bark	As required	Garland for Children	Any time; until cure
Smilax aspera L.	Smilacaceae	कुकुरडाइनो	Protection	Dried stem	As required	Garland for Children	Any time; until cure
Urtica dioica L.	Urticaceae	सिस्ना	Protection	Dried form of plant with root	As required	Tied on waist of Child (Darador, Dan.)	Any time; until cure
Ziziphus spp.	Rhamnaceae	बैर	Protection (As ornamental)	Dried seed (People brought it from Eastern region)	As required	Garland/Bracelet	Any time; until cure
Plants applications in Sensory system ailments							
Abrus precatorius L.	Fabaceae	लालगेढी	Eye impurities	Seeds	One	Eye massage	Any time; until cure

Scientific name	Family	Danuwari name	Ailments	Preparation/additives	Dose & medication forms	Mode of application	Time requirement
Allium sativum L.	Amaryllidaceae	लसोन	Earache	Heated bulb	Liquid extract	Put on ear	Any time; until cure
Alternanthera sessilis (L.) DC.	Amaranthaceae	नुनियली साग / सिरैन्ची	Corneal Ulcer	Fresh stem/	As required	Put into eyes	Any time; until cure
Datura metel L.	Solanaceae	धुतुर	Earache	Heated leaf	Liquid extract	Put on ear	Any time; until cure
Euphorbia hirta L.	Euphorbiaceae	दुधिया	Earache	Heated leaf	Liquid extract	Put on ear	Any time; until cure
Lagenaria siceraria (Molina) Standl.	Cucurbitaceae	लौका	Earache	Heated leaf	Liquid extract	Put on ear	Any time; until cure
Leucas cephalotes (Roth) Spreng.	Lamiaceae	डुल्फी	Stye/Blepharitis	Plant juice	As required	Put into eyes	Any time; Once
Plants applications in Cardiovascular system ailments							
Drimia indica (Roxb.) Jessop	Amaryllidaceae	बोन प्याज	High BP	Bulb powder & Luke warm water	2-3tsp. infusion	Oral	Morning/ evening; Until cure
Azadirachta indica A. Juss.	Meliaceae	नीम	High BP	Leaf	2-3tsp. infusion	Oral	Early morning; Until cure
Clerodendrum infortunatum L.	Lamiaceae	भाटिक पट्टा	Balance BP/Blood purification	Young shoot	2-3tsp juice	Oral	Morning/night; Until cure
Urtica dioica L.	Urticaceae	सिस्ना	High BP	Young leaf	Curry	Oral	Any time; Until cure
Mahur		माहुर (परसोधी)	Blood purification	Root latex	½ cup of Latex	Oral	Morning
Plants applications in Domestic animal ailments							
Alternanthera sessilis (L.) DC.	Amaranthaceae	नुनियली साग / सिरैन्ची	Corneal ulcer	Fresh stem/leaf	Liquid extract	Put on eye	Any time; until cure
Argemone mexicana L.	Papaveraceae	कतारा	Eye troubles	Seed oil	As required	Put into eyes	Any time; until cure
Artocarpous lacucha Buch.-Ham. Ex D.Don	Moraceae	बरहर	Diarrhea	Leaf twig	As required	Oral	Any time; Few weeks
Asparagus racemosus Willd.	Asparagaceae	सतावरि	Milk production	Fresh rhizome + Pina	A cup of paste	Oral	Morning; Few weeks
Cannabis sativa L.	Cannabaceae	गँजा	Diarrhea	Leaf juice	As required	Oral	Any time; until cure

Scientific name	Family	Danuwari name	Ailments	Preparation/additives	Dose & medication forms	Mode of application	Time requirement
Capsicum frutescens L.	Solanaceae	सिर्सिर्या	Swollen stomach	5 gm fruit + 5 gm seed of *Zanthoxylum armatum* + 10 gm bulb of Onion+5gm of Garlic juice	A cup of juice	Oral	Twice a day; Until cure
Ichnocarpous frutescens (L.) W.T.Aiton	Apocynaceae	दुधिया लट्टी	Milk production	Root paste	As required	Oral	Any time; Few weeks

Table 3: Different ailments name in Danuwari language

Danuwari name of ailments	Ailments	Danuwari name of ailments	Ailments	Danuwari name of ailments	Ailments	Danuwari name of ailments	Ailments
आख पक्लछो	Stye/Blepharitis	फुली पर्ल	Corneal Ulcer	कपाल दुख्ल	Headache	पथ्री	Kidney Stone/Stone in Urinary tract
अगिया	A kind of skin blisters with fever	गह/माडी गह	Green diarrhea in infant	खला	Pneumonia	पेट दुखल	Stomache
अट्कपोरी	Sinusitis	गलसोत	Mumps	खोखी ठठल	Coughing	घा भेलछो	Wound
भलाठप्छो	Skin irritation due to the Latex of *Semecarpus anacardium*	घम्घोरी	Miliaria	कफ	Asthma	रत जर	Night fever
बिछी धरलको	Scorpion bite	गुध	Boils	माछीकाटा अड्क्लो	Fish bone pricking	साँप धरलको	Snake bite
देहफुल्ला	Swollen body	हावा लग्ल	Paralysis	माही	Measles	सस्वाइछो	Water allergy
धाद	Mucus in urine/Blood in urine (Hematuria)	जाबे	Skin allergy due to water	तुही भेल स	Menstruation	सुखानी	Anorexia (Loss of Appetite) leads thinning of body
ढिल पर्ल	Louse in head	जर	Fever	पास्पानी	Over bleeding in women/girls	सुलुवाही	Blood dysentery
ढोक्रे	Cellulitis	जोग पर्ल	Intestinal Worm	परसेना	After pregnancy	तिहाइ जर	Fluctuating type of fever
दोख	Typhoid	कपाल दुख्ल	Headache	परसोधी	Pregnancy	बोकाइलो	Vomit

The majority of the medications (52%) were taken orally, followed by poulticing or applying externally (32%), massage (10%), fumigation (3%), and wearing as a garland or other type (3%) (Figure 5). Due to an increase in forest degradation into rangeland or other pasture land, plant habitats are becoming rarer day by day. The collection places of the recorded medicinal plant species were mostly from cultivated fields (28%), followed by relatives or neighbors (16%), forests (15%), farm yard (15%), rangelands (12%), markets (7%), and herbalists (7%) (Figure 6).

Altogether 96 plant species were found to be cultivated or protected, whereas 61 plant species were common and not protected by local people. Similarly, 64% of plant species were common, followed by rare species (19%) and dominant species (17%) (Figure 7).

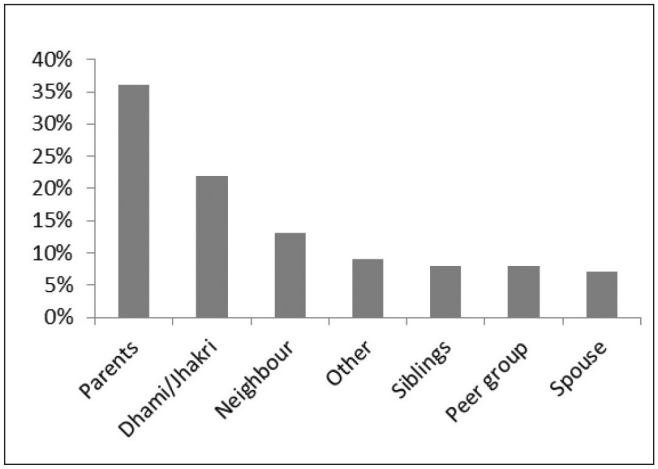

Figure 8: Source of knowledge of remedies

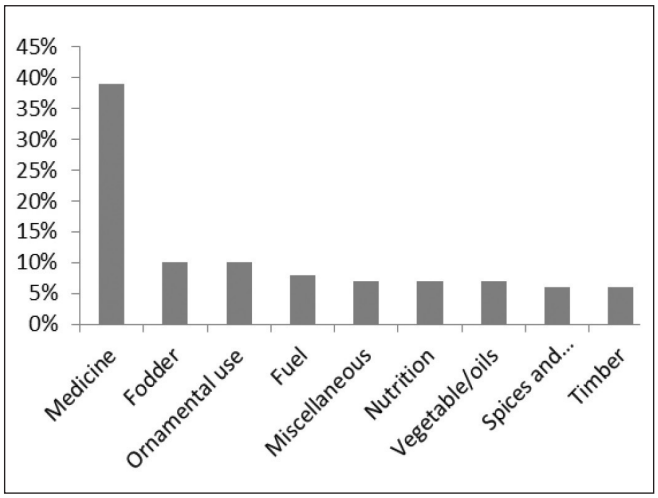

Figure 9: Usage of Plants in other application

About 60 plant species had a priority score of 1, which means that those plant species were used by informants for only one particular disease but not others. About 54 plant species that had other plant species in priority had a score of 2, which means that informants used the same plant species for another disease that is not in priority. And 43 plant species with unknown priority had a score of 0, which means that informants were unknown about remedy preference.

About 36% of medicinal plant species' remedies were known through parents; 22 % from Dhami/ Jhakri; 13% from Chhetri and Brahmin neighbours; 9% from others; 8% were known via siblings; 8% from peer groups; and 4% from spouse (Figure 8). Among 161 plant species, 39% of species were used for medicine, 10% of species were used for fodder, 10% of species were used for ornamental purposes, 8% of species for fuel, 7% of species for miscellaneous use, 7% of species for nutrition, and 7% of species for other vegetable/oils, 6% of species for spices/condiments, and 6% of species for timber (Figure 9). The recorded plant species have been found to be used for the treatment of 47 different ailments by the local Danuwars using their indigenous knowledge system. The largest numbers of plant species were used in the digestive system (21%), followed by the skin & integumentary system (18%), respiratory system (16%), unspecified ailments (9%), and the least number of species (2%) were used in the endocrine system (Table 4).

Traditional practices of plants as medicine

Most of the plants were herbs, followed by shrubs, which is consistent with other studies from Nepal (Rokaya et al., 2012; Shrestha & Dhillon, 2003). The preference of herbs over other forms is due to their easy access and abundance (Luitel et al., 2014). The Fabaceae and Lamiaceae comprise the highest number of medicinal plant species, which might be the result of their highest species richness in Nepal. Other studies conducted in different parts of the country (Bhattarai, 2020; Singh et al., 2012) also supported this trend. The higher number of medicinal plant species used in digestive system ailments could be the result of improper sanitation, drinking water

Table 4: List of the plant species used for various ailments

Categories of ailments	Ailments type/ medication	Name of plant species used for each specific category	No. of plant species
Digestive system disorder	Amoebic dysentery, Anthelmintic, Appetizer, Blood dysentery, Constipation, Diarrhea, Diet, Dysentery, Gastritis, Food poisoning, Gaha, Intestinal worm, Mouth infections, Stomach disorder, Swollen stomach, Ulcer, Worm, Jaundice, Dental care, Fish bone pricking, Typhoid	*Abrus melanospermus* subsp. *melanospermus, Abrus precatorius, Butea monosperma, Cajanus cajan, Cannabis sativa, Cantharellus odoratus, Cassia fistula, Catunaregam spinosa, Centella asiatica, Clerodendrum indicum, Curcuma caesia, Desmostachya bipinnata, Erigeron sublyratus, Flemingia strobilifera, Mangifera indica, Ophioglossum reticulatum, Oxalis corniculata, Paederia foetida, Phyllanthus emblica, Psidium guajava, Ricinus communis, Scoparia dulcis, Shorea robusta, Syzygium aromaticum, Syzygium cumini, Terminalia bellirica, Terminalia chebula, Tinospora sinensis, Uraria picta, Woodfordia fruticosa, Zanthoxylum armatum, Musa* sp.*, Rhododendron arboreum, Azadirachta indica, Bambusa bambos, Dalbergia sissoo, Jatropha curcas, Mimosa pudica, Solanum aculeatissimum, Syzygium aromaticum, Centella asiatica, Cuscuta reflexa, Equisetum* sp.*, Oroxylum indicum, Trichosanthes cucumerina* subsp. *cucumerina*	47
Skin & Integumentary system disorder	Allergy, Athlete's foot, Bleeding, Blister/rashes, Boils, Burn, Cuts, Dhokre, Foot/Hand crack & fissures, Fungal infection, Heat rash, Remove leech, Scar removing, Scorpion bite, Skin infection, Skin irritation due to latex, Wound, Hair tonic, Hair colour, Hair wash	*Adina cordifolia, Ageratina adenophora, Allium sativum, Aloe vera, Amaranthus spinosus, Areca catechu, Artemisia vulgaris, Artocarpus lacucha, Bambusa bambos, Brassica campestris, Cocos nucifera, Brassica juncea, Calotropis gigantea, Carica papaya, Chromolaena odorata, Citrus maxima, Clerodendrum indicum, Iresine herbstii, Datura metel, Desmodium multiflorum, Eclipta prostrata, Elsholtzia fruticosa, Elephantopus scaber, Jatropha curcas, Lablab purpureus, Lagenaria siceraria, Lawsonia inermis, Leucas cephalotes, Melia azedarach, Mimosa pudica, Mucuna interrupta, Nerium oleander, Nicotiana tabacum, Oryza sativa, Plumbago zeylanica, Polygonum barbatum, Ricinus communis, Schima wallichii, Semecarpus anacardium, Sesamum indicum, Tridax procumbens*	42
Respiratory system disorder	Asthma, Common cold, Cough, Expectorant, Tonsillitis, Ulcer, Sinusitis	*Achyranthes aspera, Acorus calamus, Bambusa bambos, Brassica campestris, Calotropis gigantea, Cuminum cyminum, Curcuma longa, Curcuma caesia, Dalbergia sissoo, Eclipta prostrata, Elettaria cardamomum, Euphorbia royaleana, Glycyrrhiza glabra, Justicia adhatoda, Leucas cephalotes, Mangifera indica, Musa balbsiana, Myristica fragrans, Nyctanthes arbor-tristis, Ocimum basilium, Ocimum tenuiflorum, Oryza sativa, Phyllanthus emblica, Piper longum, Senegalia catechu, Shorea robusta, Maianthemum purpureum, Solanum lycopersicum, Spondias pinnata, Swertia chirayita, Syzygium aromaticum, Syzygium nervosum, Tagetes erecta, Trigonella foenum-graceum, Vitex negundo, Zingiber officinalis*	36
Unspecified disorder	Cooling agent, Fever, Measles	*Achyranthes aspera, Aegle marmelos, Aleuritopteris bicolor, Ananas comosus, Azadirachta indica, Centella asiatica, Capsicum fruetescens, Cyanodon dactylon, Equisetum* sp.*, Hellenia speciosa, Mimosa pudica, Opuntia monacantha, Oroxylum indicum, Piper nigrum, Pogostemon benghalensis, Premna serratifolia, Senna tora, Terminalia chebula, Trachyspermum ammi, Ziziphus mauritiana*	20

Categories of ailments	Ailments type/ medication	Name of plant species used for each specific category	No. of plant species
Skeleto-muscular system disorder	Body pain, Swollen body, Relaxation, bone breakage	*Senegalia catechu, Amorphophallus paeoniifolius, Curcuma Curcuma caesia, Curcuma longa, Cuscuta reflexa, Eleusine corocana, Equisetum* sp.*, Mallotus philippensis,* Orchids*, Oryza sativa, Phoenix sylvestris, Psidium guajava, Syzygium cumini, Triticum aestivum, Zea mays*	15
Nervous system disorder	Headache, Paralysis	*Allium cepa, Allium sativum, Brassica campestris, Calotropis gigantea, Capsicum frutescens, Cyperus rotundus, Entada phaseoloides, Euphorbia royaleana, Millettia glaucescens, Plumbago zeylanica, Zanthoxylum armatum*	12
Reproductive system disorder	Agalactia, Blood purification, Menstrual cramp, Milk production, Over bleeding, Sterility, Abortion, Tonic, Weakness	*Alstonia scholaris, Anethum graveolens, Asparagus racemosus, Astilbe rivularis, Berginia ciliata, Clerodendrum infortunatum, Hibiscus sabdariffa, Holarrhena pubescens, Ichnocarpus frutescens, Nerium oleander, Oryza sativa, Trachyspermum ammi, Trigonella foenum-graceum*	13
Urinary disorder	Burn urination, Hematuria, Kidney stone, Retention of Urine, Stone in Urinary tract, Uric acid, Urinary troubles	*Cassia fistula, Centella asiatica, Citrus limon, Coix lacryma-jobi, Croton persimilis, Curcuma longa, Cyanodon dactylon, Hellenia speciosa, Macrotyloma uniflorum, Nyctanthes arbor-tristis, Piper longum, Senegalia pennata*	11
Domestic animal disorder	Corneal Ulcer, Milk production	*Allium cepa, Allium sativum, Alternanthera sessilis, Asparagus racemosus, Artocarpus lacucha, Cannabis sativa, Ichnocarpus frutescens, Capsicum frutescens, Zanthoxylum armatum*	9
Sensory system disorder	Blepharitis, Corneal Ulcer, Eye impurities, Eye troubles, Stye, Earache	*Abrus precatorius, Argemone mexicana, Leucas cephalotes, Allium sativum, Datura metel, Euphorbia hirta, Lagenaria siceraria*	7
Protection of Body system	Ornamental, Protection	*Clerodendrum indicum, Premna serratifolia, Smilax aspera, Urtica dioica, Zizhyphus* sp.	5
Cardiovascular system disorder	Balance BP, Blood purification, High BP	*Drimia indica, Azadirachta indica, Clerodendrum infortunatum,* Mahur (Dan.)*, Urtica dioca*	5
Endocrine system disorder	Mumps, Diabetes	*Crinum asiaticum, Artocarpus lacucha, Syzygium cumini, Tinospora sinensis*	4

quality in the study area, which is also found in other relevant studies (Rokaya et al., 2014).

Because of their ease availability, different aerial parts of medicinal plants, such as leaves, flowers, and fruits are commonly used. This demonstrates the importance of traditional knowledge in the primary health care system because these plant parts contain a higher concentration of bioactive compounds than underground plant parts. The collection of leaves for medicinal uses does not threaten the survival of plants in comparison to other parts such as whole parts, stems, barks and roots (Giday et al., 2003; Luitel et al., 2014). About 136 plant remedies were used after processing, but 38 plant remedies were used without processing, as mentioned in previous studies (Bhattarai & Khadka, 2016; Limbu & Rai, 2013; Rai & Singh, 2015; Singh et al., 2012). Danuwar people mentioned that processed form such as juice, decoction and fermented form of remedies are effective to cure ailments, while remedies without processing are not as effective to cure ailments. Juice is the most commonly used form of medication, followed by paste, infusion, powder, decoction, raw, steamed, fermented and smoke. Juice and paste forms have a

higher score because most of the applications were for gastro-intestinal, dermatological, urinary and other ailments. Variations in forms of medications represent the single or multiple plant remedies reported in different literatures, as in Khadka et al. (2018) and Bhattarai (2020). The mixed remedies, i.e., two or many species mixed together, were found to be strong and effective in curing specific illnesses (Meragiaw et al., 2016). The majority of the remedies was taken orally or topically and was found to be useful. Limbu and Rai (2013) and Luitel et al. (2014) also reported that these methods were easy and effective for delivering bioactive compounds inside the body.

The other usages for fodder, nutrition, ornamental purposes, fuel and vegetables indicate that people not only use the local plants to cure their illnesses but also for other purposes as well. The traditional home remedy practice has been reduced slightly in comparison to the past few years in the study area. The study revealed that a minority of the local people prefer the facility of the Health Post, located in the Sirthauli/Dudhauli nearby study area and go for modern medicine instead of going to local healers, especially those who are exposed to urban areas or who are rich enough to afford allopathic medicine. However, the majority of people prefer Dhami/Jhankri systems/traditional medicine first, and only if that fails then they seek out other options. Simple common ailments, such as cough and allopathic cold, cuts and wounds, low fever, typhoid, jaundice, aches and other illnesses are treated at home by the villagers. This shows that the local people have not fully depended on modern medicine for their primary health care services.

Source of knowledge among various age groups

According to the local healers of the study area, the acquisition of traditional knowledge is mainly from their ancestors. Besides Dhami/Jhankri, the other knowledgeable groups learned about the uses of medicinal plant species from those family members who practiced such healing systems in the past. However, due to the ethnic diversity present in the nearby area, they also follow Brahmin, Chhetries' shamanism and other cultures that have an impact on their ethnicity. The traditional medicinal knowledge and practices are in rapid loss because of the people's dependency on verbal transformation, the impacts of modernization, rapid land degradation, and deforestation (Joshi & Joshi, 2006; Manandhar 1990). For example, the vernacular names of plant species that were described in Manandhar (1989) were found to be a bit different in the present findings. Majority of respondents were local healers who were either elderly or housewives. There is also a lack of handover or sharing of knowledge from the experts to the learners or younger generations. The traditional knowledge of medicinal plants and the correct identification and cure of various illnesses has been reported in different literature in Nepal (Bhattarai, 2020; Luitel et al., 2014).

Sustainable harvesting and conservation of plants

People harvest plants and their products from the wild (Ghimire, 2008; Luitel et al., 2014). The conversion of forest into rangeland or other pasture land has led to the loss of plant habitat, and plants are becoming rarer day by day. Nowadays, Danuwars have become more convenient and often used to grow medicinal plants in their croplands. Local healers have their own collection guidelines that directly or indirectly contribute to the sustainable use of plant species. A few plant species are protected in the study area: *Asparagus racemosus, Dalbergia sissoo*, *Senegalia catechu* and *Shorea robusta*, which are protected through government policy and the local community as community forests, sacred place vegetation, forest edges and croplands. Among reported plant species, *Acorus calamus*, *Piper longum, Terminalia bellirica and T. chebula* are listed as medicinal plants threatened due to over-collection for the export or trade, whereas *Alstonia scholaris, Oroxylum indicum and Senegalia catechu* are listed as non-endemic threatened plants (Shrestha & Joshi, 1996). The majority of plant species, including *Acorus calamus, Asparagus racemosus* and *Dalbergia sissoo* are cultivated in the Dudhauli area by local people. Concerns have been expressed about the conservation of several medicinal and aromatic plant (MAP) species, especially herbaceous perennial plants that already

have a higher degree of extinction due to excessive and destructive harvesting practices (Shrestha et al., 2022). Changes in ecological, social, and climatic conditions increase concern about losing medicinal plants (Kunwar et al., 2022). Therefore, the identification of sustainable harvesting strategies helps to conserve and establish the maintenance of the livelihoods of rural people (Hamilton, 2004; Schmidt & Ticktin, 2012).

Comparison with literatures and novel uses of reported plant species

Based on our findings, 161 plants were reported as being used by the Danuwar people of Dudhauli Municipality in Sindhuli district. The number of documented plant species is higher than in the previous studies carried out by Manandhar (1990, 2002), Basnet (1998) and Thapa (2000). Ethnomedicinal documentation of *Millettia glaucescens* and *Croton persimilis* has not been found in previous literature, but they are found to be used as ethnomedicinal plant species in this study. However, *Croton persimilis* seed oil is reported to be used as a piscicide in Nepal (Manandhar, 2002). Novel applications of plants as medicines for diseases that have not before been reported in literature are mentioned in Table 5.

Conclusion

The Danuwar community of Dudhauli municipality has better knowledge of the traditional utilization of locally found medicinal herbs to treat a variety of ailments. Common ailments such as cough and cold, cuts and wounds, low fever and so on are treated at home by the villagers. Thus, it has been found that the local people of the study area are not fully depended on allopathic medicine for their primary health care services. In the present study, two species were reported as new for ethnomedicinal practices, and eight species have new medicinal uses in Nepal. Despite their importance, medicinal plants are harvested randomly, and their sustainable harvesting is an emergency need. The study indicates that there is a gradual replacement of ethnomedicinal practices by modern medicines and other products, which leads to a decrease in interest and less recognition of traditional ethnomedicinal practices among Danuwar people. There is also a gap in the handover or sharing of knowledge from the experts to the

Table 5: Novel medicinal uses of plants against different ailments which are not reported in previous literatures

Plant name	Novel uses	Literature
Clerodendrum indicum (L.) Kuntze. (Agiyathi, Dan.)	"Agiya" (Dan.) term of a skin ailment, only curable with the use of this plant, also used in menstrual cramp /Worm, Anthelmintic/ Ulcer, protection	Stem is used in fever (Acharya, Siwakoti & Pokhrel, 2006)
Crotolaria prostrata Rottler ex Willd.	"Dhokariya" (Dan.) plant used cure cellulitis	Anti-inflammatory (Devkota, 2014)
Datura metel L.	Fruit used as a ring to cure cellulitis	Seeds, leaves & roots in fever, narcotic, injury, rheumatic pain, chronic bronchitis (IUCN, 2000)
Hibiscus sabdariffa L.	Blood purification in woman after pregnancy	Leaves paste on foot maceration (Rai, 2004)
Ophioglossum reticulatum L.	Whole plant in Diarrhea, Dysentery	Leaf to control bleeding on nose (Ojha & Devkota, 2021)
Mucuna interrupta Gagnep.	Bark pastes on boils	Rijal (2011)
Oryza sativa L.	Root in scorpion bite	Fermented seeds liquid in fever, food poisoning, joint pain, migraine (Ambu et al., 2020)
Alstonia scholaris (L.) R. Br.	Latex and bark used in sterility in women, weakness, abortion	Bark used as stringent, anthehilmintic, diarrhea/ dysentery; Tender leaves in ulcers (IUCN, 2000; Bark in Sterility in female cattle, tonic (Bhattarai, 2020)

learners or younger generation. Because of this, there is a possibility that such traditional medical practices will decline in near future. However, some villagers still prefer the Dhami/Jhankri system at first, if it doesn't work, switch to other alternatives. The ethnomedicinal and other economically important plants are under great threat due to habitat loss, deforestation, human population growth, lack of awareness and unsustainable harvesting techniques.

As such, this study represents a contribution to our present knowledge of the crude drugs used against various ailments in domestic cattle and deserves further phytochemical and pharmacological screening in the context of the important claims reported. Promoting the long-term use of herbal remedies and the preservation of traditional medicinal plant knowledge may help the highly marginalized people maintain their way of life. Scientific training and awareness programs in traditional medicine by the government are highly recommended to create awareness and involvement of the younger generation in practicing conservation, cultivation, and utilization of medicinal plants. Further biochemical analysis of the plant species used in folk medicine is necessary for their efficacy and verification.

Author Contributions

The first author collected data, identified plants, wrote and revised manuscript. The second author designed methodology, identified plants, analyzed data, revised manuscript and supervised the study.

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