Indian Journal of Traditional Knowledge
Vol 21(1), January 2022, pp 72-80

Ethno-medicinal plants used by the people of Dharan, Eastern Nepal

Renuka Ale Magar[a], Anand Raj Mallik[b,]*, Sujan Chaudhary[c] & Sanju Parajuli[a]

[a]Department of Biology, Central Campus of Technology, Tribhuvan University, Dharan, Nepal

[b]Department of Botany, Post Graduate Campus, Tribhuvan University, Biratnagar, Nepal.

[c]Department of Botany, Amrit Science Campus, Kathmandu,Tribhuvan University, Nepal

Address of Institution: Central Campus of Technology

E-mail: mallikraj.anand@gmail.com

Received 14 July 2020; revised 14 June 2021

The present study aims to document the traditional knowledge of local people of Dharan, Eastern Nepal, associated with medicinal plants and their uses. Rapid Rural Appraisal (RRA) was used to collect ethno-medicinal data and information from the study area. The present study has reported 33 medicinal plant species under 20 families where 21 plant species were found to be wild and 12 as cultivated. Frequently occurring life form was found to be herbs, n=15 (42.42%) followed by shrubs (33.33%) and trees (24.24%). The present study has reported more than 35 different ailments, which have been treated, prevented and cured by 33 plant species. Some of the major disorders are cancer, piles, perspiration, bronchitis and asthma. Many plants have shown similar results as previous study by different researchers. However, some plants have shown different medicinal uses as compared to others' research.

Keywords: Disease and Treatment, Eastern Nepal, Ethno-medicine, Traditional knowledge

IPC Code: Int Cl.[22]: A61K 45/00, A61K 33/00, A01G 7/00

Nepal is a multicultural, multilingual and multireligious (Himalayan) country, which is rich in cultural heritage and biological diversity. Nepal being rich in cultural heritage, the use of folklore medicine has been practiced since the beginning of human civilization[1]. According to Shrestha *et al.*[2] and Magar[3], Nepal includes about 10,167 plant species, of which over 7000 are flowering plants and over 1600 species are medicinal and aromatic herbs. From the pre-historic times, plants have been used for various purposes like food, fodder, medicine, timber and for cultural values. However, the use of local plants in therapy is common in the rural communities of Nepal[4]. For a developing country like Nepal, traditional healing practices play important role in the health care system[5]. It is estimated that about 80% of the people in Nepal depend upon herbal medicines which is due to the unavailability of modern medicine in the rural areas of Nepal[6].

Indigenous knowledge is not only responsible to identify but it also has a role in the system of management of natural resources[7]. Medicinal plants are considered to be ideal sources of novel bio-molecules from pre-historic time[8,9]. Therefore, it is important to document their uses because such knowledge not only helps in obtaining maximum benefits from these plants but also increases the possibility of their conservation and efficient use in the future[10]. Different researchers have been continuing their study in medicinal plants of Nepal time to time[2,11-16]. However, very little documentation of medicinal plants has been done from Eastern Nepal[1]. At the same time, Dharan is rich in plant diversity but is much more affected due to the increase in human encroachment and leading to the loss of traditional medicinal uses of local plants. Moreover, traditional medicinal practices are dwindling due to modernization and allopathic medicines. Hence, this study aims to document traditional knowledge associated with medicinal plants which might be significant in the conservation of the plants in this area.

Methodology

Study area

Dharan is a sub-metropolitan city in Sunsari District of Nepal which lies at 26° 49' 0"North, 87° 17'

*Corresponding author

0" East (Fig. 1). It is situated on the foothills of the Mahabharata Range in the North with its southern tip touching the edge of the Terai region at an altitude of 1148 ft (349 m) and occupies an area of 193.8 Sq km (nepalindata.com). The average temperature of Dharan is 23.2°C and precipitation averages 1799 mm. According to the 2011 census, the population of Dharan is 141,439 out of which 67,634 were males and 73,805 were females[17]. Rai, Limbu, Magar and Tamang are major ethnic groups inhabiting this area. Charkose Jhadi is the major forest located just few miles south of Dharan[18]. The dominant vegetation observed within the areas of Dharan are *Shorea robusta* Gaertn., *Azadirachta indica* A. Juss., *Dalbergia sissoo* Roxb., *Mangifera indica* L., *Phyllanthus emblica* L., *Ficus religiosa* L.

Field survey

An ethno-medicinal survey was carried out in March and July, 2019 in the area of Dantakali, Budhasubba and Oso Park of Dharan, Nepal. The methodology of the present study follows the literature of Chaudhary *et al*[19] and Mallik *et al*[20]. Initially, objectives of the study were explained to each and every respondent and vocal consent was obtained from every respondent for further publication of research paper. Ethno-medicinal data was collected using Rapid Rural Appraisal Methods like door-to-door survey, individual interview, field visit and semi structured questionnaire with people of different age group, gender, occupation, education and family structure.

Primary data collection

Semi structured questionnaire was prepared in English and provided to the respondent in their local languages for their convenience. 22 local people from 22 households were involved in the study as respondents for the exchange of ethno-medicinal data. Random sampling was carried out for this process. Demographic data of the respondents are listed in Table 1.

Plant identification and herbarium preparation

Plants were collected with the help of local and old aged people. Excess water and mud from roots were removed from the plant. Plant specimens were arranged properly in the newspapers dorsoventrally without any folding of leaves, infected parts and at least showing one leaf. The newspaper folded with plant specimens were changed daily so that the specimen was dried properly without being decayed. The dried and well pressed specimens were mounted on herbarium sheets of standard size according to Lawrence[21]. The prepared specimen was minutely studied and identified using herbarium specimens and also with the help of expert

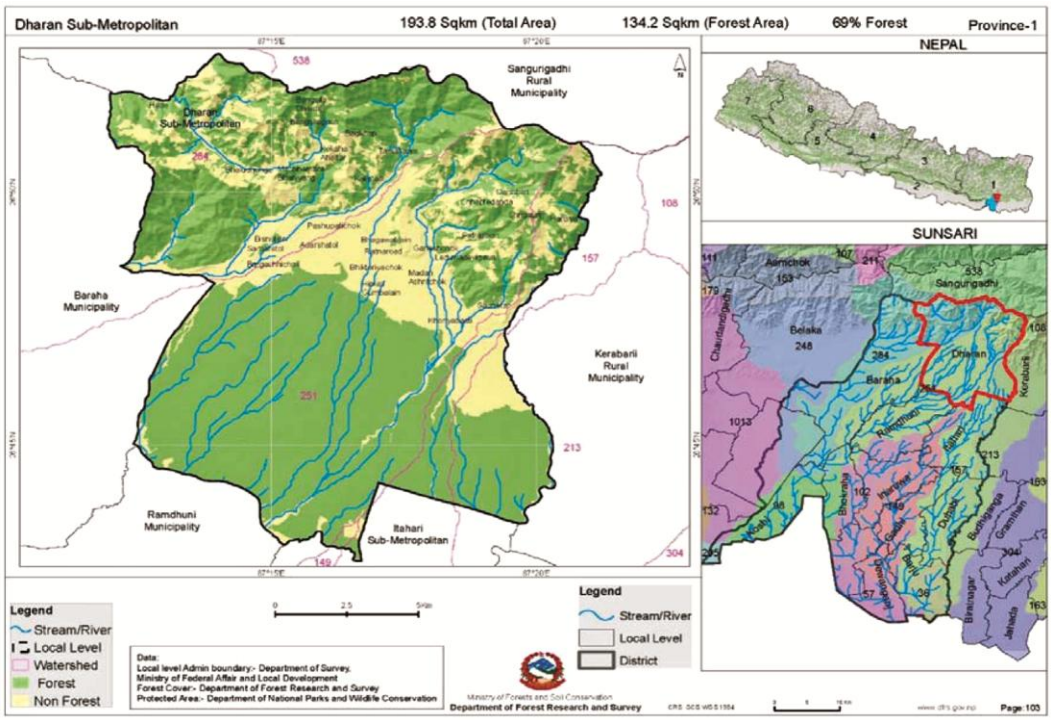

Fig. 1 — Map of the study area

Table 1 — Demographic data of respondent in the study

Demographic details		Total
Number of respondents	Male	11
	Female	11
Age group	Below 30	2
	30-50	8
	Above 50	12
Occupation	Farmer	9
	Household	9
	Job	1
	Business	2
	student	1
Education	Literate	9
	Illiterate	13
User/Healer	User	19
	Healer	3

Professors and teaching staffs of Post Graduate Campus, Biratnagar and Central Campus of Technology, Dharan. Further identification of plants was done by the Dictionary of Nepalese Plant Names book[22] and checklist of medicinal plant of Eastern Nepal[23]. Finally, all the identified species were confirmed for their accepted names in www.gbif.org. Meanwhile, the distinctively identified herbarium specimens were submitted and preserved for further study in herbarium of Department of Biology, Central Campus of Technology, Dharan. The herbarium specimens were given unique accession codes (RKH) which are listed in Table 2.

Inclusion criteria

All the grasses and under shrubs recorded in the present study are kept under "Herbs" and "Shrubs" category respectively. All the information's from respondents were included.

Exclusion criteria

The modes, preparation and doses of medicine intake were excluded from our study as most of the local people did not provide us knowledge regarding it. The traditional knowledge was found to be limited only to some person in the study area. Therefore, as much information we got from the respondent regarding modes (Paste or juice or decoction) were listed in the study. However, the doses and method of preparation of medicine were excluded from our study due to lack of information from respondents.

Results

Medicinal plant diversity

The present study has reported 33 ethnomedicinal plant species under 20 families which are listed with life forms, local names and source of habitat in Table 2. Among the 20 families, Lamiaceae and Fabaceae were found to be dominant with (n=5, 22.72%) plant species each followed by Asteraceae (n=4) (Fig. 2). In total 33 plant species, 30 species (90.9%) were found to be dicotyledons and 3 species (9.1%) as monocotyledons (Fig. 3). Different types of life forms were recorded in the present study. However, generally occurring life form was found to be herbs (n=14, 42.42%) followed by shrubs (n=11, 33.33%) and trees (n=8, 24.24%) (Fig. 4). In total 33 plant specimens, 21(63.6%) were found to be wild and 12 (36.3%) were cultivated.

Plant parts used

The present study has reported all the different plant parts that have been used for the treatment and prevention of diseases. Plant parts which have been used for the medication purposes in the present study are leaf, stem, root, rhizome, seed, flower, bark, fruit and whole plant. However, leaf (n=19, 57.5%) has been used frequently for the treatment and prevention of human diseases and health problems followed by root/rhizome (n=7, 21.2%), fruit (n=4, 12.1%), seed (n=3, 9.1%), whole plant (n=3, 9.1%), flower (n=2, 6.1%), stem (n=2, 6.1%) and bark (n=1, 3.03%) (Fig. 5).

Use value (UV)

The present study has recorded 33 medicinal plant species for different ailments. However, the plant species was found to have different use values (UV). All the plants in the study were found to have one, two, three and multiple use value (>3 use value). In total, among 33 plant species, 11 plants were found to be used to treat single disease or ailments followed by 9 plant species (2 UV), 4 plant species (3 UV) and 9 plant species (>3 UV). In the present study, use value has been differentiated in four categories (A, B, C and D) (Fig. 6).

Ethno-medicinal information

The present study has reported 33 medicinal plant species under 20 families. All the reported plants were found to have different medicinal uses against more than 35 different ailments which are described below and all the plants with their disease treatment categories are listed in Table 3.

Achyranthes aspera L. (Amaranthaceae): The root extraction is given for fever and pneumonia. Decoction of root with water is used for curing cough and tonsillitis.

Table 2 — Details of the studied plant in Dharan, Eastern Nepal.

Name of plant species	Voucher number	Family	Local name	Life form	Source
Achyranthes aspera L.	RKH10	Amaranthaceae	Apamarga	Undershrub	Wild
Acorus calamus L.	RKH24	Acoraceae	Bojho	Herb	Wild
Ageratum conyzoides L.	RKH16	Asteraceae	Ilame jhar	Herb	Wild
Aloe vera (L.) Burm.f.	RKH29	Asphodelaceae	Ghiukumari	Herb	Cultivated
Argemone mexicana L.	RKH9	Papaveraceae	Sungure kada	Herb	Wild
Artemisia dubia Wall. ex Bess.	RKH8	Asteraceae	Titepati	Shrub	Cultivated
Azadirachta indica A. Juss.	RKH30	Meliaceae	Neem	Tree	Cultivated
Calotropis gigantean (L.) W.T. Aiton.	RKH1	Apocynaceae	Aank	Shrub	Wild
Cannabis sativa L.	RKH31	Cannabaceae	Ganja	Shrub	Wild
Cassia fistula L.	RKH22	Fabaceae	Rajbrickchha	Tree	Wild
Catharanthus roseus (L.) G. Don.	RKH3	Apocynaceae	Sadabahar ful	Herb	Cultivated
Citrus limon (L.) Burm.f.	RKH23	Rutaceae	Kagati	Shrub	Cultivated
Cynodon dactylon (L.) Pers.	RKH15	Poaceae	Dubo	Herb	Wild
Dalbergia sissoo DC.	RKH26	Fabaceae	Sisau	Tree	Wild
Delonix regia (Bojer) Raf.	RKH11	Fabaceae	Siris	Tree	Wild
Euphorbia hirta L.	RKH2	Euphorbiaceae	Dudhe jhar	Herb	Wild
Ficus religiosa L.	RKH33	Moraceae	Peepal	Tree	Wild
Galinsoga parviflora Cav.	RKH17	Asteraceae	Chitlaange jhar	Herb	Wild
Hibiscus rosa-sinensis L.	RKH7	Malvaceae	Ghanti ful	Shrub	Cultivated
Kalanchoe pinnata (Lam.) Pers	RKH32	Crassulaceae	Patharchata	Herb	Cultivated
Mentha spicata L.	RKH27	Lamiaceae	Pudina	Herb	Cultivated
Mimosa pudica L.	RKH25	Fabaceae	Lajawati jhar	Herb	Wild
Ocimum basilicum L.	RKH13	Lamiaceae	Babari phool	Shrub	Wild
Ocimum tenuiflorum L	RKH21	Lamiaceae	Tulsi	Shrub	Cultivated
Phyllanthus emblica L.	RKH18	Phyllanthaceae	Amala	Tree	Wild
Pogostemon benghalensis (Burm.f.) Kuntze.	RKH5	Lamiaceae	Rudhilo	Herb	Wild
Ricinus communis L.	RKH19	Euphorbiaceae	Andi	Shrub	Wild
Rosa indica L.	RKH28	Rosaceae	Gulab	Shrub	Cultivated
Solanum torvum Sw.	RKH14	Solanaceae	Bihi	Shrub	Wild
Senegalia catechu (L.f.) P.J.H. Hurter & Mabb.	RKH4	Fabaceae	Khair	Tree	Wild
Tagetes erecta L	RKH6	Asteraceae	Saypatri	Herb	Cultivated
Vitex negundo L.	RKH20	Lamiaceae	Simali	Tree	Wild
Ziziphus mauritiana Lam.	RKH12	Rhamnaceae	Bayar	Shrub	Cultivated

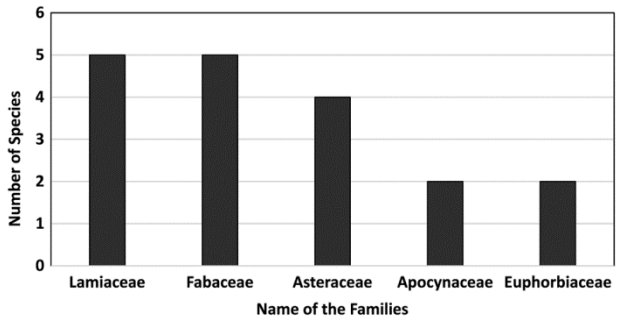

Fig. 2 — The dominant families in the present study

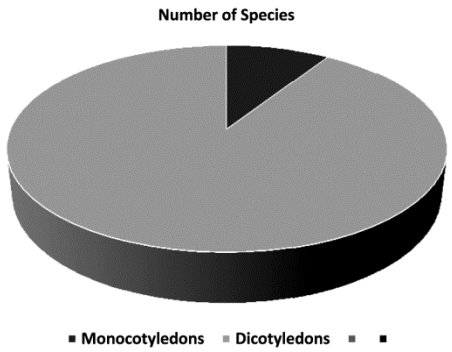

Fig. 3 — Number of dicotyledons and monocotyledons

Acorus calamus L. (Acoraceae): Rhizome for fever, bronchitis, diarrhoea, dysentery and snake bites.

Ageratum conyzoides L. (Asteraceae): Juice of leaves is applied to fresh cuts to check bleeding.

Aloe vera (L.) Burm.f. (Asphodelaceae): The gels obtain from the leaves of *A. vera* is used in the treatment of infected tooth and gums, also used for

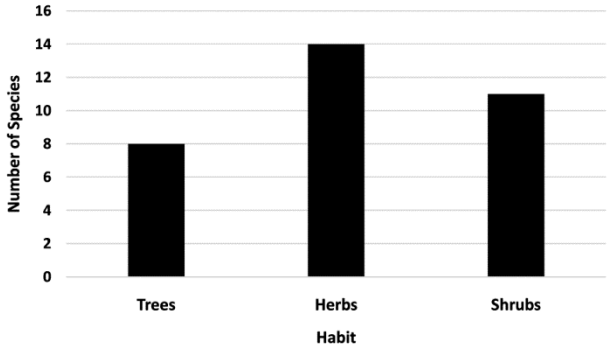

Fig. 4 — Life form of plants

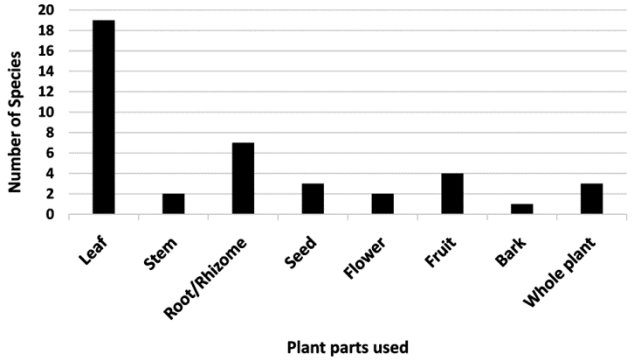

Fig. 5 — Ethnomedicinal plants used by their parts

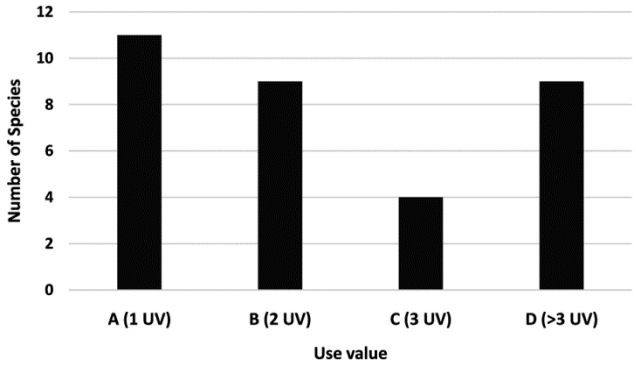

Fig. 6 — Use value and the number of plant species

the treatment of constipation, promotes significant wound healing and used as antioxidant.

Argemone mexicana L. (Papaveraceae): Ash of plant is mixed with the oil of andi (*Riccinus communis* L.) and the paste is prepared to cure scabies.

Artemisia dubia Wall. ex Bess. (Asteraceae): Leaf extract is applied to avoid bad odor of body, also useful for scabies, inhaling of crushed leaves is effective in checking vomiting.

Azadirachta indica A. Juss. (Meliaceae): Decoction of leaf is used externally during bathing for the treatment of skin disease. Leaves are also used to kill the worms inside our body.

Calotropis gigantea (L.) W.T.Aiton. (Apocynaceae): The latex from stem is applied in wounds to be free from tetanus. Bark of root is used to cure gastritis.

Cannabis sativa L. (Cannabaceae): Leaves and other parts of plants are used as narcotic drugs. Plant parts are used as a pain- killer, sleep- inducer.

Cassia fistula L. (Fabaceae): Seeds are used for constipation.

Catharanthus roseus (L.) G. Don. (Apocynaceae): The leaf juice or water decoction of this plant is used as a folk medicine for treatment of cancer.

Citrus limon (L.) Burm.fil. (Rutaceae): Lemon juice is taken to check vomiting and lowering the blood pressure.

Cynodon dactylon (L.) Pers. (Poaceae): Whole herb and root stalks are used for the treatment of cancer, diarrhea, dysentery, headache, asthma.

Dalbergia sissoo Roxb. ex DC. (Fabaceae): Decoction of leaf is used to cure diarrhoea.

Delonix regia (Bojer ex Hook.) Raf. (Fabaceae): Leaves and seeds are used in the treatment of eye problems such as opthalmia. Bark is taken internally to treat diarrhoea, dysentery and piles.

Euphorbia hirta L. (Euphorbiaceae): Decoction of leaves and roots are used for treatment of complications during pregnancy, cough, worm infestations in children, and digestive problems.

Ficus religiosa L. (Moraceae): Fruits are used for the treatment of cough. Leaves and seeds are used for the treatment of asthma, diarrhea, gastric problems and sexual disorders.

Galinsoga parviflora Cav. (Asteraceae): Juice of the plants is used to treat wounds. Coagulate the blood of fresh cuts and wounds.

Hibiscus rosa-sinensis L. (Malvaceae): Leaves pulps are used in wounds and for fever.

Kalanchoe pinnata (Lam.) Pers. (Crassulaceae): Its leaf paste is used to cure kidney stone disease.

Mentha spicata L. (Lamiaceae): Flower and leaves are used to induce perspiration and menstruation.

Mimosa pudica L. (Fabaceae): Root is used in the treatment of leprosy, dysentery, asthma, burning sensation and blood diseases. Plants parts are used in herbal preparations for gynecological disorders.

Ocimum basilicum L. (Lamiaceae): Juice of leaves to check vomiting.

Ocimum tenuiflorum L. (Lamiaceae): Juice of leaves is used for cough and wounds.

Phyllanthus emblica L. (Phyllanthaceae): Fruit is

Table 3 — Disease category of medicinal plants of used by local peoples of Dharan

S.N	Disease category	Plant species
1	Cold & fever: perspiration, pneumonia, cough	*Achyranthes aspera, Acorus calamus, Euphorbia hirta, Ficus religiosa, Hibiscus rosa-sinensis, Mentha spicata, Ocimum tenuiflorum, Pogostemon benghalensis, Ricinus communis, Solanum torvum* and *Ziziphus mauritiana*
2	Digestive disorder : Diarrhoea, dysentry, constipation, Gastritis, vomiting and other	*Acorus calamus, Aloe vera, Artemisia dubia, Azadirachta indica, Calotropis gigantea, Cassia fistula, Citrus limon, Cynodon dactylon, Dalbergia sissoo, Delonix regia, Euphorbia hirta, Ficus religiosa, Mimosa pudica, Ocimum basilicum, Phyllanthus emblica, Pogostemon benghalensis, Rosa indica* and *Solanum torvum*
3	Dermatological disorder	*Argemone mexicana, Artemesia dubia, Azadirachta indica, Mimosa pudica, Phyllanthus emblica, Tagetes erecta* and *Vitex negundo.*
4	Respiratory disorder	*Achyranthes aspera, Acorus calamus, Cynodon dactylon, Ficus religiosa, Mimosa pudica* and *Solanum torvum*
5	Cancer	*Catharanthus roseus* and *Cynodon dactylon,*
6	Piles	*Delonix regia,*
7	Cut and wounds	*Acorus calamus, Ageratum conyzoides Aloe vera, Calotropis gigantea, Cannabis sativa, Cynodon dactylon, Galinsoga parviflora, Hibiscus rosa-sinensis, Ocimum tenuiflorum, Mimosa pudica* and *Ziziphus mauritiana.*
8	Female disorder and sexual disorder	*Euphorbia hirta, Ficus religiosa, Mentha spicata* and *Mimosa pudica*
9	Ophthalmic disorder	*Delonix regia* and *Rosa indica*
10	Dental disorder	*Aloe vera*
11	Stone disease	*Kalanchoe pinnata*
12	Orthological disorder	*Senegalia catechu*
13	Others : bad odour of body, immunity, insomnia, narcotic drug, blood pressure and antioxidant	*Artemisia dubia, Aloe vera, Cannabis sativa, Citrus limon* and *Phyllanthus emblica*

used to cure insomnia and is healthy for hair also. Amla powder improves immunity and gives physical strength and used to treat diarrhoea.

Pogostemon benghalensis (Burm.f.) Kuntze. (Lamiaceae): Leaf extract is used to cure pneumonia. Juice of root is applied to cure dysentery.

Ricinus communis L. (Euphorbiaceae): Young leaf paste is applied in forehead to control fever.

Rosa indica L. (Rosaceae): Petal extracts for cleaning dirt in eyes. Paste of petals is consumed for the treatment of gastritis and constipation.

Senegalia catechu (L.f.) P.J.H. Hurter & Mabb. (Fabaceae): Stem's wood is used for injured and fractured body parts in order to fix the bones.

Solanum torvum Sw. (Solanaceae): Bitter roots and young shoots are used for the treatment of asthma, vomiting of blood. Leaf juice drink is a remedy for fever.

Tagetes erecta L. (Asteraceae): Paste of leaves is applied for treating sores and skin diseases.

Vitex negundo L. (Lamiaceae): Paste of leaves is applied for skin diseases.

Ziziphus mauritiana Lam. (Rhamnaceae): Root decoction is used in wounds and to control fever.

Discussion

The present study has documented 33 medicinal plant species under 20 families. The number of studied medicinal plants seemed less in number. This may be due to the use of modern and allopathic medicines by the locals of Dharan. Dharan is a modern and one of the developed cities of Nepal, where the facilities of hospitals are very good. This may be one of the reasons for a smaller number of observed medicinal plants from our study. The present study has recorded Lamiaceae and Fabaceae to be dominating over other families followed by Asteraceae. Malla *et al.*[24] has reported similar results where, Lamiaceae and Orchidaceae represented the highest number of medicinal plants (7 species, 5.30%), which was followed by Asteraceae (6 species, 4.54%). However, Mesfin *et al.*[25] and Bhattarai *et al.*[26] have reported Asteraceae family as the dominating family with the higher number of medicinal plants. Different types of life forms were listed among all the studied plants. However, herbs were found frequently in the studied area. This might be due to the physiological growth requirements of herbs. Moreover, study was conducted in pre-

monsoon season, which might be another constraint for enlisting of more herbs. Moreover, herbs are found naturally and abundantly in the environment[12]. Panthi and Singh[27] and Singh *et al.*[28] have also documented herbs as dominating life forms in their studies. The present study has reported that local people have been using wild plants vigorously for medicinal purpose. However, they have also been cultivating medicinal plant in good number in their homes and gardens. All the plant parts have been extracted by the locals of Dharan for the medicinal purpose. It has been reported that locals had sound knowledge about the plant parts and their related use in the preparation of medicine for different ailments. Local people have reported that "they used to pass their time with livestock in the fields and forest" which might be the strongest point to relate them with plants and use of its parts. However, it was observed that leaf is the vigorously extracted part in this study in comparison to other plant parts. Frequent use of leaves might be due to its easy availability for the users compared to other plant parts. However, physiologically leaf is the place for production and storage of nutrients which might be another constraint for the frequent use. Moreover, our study has been supported by the study of Tamang community in Rasuwa district[14], Chepang community in Chitwan district[29] and medicinal plants used by ethnic people in Parbat district of Western Nepal[24].

The studied plant species have shown a wide range of medicinal value against more than 35 different ailments. Different plant parts like leaves, root, stems, fruits and other parts are found to have been used for medicinal preparation. The leaves of *Artemisia dubia*, *Azadirachta indica, Ocimum tenuiflorum, Dalbergia sissoo* and *Ageratum conyzoides,* were previously reported for various medicinal purposes like scabies, digestive problems, diarrhea, cough and as antibiotic in cut and wounds[1,11,19,30]. Similarly, roots paste of *Euphorbia hirta, Ziziphus mauritiana* and *Pogostemon benghalensis* were also previously reported to have used for digestive problem, during pregnancy, fever, cough and cold and also pneumonia[11,24]. Other species reported with medicinal value similar to this study are *Argemone mexicana, Ficus religiosa, Aloe vera, Acorus calamus* which are used against skin diseases, sexual disorders, snake bite, constipation, and other digestive problems[11,30-32]. However, some of the species like *Mentha spicata* are used to induce perspiration and menstruation in present study but were previously reported to have been used to treat insomnia[33]; diarrhea, stomachache, and as condiments[32]. *Achyranthes aspera* was used by the local peoples to cure fever, pneumonia, cough and tonsil but Singh *et al*.[34] reported its use to treat kidney stones. Latex of *Calotropis gigantea* was used as antibiotic in wounds and its root was used to treat gastritis by the locals in the present study while, the use of its bark extract was reported to treat bloody stool[31]. In the present study, *Cannabis sativa* was used by the locals as narcotic drug, painkiller and sleep inducer but Thapa *et al.*[31] have reported its use to treat digestive problems. Similarly, the present study shows local people of Dharan used *Vitex negundo* for skin diseases but Malla *et al*[24] have reported its use for treatment of gastritis, fever, cough and cold.

This study was focused in the remote areas of Dharan where most of the indigenous practices are performed. The indigenous knowledge regarding the medicinal plants was obtained from the local people. However, they were not likely to share about the uses and doses of medicinal plants in detail. However, as we got some information, we have mentioned some way of intake (paste, decoction, juice etc) of some medicinal plants. This may be because knowledge regarding way of intake and practices was only limited to senior citizens and also may be because of belief that their medicinal knowledge will be lost if they share it with other like in Kisan community of Eastern Nepal[35]. Moreover, females were very reluctant and showed hesitation in sharing their traditional knowledge with strangers (interviewers). This similar practice was observed in Chenab riverine area, Punjab province Pakistan which was explored by Umair *et al.*[36].

Conclusion

It is concluded that the local people of Dharan have been using different plants for the treatment of wide variety of diseases. A large number of species of plants were found be used to treat digestive disorders, dermatological disorder, respiratory disorder, stones, piles, cough and cold, etc. Although, in this study only 33 species of medicinal plants were identified, it is possible that other plant species with significant medicinal values are yet to be explored. However, the study also revealed that the modernization and allopathic medicines have led to the decrement in dependency of people upon the traditional medicinal use of plants. Thus, the present study may play

significant role in the conservation of plants species and their traditional medicinal values which may be beneficial for future generations.

Acknowledgments

None

Funding

The present study did not receive any external funding.

Conflict of Interest

Authors declare that there is no conflict of interest regarding the publication of this manuscript.

Authors' Contributions

Research design was made by SP and RAM. Data collection in the field was performed by RAM, SC, ARM and SP. Manuscript was written by SC and ARM. Manuscript was critically revised by SP and SC and finally approved by all the authors for further publication.

References

1 Shrestha N, Shrestha S, Koju L, Shrestha K K & Wang Z, Medicinal plant diversity and traditional healing practices in eastern Nepal, *J Ethnopharmacol*, 86 (2016) 81-96. https://doi.org/10.1016/S0378-8741(03)00051-5

2 Shrestha K K, Tiwari N N & Ghimire S K, MAPDON-Medicinal and aromatic plant database of Nepal, Proceedings of Nepal-Japan symposium on conservation and utilization of Himalayan medicinal resources, (ESON and CBD, Tribhuvan University, Nepal), 2000, p. 53-74.

3 Magar S T, A report on indigenous knowledge on the utilization of medicinal plants in the Magar community: A case study of Saliza VDC Parbat, (SNV Nepal, Lalitpur, Nepal), 2008, p. 13-15.

4 Manandhar N P, Native phytotherapy among the Raute tribes of Dadeldhura district, *J Ethnopharmacol*, 60 (1998) 199-206. https://doi.org/10.1016/S0378-8741(97)00150-5

5 Alves R R N & Rosa I M L, Biodiversity, traditional medicine and public health: where do they meet?, *J Ethnobiol Ethnomed*, 3 (2007) 14. https://doi.org/10.1186/1746-4269-3-14

6 Rajbhandari T K & Bajracharya J M, National status paper on NTFPs: medicinal and aromatic plants, In: National Seminar on Non-timber Forest Products: Medicinal and Aromatic plants, Kathmandu, Nepal, (Ministry of Forest and Soil Conservation; Herbs Production and Processing CO. Ltd., Nepal), page no.?

7 Koirala R R & Khaniya B N, Present status of traditional medicines and medicinal, aromatic plants related resources and organizations in Nepal, (Nepal Health Research Council, Government of Nepal), 2009. http://hdl.handle.net/123456789/546

8 Heinrich M & Gibbons S, Ethnopharmacology in drugs discovery: an analysis of its role and potential contribution, *J Pharm Pharmacol*, 53 (2001) 425-432. https://doi.org/10.1211/0022357011775712

9 Holland B K, Prospecting for drugs in ancient texts, *Nature*, 369 (1994) 702. https://doi.org/10.1038/369702a0

10 Andrade-Cetto A, Ethnobotanical study of medicinal plants from Tlanchinol, Hidalgo, Mexico, *J Ethnopharmacol*, 122 (2009) 163-171. https://doi.org/10.1016/j.jep.2008.12.008

11 Joshi K & Joshi A R, Indigenous Knowledge and use of medicinal plants by local communities of tha Kali Gandaki watershed area, Nepal, *J Ethnopharmacol*, 73 (2000) 175-183. https://doi.org/10.1016/S0378-8741(00)00301-9

12 Shrestha P M & Dhillion S S, Medicinal plants diversity and use in the high lands of Dolakha district, Nepal, *J Ethnopharmacol*, 86 (1) (2003) 81-96. https://doi.org/10.1016/S0378-8741(03)00051-5

13 Ojha Khatri S, Chaudhary S, Shrestha N & Munankarmi N N, Ethnomedicinal study and phytochemical screening of selected plants in Jhule, Dolakha district, Nepal, Vegetos, 34 (4) (2021), 834-846. https://doi.org/10.1007/s42535-021-00266-2

14 Uprety Y, Asselin H, Boon E K, Yadav S & Shrestha K K, Indigenous use and bio-efficacy of medicinal plants in the Rasuwa district, Central Nepal, *J Ethnobiol Ethnomed*, 6 (2010) 1. https://doi.org/10.1186/1746-4269-6-3

15 Joshi K, Joshi R & Joshi A R, Indigenous Knowledge and useful medicinal plants of Macchegaun, Nepal, *Indian J Tradit Know*, 10 (2011) 281-286.

16 Malla B, Gauchan D P & Chhetri R B, Medico-ethnobotanical investigation of Parbat district of Western Nepal, *J Med Plants Res*, 8 (2) (2014) 95-108. https://doi.org/10.5897/JMPR2013.5228

17 C B S, Population Census, In: Central Bureau of Statistics, Government of Nepal, 2011

18 Sakya K, Paradise in Our Backyard: A Blueprint for Nepal, (Penguin Books India, India), 2009.

19 Chaudhary S, Magar GT, Sah SN & Parajuli S, Ethnic Plant of Tharu Community of Eastern Nepal, *Int J Appl Sci Biotechnol*, 8 (2) (2020) 223-230. https://doi.org/10.3126/ijasbt.v8i2.28325

20 Mallik A R, Chaudhary S & Shrestha S, Useful valuable plants of Maithili community in Eastern Nepal: An ethnobotanical study, *Bangladesh J Plant Taxon*, 27 (2) (2020) 439-446. http://dx.doi.org/10.3329/bjpt.v27i2.50678

21 Lawrence G H M, *Taxonomy of Vascular Plants*, New York, Macmillan, United States, America (1951).

22 Shrestha K, Dictionary of Nepalese Plant Names, (Mandala Book Point, Nepal), 1998.

23 Siwakoti M & Verma S K, Medicinal Plants of the Terai of Eastern Nepal, *J Econ Tax Bot*, 12 (1996) 423-438.

24 Malla B, Gauchan D P & Chhetri R B, An ethnobotanical study of medicinal plants used by ethnic people in Parbat district of Western Nepal, *J Ethnopharmacol*, 165 (2015) 103-117. https://doi.org/10.1016/j.jep.2014.12.057

25 Mesfin F, Demissew S & Teklehaymanot T, An ethnobotanical study of medicinal plants in Wayu Tuka district, East Welega zone of Oramia regional state, West Ethiopia, *J Ethnobiol Ethnomed*, 5 (2009) 28. https://doi.org/10.1186/1746-4269-5-28

26 Bhattarai S, Chaudhary R P, Quave CL & Tylor R S L, The use of medicinal plants in trans Himalayan arid zone of Mustang district, Nepal, *J Ethnobiol Ethnomed*, 6 (2010) 14. https://doi.org/10.1186/1746-4269-6-14

27 Panthi M P & Singh A G, Ethnobotany of Arghakhanchi district, Nepal, *Int J Appl Sci Biotechnol*, 1 (2) (2013) 27-32. https://doi.org/10.3126/ijasbt.v1i2.8199

28 Singh A G, Kumar A & Tiwari D D, An ethnobotanical survey of medicinal plants used in Terai forest of Western Nepal, *J Ethnobiol Ethnomed*, 8 (2012) 19. https://doi.org/10.1186/1746-4269-8-19

29 Rijal A, Living Knowledge of the healing plants: ethno-phytotherapy in the Chepang communities from the mid hills of Nepal, *J Ethnobiol Ethnomed*, 4 (2008) 23. https://doi.org/10.1186/1746-4269-4-23

30 Acharya E & Pokhrel B, Ethno-medicinal plants used by Bantar of Bhaudaha, Morang, Nepal, *Our Nature*, 4 (2006) 96-103. https://doi.org/10.3126/on.v4i1.508

31 Thapa L B, Dhakal T M, Chaudhary R & Thapa H, Medicinal plants used by Raji ethnic tribe of Nepal in treatment of gastrointestinal disorders, *Our Nature*, 10 (2013) 177-186. https://doi.org/10.3126/on.v11i2.9645

32 Rokaya M B, Munzbergova Z & Timsina B, Ethnobotanical study of Medicinal plants from Humla district of Western Nepal, *J Ethnopharmacol*, 130 (2010) 485-504. https://doi.org/10.1016/j.jep.2010.05.036

33 Thapa S, Medico-ethnobotany of Magar community in Salija VDC of Parbat District, Central Nepal, *Our Nature*, 10 (2012) 176-190. https://doi.org/10.3126/on.v10i1.7780

34 Singh A G, Kumar A, Tiwari D D & Bharati K A, New ethnomedicinal claims from Magar Community of Palpa district, Nepal, *Indian J Tradit Know*, 17 (3) (2018) 499-511.

35 Rajbanshi N & Thapa L, Traditional knowledge and practices on utilizing medicinal plants by endangered Kisan ethnic group of eastern Nepal, *Ethnobot Res Appl*, 18 (2019) 1-9. https://doi.org/10.32859/era.18.23.1-9

36 Umair M, Altaf M, Bussman R W & Abbasi A M, Ethnomedicinal uses of the local flora in Chenab riverine area, Punjab province Pakistan, *J Ethnobiol Ethnomed*, 15 (1) (2019) 1-31. https://doi.org/10.1186/s13002-019-0285-4