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AN ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS USED BY KUMAL AND GANDHARVA COMMUNITY OF POKHARA METROPOLIS, KASKI, NEPAL

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ABSTRACT

The study of indigenous knowledge about the use of medicinal plants among Kumal and Gandharva ethnic groups residing in Pokhara Metropolis, was carried out from January to April 2019. A semi-structured questionnaire survey was conducted with 77 respondents of 40 and above age group (44 Kumal and 33 Gandharva). Altogether 80 plant species of medicinal value belonging to 75 genera under 48 families including 5 species of Pteridophytes have been recorded from the study area. The family Asteraceae and Fabaceae were found with higher number of species, 7 of each. A total of 45 plants species were found used by both ethnic groups in their medical purpose; 65 species were used by Kumal, while 60 species were used by Gandharva. These plant species have been used for the treatment of a total of 39 different human ailments, grouped under 10 major diseases.

Key words: Ailments, Ethnobotany, Kumal and Gandharva, Medicinal Plants, Pokhara

INTRODUCTION

Ethnobotany, an interdisciplinary subject, is the study of past and present relationships between human cultures and the plants, animals and other organisms in their environment (Martin ,1995; Balick,1996). All the cultures from ancient time to the present day have used plants as a source of medicine, with 80% of the world's population depending on traditional medicine for their primary health care that is mainly based on plant materials (WHO, 1993). In spite of tremendous advances in allopathic medicinal practices, the indigenous knowledge of medicinal plants has played an important role throughout the world, particularly in the developing countries, in treating and preventing varieties of diseases (Vijayakumar *et al*. 2015). Most of the elder people still follow the use of medicinal herbs even when they live in the urban areas (Adhikari and Adhikari, 2006; Thapa,2011; Acharya 2012; Amiri *et al*. 2013). Along with an increase in human population and technological advancement, we are also experiencing an unprecedented increase in new diseases. Although modern allopathic drugs have been developed to control these diseases, many of them have been ineffective due to the evolution of drug-resistant microorganisms (Alves *et al*.,2007).

Nepal is a multiethnic and multilingual country; with 126 ethnic/ caste groups (CBS,2011). The indigenous knowledge is found retained in health practitioners such as Vaidhya, Jhankri, Dhami, Guruba and various elder people. All the ethnic communities have their own pool of secret ethnomedicinal knowledge about the plants available in their surroundings (Awale, 2008; Thapa,2011; Singh *et al*.,2012). Tribal societies living in rural areas, indigenous

knowledge on plants are being practiced for the treatment of human ailments (Chaudhary,1998; Thapa,2010). Most of the information is still in the hands of traditional healers which gets either lost or passed to the next generation only through verbally. Therefore, the collection and documentation of the culturally and scientifically important indigenous knowledge associated with ethno medicine should be carried out before such rich heritages are lost (Martin,1995; Kunwar *et.al.*,2008). In Nepal, Kumal and Gandharva ethnic groups are inhabiting with the population of 121196 and 6791 respectively (CBS, 2011). These communities are found scattered throughout the country in particular settlement clusters having their own culture and traditional occupations.

With the increase in urbanization and uptake of allopathic medicines, there is a great threat on the indigenous knowledge of traditional medicine (Thapa,2010). So that, it is very urgent to document the traditional knowledge of medicinal plants and their preparation of herbal drugs, retained in elder peoples and traditional healing practitioners. This necessitates the alternative medicines that can provide very low or no risk of side effects and reduces future drug-resistance. There is a great potential for the discovery and development of new and safer medicines that can be extracted from natural products of medicinal plants. For further investigations of these medicines, it is essential to identify the key medicinal plants that have been used for centuries by different ethnic groups and traditional healers. The present work was aimed to identify and document the medicinal plants, most common human health problems, methods of preparation of herbal drugs and route of administration as traditionally practiced by Kumal and Gandharva communities residing in Pokhara Metropolis Kaski in Gandaki Province Nepal.

MATERIALS AND METHODS

Study area

The study was conducted in Pokhara metropolitan city, the capital city of Gandaki Province Western Nepal. Its population is 413934 with 40 different ethnic/caste group out of total 126 caste group of Nepal. The targeted Kumal with the population of 1208 and that of Gandharva with 608 are found residing in the wards 16, 25, 26, 27, 29 and 32 (CBS, 2011). So, the study was mainly focused on these wards.

Location Map of Study Area

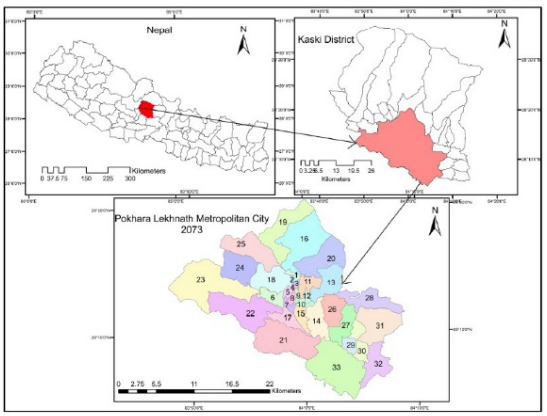

Figure 1: Study Sites (Source: Pokharel R.P., 2018)

ETHNO MEDICINAL INFORMATION

The survey of study area and plant collection was done from January to April 2019. The people of targeted ethnic groups were consulted with ethical consideration and with their full consent before interview conducted, however, a few of them denied. Altogether 77 persons belonging to Kumal (41) and Gandharva (36) ethnic group of age 40 years or above were interviewed. They were 44 males (57.15%) and 33 females (42.85%). All the respondents were divided into three age groups. 40-59 years (61.04%); 60-79 years (33.77%); and 80 above age group only (5.19%). From the educational point of view, only three people (3.89%) were found educated with high

school level or above; 46 people (59.75%) literate having informal education but 28 persons (36.35%) were found illiterate.

The semi-structured questionnaire, a framework of research was developed with the help of literatures(Martin,1995) and experts of Botany, Department of Botany, Prithvi Narayan Campus and Central Department of Botany, Kirtipur Campus. The field survey, personal interviews, group discussions with informants were as Participatory Rural Appraisal (PRA) and Rapid Rural Appraisal (RRA) to reveal the traditional knowledge about ethno medicine and that of medicinal plants (Martin,1995). The sample of population for this study were households having at least one family member of 40 years or above age group. The site for the first household survey was purposive where the first unit was randomly selected. Then, it was followed by tracking the snowball network sampling technique, in which, the following respondents were the referral of the preceding one. Personal Interviews (PI) with a total of 77 people (44 Kumal, 33 Gandharva) and 7 Focus Group Discussion (FGD) (4 with Kumal and 3 with Gandharva) were made. The Key Informant Interview (KII) were made with professional traditional healers (Baidhya/ Jhakri/ Dhami) for the further verification of ethno medicinal information.

Plant collection, herbarium preparation and identification

All the plants of medicinal importance were collected as voucher plants specimens and pressed and mounted on herbarium sheet as per the rule of ethnobotanical standard of herbarium (Martin, 1995). All the plant specimens were identified with the help of standard literatures (Manandhar, 2002; Fraser- Jenkins, 2015), National Herbarium and Plant Laboratory, KATH and from the website "Annotated checklist of flowering plants of Nepal". All such information from respondents related with human ailments, ethno medicine and medicinal plants were encoded, then entered in computer and analyzed in various ways.

RESULT AND DISCUSSION

Diversity of Medicinal Plants and growth forms

A total of 80 plants species belonging to the 75 genera under 48 families including 5 ferns families were found used as medicinal purposes (table 1). The family Asteraceae with 7 species under 5 genera; and Fabaceae with 7 species under 5 genera were largest followed by Lamiacae, Euphorbiaceae and Menispermaceae with 5, 4 and 3 species respectively; 11 families with 2 species and rest of 32 families with single species each (table 2). All these plant species based on their growth forms (habit) were, herbs 33 (41.25%) followed by shrubs 19 (23.75%), trees 14(17.5%) climbers 9(11.25% and ferns 5 (6.25%). (Fig. 2).

Table 1: Checklist of Medicinal Plants and their uses in Human Ailments by Kumal and Gandharva Community of Pokhara Metropolis, Kaski, Nepal

S.N./ C.N.	Botanical/Family Name	Local Name	Habit	Parts Used	Ailments Category
1	*Abelmoschus manihot* (L.) Medik Malvaceae	Bankapas	Sr	Rt	I
2	*Acacia pennata* (L.) Wild Fabaceae	Arakhu	Cr	Rt	VI
3	*Acorus calamus* L. Araceae	Bojho	Hr	Rz	IV
4	*Agave cantula* Roxb. Agavaceae	Ketuki	Sr	Rt	V
5	*Ageratum conyzoides* L. Asteraceae	Gandhejhar	Hr	Wp	VI
6	*Aleuritopteris bicolor* (Roxb.) Fraser-Jenk Pteridaceae (Fern)	Kali Sinki (Dankerno)	Fr	Lf and Rz	I
7	*Aloe vera* (L.) Burm Asphodelaceae	Ghiukumari	Hr	Lf	I,V,X
8	*Amaranthus spinosus* L. Amaranthaceae	Ludekande	Hr	Rt	V
9	*Angiopteris helferiana* C. Presl Marattiaceae (Fern)	Gaikhure	Fr	Rz	I
10	*Artemisia indica* Willd. Asteraceae	Titepati	Sr	Lf and young shootz	I, VII
11	*Aschyanthus parviflorus* (D. Don) Spreng. Gesneriaceae	Thirjo	H r (epiphyte)	Wp	I, IV
12	*Azadirachta indica* L. Meliaceae	Neem	Tr	Lf/St	I, II, VII, IX
13	*Bauhinia variegata* L. Fabaceae	Koiralo	Tr	Br Frl	I
14	*Belamcanda chinensis* (L.) Redoute. Iridaceae	Khadgadhari	Hr	Rz	I
15	*Berberis aristata* DC. Berberidaceae	Chutro	Sr	Br/Rt	VIII
16	*Bombax ceiba* L. Bombacaceae	Simal	Tr	Br/Thr	VII
17	*Bryophyllum pinnatum* (Lam.) Oken. Crassulaceae	Ajambari	Hr	Lf	VIII

S.N./ C.N.	Botanical/Family Name	Local Name	Habit	Parts Used	Ailments Category
18	*Calotrapis procera* (Aiton) Dryand. Asclepiadaceae	Aank	Sr	St	VI
19	*Callicarpa macrophylla* Vahl. Verbenaceae	Dahichamle	Sr	Lf/ Br/ Rt	II
20	*Carica papaya* L. Caricaceae	Mewa	Tr	Rt	V
21	*Cassia fistula* L. Fabaceae	Raj Brikshya	Tr	Frt	V
22	*Cassia tora* L. Fabaceae	Tapre (Sano)	Hr	Sd/Lf	I, X
23	*Castanopsis indica* (Roxb.) Miq. Fagaceae	Katus	Tr	Young shoot	II
24	*Centella asiatica* (L.) Urb. Apiaceae	Ghod Tapre	Hr	Lf	I, II, IV
25	*Centipeda minima* (L.) A. Br. & Asch. Asteraceae	Chhimke Jhar	Hr	Lf	II
26	*Chenopodium album* L. Chenopodiaceae	Bethe	Hr	Sd and Wp	I
27	*Cirsium verutum* (D.Don) Spreng. Asteraceae	Thakalkanda	Hr	Rt	I
28	*Cissampelos pareira* L. Menispermaceae	Chillo Batulpate	Cr	Wp	II, IV, V
29	*Cissus javana* DC. Vitaceae	Jogi Laharo	Cr	Lf/St	V
30	*Cissus repens* Lam. Vitaceae	Puraneko Lahara	Cr	St	VIII
31	*Cleistocalyx operculatus* (Roxb.) Merr. & Perry. Myrtaceae	Kyamuno	Tr	Br/Lf	II, IV
32	*Coix lachryma-jobi* L. Poaceae	Virkamli	Hr	Rt	V
33	*Colebrookia oppositifolia* Sm. Lamiaceae	Dhurseli	Sr	Lf	VI, VIII
34	*Colocasia esculenta* (L.) Schott. Araceae	Karkalo	Hr	Lf (Petiole)	I

S.N./ C.N.	Botanical/Family Name	Local Name	Habit	Parts Used	Ailments Category
35	*Crassocephalum crepioides* (Benth.) S.Moore. Asteraceae	Salaha Jhar	Hr	Wp	VI
36	*Crateva unilocularis* Buch-Ham. Capparaceae	Siplikan	Tr	Br	III
37	*Curcuma longa* L. Zingiberaceae	Haledo	Hr	Rz	VI
38	*Cuscuta reflexa* Roxb. Convolvulaceae	Akash Beli	C r (rootless)	Wp	III
39	*Drymaria diandra* Blume. Caryophyllaceae	Abhijalo	Hr	Wp	I, II
40	*Drynaria coronans* (Wall.ex Mett.) T. Moore Polypodiaceae (Fern)	Kammari	Fr	Rz	VI
41.	*Eclipta prostrata* (L.) L. Asteraceae	Bhringa Raj	Hr	Wp	VII
42.	*Elephantopus scaber* L. Asteraceae	Sahasra Buti	Hr	Wp	I, II, III, VI
43	*Euphorbia royleana* Boiss. Euphorbiaceae	Siundi	Sr	Lf/St	I, VI, IX
44	*Jatropha curcas* L. Euphorbiaceae	Sajiwan	Sr	St/Br	VI, IX
45	*Justicia adhatoda* L. Acanthaceae	Asuro	Sr	Lf	I, IV
46	*Lablab purpureus* (L.) Sweet Fabaceae	Hiudesimi	Cr	Lf	VII
47	*Lepidium sativum* L. Barassicaceae	Chamsur	Hr	Sd	VI
48	*Lobelia pyramidalis* Wall. Campanulaceae	Eklevir	Hr	Lf	VII
49	*Malvaviscus arboreus* Cav. Malvaceae	Baramase Phool	Sr	Lf/Flr	I, V
50	*Mangifera indica* L. Anacardiaceae	Aanp	Tr	Br	I
51	*Melia azedarach* L. Meliaceae	Bakaino	Tr	Br	I, II
52	*Mimosa pudica* L. Fabaceae	Lazzawati Jhar	Hr	Lf/Rt	I,VI

S.N./ C.N.	Botanical/Family Name	Local Name	Habit	Parts Used	Ailments Category
53	*Mimosa rubicaulis* Sub sp. *himalayana* Lam. Fabaceae	Areli	Sr	Rt	VI
54	*Mirabilis jalapa* L. Nyctaginaceae	Malati	Hr	Tr	V
55	*Musa paradisiaca* L. Musaceae	Kera	Hr	Frt/Flr	I
56	*Nephrolepis cordifolia* (L.) C. Presl. Nephrolepidaceae (Fern)	Pani Amala	Fr	Tr	V
57	*Ocimum americanum* L. Lamiaceae	Bawari	Hr	Sd	I
58	*Ocimum tenuiflorum* L. Lamiaceae	Tulasi	Hr	Lf/Rt	II, IV
59	*Opuntia monacantha* (Willd) Haw. Cactaceae	Dammaru Kanda	Sr	St	V
60	*Oxalis corniculata* L. Oxalidaceae	Chari Amilo (Sano)	Hr	Lf/St	I
61	*Oxalis latifolia* Humb. Oxalidaceae	Chari Amila (Thulo)	Hr	Lf	V, III
62	*Periploca calophylla* (Wight.) Falc. Asclepiadaceae	Shikari Lahara	Cl	St	VI
63	*Phyllanthus emblica* L. Euphorbiaceae	Amala	Tr	Br/Frt	I
64	*Plectranthus millis* (aiton) Spreng. Lamiaceae	Guhey Silam	Hr	Lf	VII
65	*Pogostemon benghalensis* (Brum. f.) Kuntze. Lamiaceae	Rudilo	Sr	Lf/St	II, IV
66.	*Psidium guajava* L. Myrtaceae	Belauti	Tr	Lf/Br	I, II
67	*Rubus ellipticus* Sm. Rosaceae	Aiselu	Sr	Young shoot	I
68	*Sansevieria sp.* Agavaceae	Bishmari	Hr	Lf	X
69	*Sapium insigne* (Royle) Benth. ex Hook. Euphorbiaceae	Khirro	Tr	Br	VI
70	*Solanum nigrum* L. Solanaceae	Sano Bihi	Hr	Rt	II

S.N./ C.N.	Botanical/Family Name	Local Name	Habit	Parts Used	Ailments Category
71	*Stephania glandulifera* Miers. Menisperamaceae	Gudargano	Cr	Tr	I
72	*Tectraria coadunata* (J.Sm.) C.Chr. Dryopteridaceae (Fern)	Kali Niuro	Fr	Lf / Rz	I
73	*Terminalia bellirica* (Gaerth) Roxb. Combretaceae	Barro	Tr	Frt	I, IV
74	*Terminalia chebula* Retz. Combretaceae	Harro	Tr	Frt	I, IV
75	*Tinospora cordifolia* (Willd) Hook.f. and Thoms Menispermaceae	Gurjo	Cr	St	I, V
76	*Trichosanthes anguina* L. Cucurbitaceae	Chichindo	Cr	Frt	X
77	*Vitex negundo* L. Verbenaceae	Simali	Sr	Young shoot/Lf	II, IX
78	*Woodfordia fruticose* (L.) Kurz. Lythraceae	Dhairo	Sr	Frt	I
79	*Zingiber officinalae* Rosc. Zingiberaceae	Aduwa	Hr	Rz	IV, X
80	*Zizyphus oenopholia* (L.) Mill. Rhamnaceae	Bayar	Sr	Sd	VII

Serial Number/Code Number= S.N./C.N.

Habit: Herb = Hr, Shrub=Sr, Tree= Tr, Climber = Cr, Fern = Fr, Whole plant= Wp

Parts used: Root = Rt, Tuber= Tr, Rhizome= Rz, Stem = St, Bark= Br, Leaf = Lf, Flower= Flr, Fruit= Frt,

Ailments Category:

Gastro-Intestinal Ailments= (I)
Common cold, sinusitis, fever= (II)
Hepatic Ailment= (III)
Bronchial and Lungs ailment= (IV)
Urinogenital disorder= (V)
Injuries/ Sprains/ Fractures= (VI)
Skin ailments= (VII)
Eye and Ear Ailment= (VIII)
Oral and teeth Ailments= (IX)
Bites, Burns, Scald Burn=(X)

Parts used, Forms of Drugs Obtained and Mode of use of Drugs

Regarding the parts used in medicinal purposes, use of leaf and young shoot apex 31(38.75%) stood at first rank, followed by root, rhizomes and tubers 24(30%); bark, stem 21(26.25%); flower, fruit and seeds 15(18.75%) and that of whole plants 10(12.5%) (Fig. 3). Similarly, in case of forms of drugs obtained, showed that highest percentage 48 (60%) of plant juice and sap form were used, followed by 13 (16.25%) paste form, 12 (15%) powder form, 12(15%) latex form and that of aroma or scent form 5 (6.25%) (Fig. 4). Thus, obtained drugs were used in four different ways, taken in orally 57(71.25%), applied externally on affected parts (topical) 27(33.75%) and inhalation of aroma or scent 4 (5%) and some of them smoked. oral), and smoked 2(2.55%). (Fig.5)

Preference of use of Medicinal Plant

As of respondents, out of 80 medicinal plants, some variations found in the types of plant selection for the treatment of diseases among these two ethnic groups, 65 (81.25%) plants from Kumal; 60 (75%) from Gandharva, of which only 45(55.25%) of plants were found common in both tribes. There were 20 (25%) plants used by only Kumal, similarly 15 (18.75%) by Gandharva only. (Fig. 1)

The present study revealed that a total of 80 plants species belonging to 48 families (43 angiosperms and 5 pteridophytes) for the treatment of 39 different ailments among Kumal and Gandharva people in Pokhara Metropolis, where Asteraceae and Fabaceae, Lamiaceae and Euphorbiaceae families were found larger. The elderly people have good knowledge and faith about the traditional uses of such medicinal plants, as they inherited it from their parents and neighbors through oral or verbal form but now, worrying about the transfer of such indigenous knowledge and abundance of plants, because of dominance of allopathic medicines, deforestation and rapid urbanization of this area. The abundance of medicinal plants, their conservation and proper utilization is being declined. Such a great indigenous knowledge of medicinal plants use is nearly in the verge of disappearance either by the lack of transfer of knowledge to the new generation or due to the scarcity of medicinally important plants. Dependency on the traditional medication practices also found gradually declined. Some of the people still have the strong tendency of keeping secret of indigenous knowledge.

Table 2: Medicinal plants with families, and number of species

S N	Plants Families	No. of Species	Proportion in %
1	Asteraceae	7	8.75
2	Fabaceae	7	8.75
3	Lamiaceae	5	6.25
4.	Euphorbiaceae	4	5
5.	Menispermaceae	3	3.75
6.	Agavaceae	2	2.5
7.	Araceae	2	2.5
8.	Ascelpiadaceae	2	2.5
9.	Combretaceae	2	2.5
10.	Malvaceae	2	2.5
11.	Meliaceae	2	2.5
12.	Myrtaceae	2	2.5
13.	Oxalidaceae	2	2.5
14.	Verbenaceae	2	2.5
15.	Vitaceae	2	2.5
16.	Zingiberaceae	2	2.5
17.	Others 32 families with one species each	1	1.25

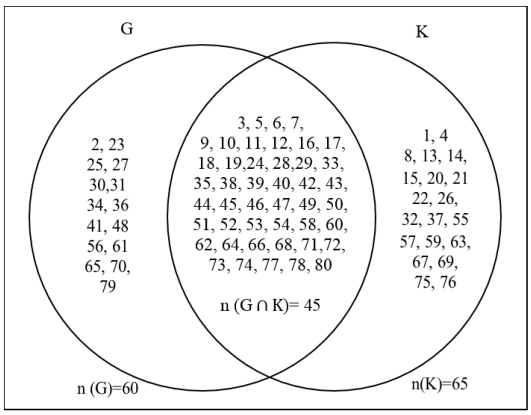

Figure 1: Relationship in the use of Medicinal Plants between Kumal and Gandharva Community

G = Plants species used by Gandharva Community, K= Plants species used by Kumal Community [Digits indicate the types of plant species according to serial number given in table 1 (check list of plants)]

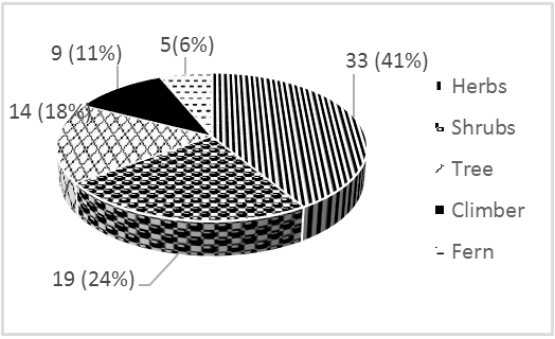

Figure 2: Types of Plants based on growth forms (Habit)

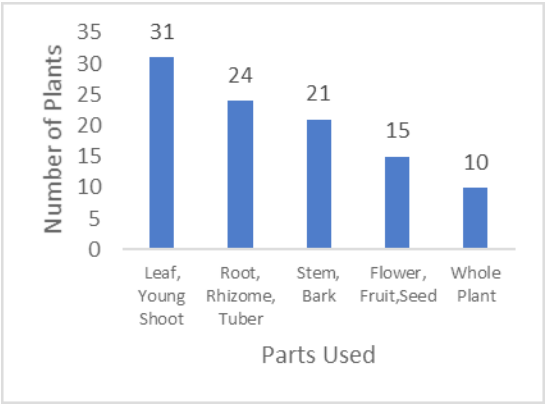

Figure 3: Proportions of Parts Used

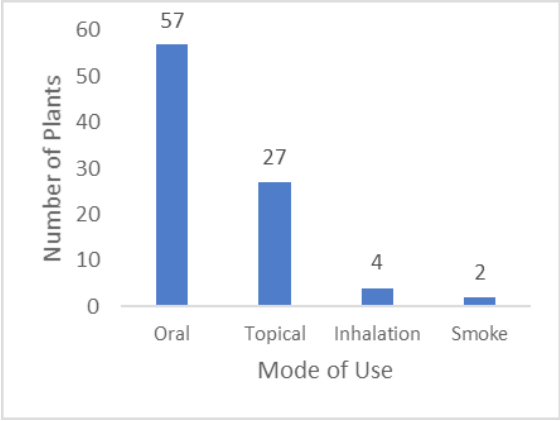

Figure 4: Proportions of Forms of Drugs

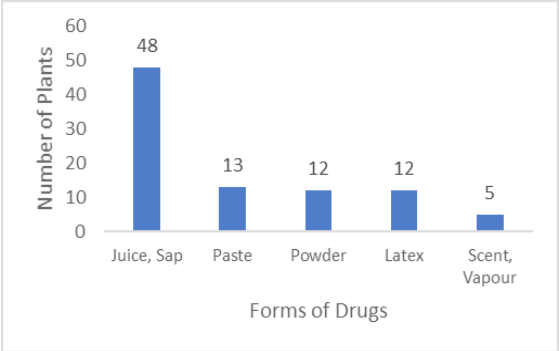

Figure 5: Mode of Use of Drugs

Table 3: Preference status of medicinal plants based on use in multiple ailments categories

S.N.	Plant No.	Medicinal Plants Species	Ailment Categories	Preference Status
1	12	*Azadirachta indica* L.	I, II, VII, IX	1st
2	*42*	*Elephantopus scaber* L.	I, II, III, VI	1st
3	*7*	*Aloe vera* (L.) Burm	I, V, X	2nd
4	24	*Centella asiatica* (L.) Urb.	I, II, IV	2nd
5	*28*	*Cissampelos pareira* L.	II, IV, V	2nd
6	*43*	*Euphorbia royleana* Boiss.	I, VI, IX	2nd
7	-	17 species used in more than 2 ailment categories	-	3rd
8	-	Rest of 57 species are used in only one disease ailment categories	-	4th

As this study was focused on two aboriginal ethic groups, the Kumal community cited using more medicinal plants 65 (81.25%) in comparison with the Gandharva,60(75%) , it may be due to the few more percentages of elderly people above 60 age group or lack of familiarity with more medicinal plants. However, ethno medicinal data shows that 45 (56.25%) plant species are popular between both community, it is consistent with the study of Thapa and Rajbhadari (2010) as the people inhabiting in a particular locality share various traditional knowledge and have common methods of using natural resources. Popularly used species usually belong to the herbaceous growth forms (41.25%) like *Centella asiatica, Drymaria diandra* is consistent with the findings of Balami (2004). The use of greater number of medicinal plants belonging to the families Asteraceae and Fabaceae showed similar results with the study of Thapa and Rajbhandari (2010) and parts used for medicine were higher in using leaf, young shoot and that of undergrounds parts, the rhizome, root or tuber with the study of Napagoda *et al* (2018). The *Angiopteris helferiana* like rare Pteridophyta species also is in medicinal use, it goes along the line of study by Das *et al* (2008), from Asam, India. Though many species were utilized in a single drug but some of plants were used in combination with others plant too, the potency of a drug using a mixture of different plant or plant parts is increased compared to single plant relates with the finding of Jima and Megersa (2018). Present investigation also shows similarities with the findings of Thapa (2012), as a report of 75 species belonging to 46 families for 39 different ailments used by Magar community in Parbat, Nepal. Similarly, the use of *Woodfordia fruticosa, Tectaria coadunate* used as the remedy for dysentery; *Custuta reflexa* in jaundice consistent with the findings of Thapa (2012) and Manandhar (1990 and 1992).

CONCLUSIONS

The present study, carried out in very short period of time, the indigenous ethno medicinal knowledge used by Kumal and Gandharva community for the treatment of health problems in their traditional methods reveals that, the indigenous people have good knowledge and experiences. But their dependency on such

plants is being declined due to easy availability of allopathic drugs and the abundance of medicinal plants also being decreased due to encroachment of people for roads, buildings, constructions, deforestation etc. Most of the medicinal plants are of wild occurrence while some of these are being cultivated in home gardens and agroforest practices.

The great wealth of traditional knowledge retained in senior citizens should be preserved and properly transferred to the new generations in a systematic method. Proper initiation should be taken immediately to conserve the biodiversity of such medicinally important plants species by the method of cultivation or by protecting the wild habitats of such plant and promoting the trade of it. Phytochemical screening of bioactive compounds and their improved methods of utilization of herbal drugs based on indigenous knowledge should be developed in local level too.

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