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Ethnomedicinal plants used by yak herders for management of health disorders

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ABSTRACT

Aim: The aim of the study was to document the indigenous ethno-botanical knowledge of the transhumant nomads of Mustang, Nepal, a representative settlement in the Himalayan highland. **Methodology:** A study was carried out during a direct field visit to collect plants, consisting of a semi-structured questionnaire and personal interviews. Both fresh and dried herbs, plants parts, and fungus were collected as far as possible. **Results:** The present study identified 51 medicinal plants and 2 funguses that were used for 47 different ailments in the medicinal practices of the nomadic tribes of Lower Mustang, Nepal. Most of the medicines were prepared as juice (22.64%) or powder (49.05%) and administered orally. Roots (23%) and leaves (28%) were the most frequently used parts of the plants while prayer-laced ties were commonly applied in sheds and housing areas. **Conclusion:** This study has shown that the transhumant pastoralist nomadic communities have their own traditional ethno-botanical medicines that remain cost effective and the method of choice for management of health disorders and is passed down through oral traditions under the guidance of an herbal practitioner. There is a need for such practices to be scientifically validated, with respect and inclusion into sustainable veterinary medicine to support these remotely located communities.

KEY WORDS: Animal husbandry, ethno-medicine, ethno-veterinary practices, Himalayan highland

INTRODUCTION

Nepal is a settlement in the Himalayan lap that has a rich biodiversity. The rough terrains have given rise to some hardy tribes with interesting ways of life. Nature can still exist in a somewhat conserved state, making it a tourist destination for both humans and various species of birds. Nepal is a bio diversity rich country with 1600-1900 plant species commonly used in traditional practices from ancient times [1-3]. High altitude rangelands are highly rich in herbal and aromatic plants, and they are the rich sources of medicines and value products [4]. Cultural healing through traditional knowledge of herbal medicine, including complementary and alternative medicine provides the basis for problem-solving strategies for economically marginalized communities in any nation. Moreover, the remote areas of Nepal are particularly rich in ethno-medical knowledge and practices and are the major collectors and exporters of crude forms. Although many studies have been conducted to document medicinal plants of Nepal [5-13], only three studies have been made to document the medicinal plants in this area [4,8,14], but the ethno-botanical knowledge of yak herders has not been documented until date.

The rugged topography, aridity, and poor soils in the Mustang district make it unfavorable for agriculture; thus, nomadic pastoralism is critically important for the economy of the Mustang District. These nomadic communities are underprivileged communities in the nation and are dependent on ethno-medicine for both humans and animals. Almost every nomad who lives in alpine areas away from villages with yak and chauri rely solely on herbal and traditional practices as medicine. The reason behind this is the lack of reliable and sufficient health facilities in these areas. Over time, generations of these families in Mustang district have generated an immense amount of ethno-botanical knowledge to facilitate in curing diseases. The rich knowledge of herbal medicine in this community is totally oral, and little of it has been documented; however, it has been passed down from generation to generation [15]. Their knowledge regarding the use of plants and plants parts such as leaves, fruits, rhizomes, or bark, and also the method of processing for medicinal purposes needs to be well-documented and preserved, this is not only for the effective and cheap sources of medicine but also for the conservation of indigenous ethno-botanical knowledge and sustainable use of this knowledge. The lack of proper documentation, uncontrolled exploitation, and

also the shortage of effective conservation efforts have caused many medicinal plants to become either extinct or replaced by chemotherapeutic agents [16]. Thus, there is an urgent need to document the indigenous ethno-botanical knowledge, especially in times when natural tragedies such as earthquakes, floods, landslides, glacial lake bursts, and droughts threaten survival in the high mountainous terrains. Thus, the documentation, conservation, and sustainable use of these resources based on indigenous technological knowledge is a present need within the country.

METHODOLOGY

Study Area

The Mustang district covers 3,639 km^2 and is located in the trans-Himalayan Arid Zone [17] in the Midwestern Development region of north-central Nepal, which is bounded by Myagdi to the South, by Dolpa to the West, by Manang to the East, and by the Tibetan Autonomous region of the People's Republic of China to the North [4].

The study area is comprised of the alpine pastures and temperate forests of Lete, Kowang, Marpha, and the Tukuche VDCs of Lower Mustang, Nepal. All the areas are located above 1500 meter altitude, and extend up to 6800 meter altitude. The major ethnic inhabitants of the area are Thakali, Gurung, Bishwakarma, and Sherpa. They have roots with Tibeto Burmese and Indo-Aryan cultures speaking Thakali, Nepali, and Tibetian Dialects. Their economy relies on livestock farming, agriculture, and tourism. Owing to the low productivity of the soil, they are engaged in the collection and trade of medicinal plants and livestock farming [Figure 1].

Ethno-botanical Survey

All the 32 yak herders of lower Mustang, including the Local healers known as *Aamchi*, were surveyed with a set of pre-tested semi-structured questionnaires. The age of informants ranged between 24 and 56 years.

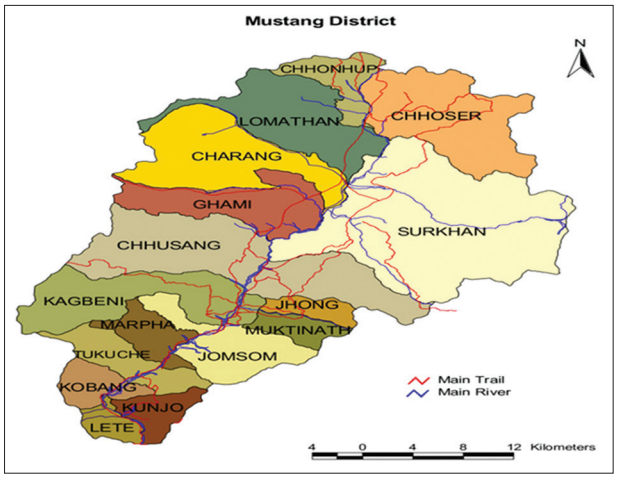

Figure 1: Map of study area (Mustang district) (Source: Adapted from Bhattarai *et al.* [4])

Prior informed consent was obtained verbally before they were interviewed and all agreed to be involved in this survey. Two interview methods were followed, and walks were taken around the grazing land and forest for plant collection and information gathering during February-June 2014. The data were compiled and interpreted in the form of Table 1.

Total Key Informants

During the survey, we discussed with 32 yak herders including local healers called "Aamchi." Among these all of the informants were male (100%), this is because females are confined to the household works and males are only involved in transhuman animal husbandry. The age of informants ranged between 24 and 56 years only two informants were below 30 years of age and rest above 30. The obtained informations were subjected to the other informants to check their precise knowledge of ethno-medicines.

Data Analysis

The obtained informations were put in a Microsoft office excel 2007 and analyzed using descriptive statistics.

RESULTS

Plants Used

The total of 51 plants and 2 fungal species belonging to 32 families and 44 genera were found to be commonly used in treating 47 ailments in the communities studied. The largest number of plant species were recorded from families *Compositae* (4 species), *Gentianaceae* (4 species) followed by *Asparagaceae* (3 species), and *Rutaceae* (3 species). Three families *Pinaceae*, *Rosaceae*, and *Ericaceae* represent 2 plant species each and rest of the families represented 1 species each.

Although Bhattarai *et al.* [4] reported 121 species belonging to 49 vascular plant and 2 fungal families and 92 genera, 8 plant species namely *Acorus calamus*, *Prunus armeniaca*, *Artemisia vulgaris*, *Chlorophytum nepalense*, *Swertia multicaulis*, *Rhodiola rosea*, *Pedicularis siphonantha*, *Taraxacum officinale* were added by the present research. When compared to ancient Tibetian literature, 1 plant species (*R. rosea*) was recorded, and medicinal plants such as *Rhododendron lepidotum*, *Rumex nepalensis*, *P. armeniaca*, *Dactylorhiza hatagirea* were reported with same ethno-medicinal values.

Parts of Plants Used and Modes of Preparation

Various parts of plants were used in the preparation of remedies. The most frequently used were leaves (28%), followed by roots/rhizomes (23%), and fruits/flowers (18%) [Figure 2].

Several types of medicinal plants were used; the most common were climbers and the least common were trees [Figure 3].

The largest numbers of medicinal plants (19 species) were used for respiratory tract infections (cold, cough, headache,

Table 1: Traditional herbal medicine for treatment of disease and ailments by yak herders of Mustang district in Nepal

Scientific name	Family	Vernacular name	Parts used	Conditions	Method of application	References
**Abies spectabilis* D. Don	*Pinaceae*	Kye (Gurung) Talispatra, Gobre salla (Nepali)	Fresh leaves and cones	Bone fracture	About 20 g of pulverized fresh leaves and cones drunk two times a day until recovery. Paste of pulverized roots and cones are applied around the site of fracture	32
Aconitum naviculare (Bruhl) Stapf	*Ranunculaceae*	Bhalaponar (Gurung)	Whole plant	Fever, jaundice	About 15 g of decoction is mixed with a cup of hot water and drunk BID after meal	28
Aconitum orochryseum Stapf	*Ranunculaceae*	Nirmasi (Gurung)	Roots	Altitude sickness, diarrhea, dysentery, cough, fever	5-10 g is taken with a cup of luke warm water BID-TID until recovery	30
Acorus calamus L.	*Acoraceae*	Bojho (Nepali)	Rhizome	Cold, anthelminthics, fever	About spoonful powder of rhizome is taken with hot water for worms. A piece of rhizome is chewed to tear fever and cold	32
**Allium fasciculatum* Rendle	*Amaryllidaceae*	Jimmu (Nepali) Nosyante (Gurung)	Whole plant	Plant poisoining, gastritis, purification of blood	10 g of the whole plant is pounded and boiled with 2 cups of water, and half cup of decoction is drunk twice a day	32
**Artemisia gmelinii* Weber ex Stechm.	*Compositae*	Titepati (Nepali) Bajha (Gurung)	Leaves	Gastritis, scabies, indigestion	10-15 g of plant parts is boiled with 2 cups of water and taken BID-TID to cure Fever, Sore throat, Indigestion, Gastritis	32
Artemisia vulgaris L.	*Compositae*	Titepati (Nepali)	Leaves	Fever, Indigestion Roundworms	About a spoonful of leaves powder is taken with honey or gur or a cup of hot water BID until recovery. About 1-2 spoonful of leaves extract is given for three alternate days to kill roundworms	28
**Asparagus filicinus* Buch.-Ham. ex D. Don	*Asparagaceae*	Kurilo (Nepali) Nirshing (Gurung)	Roots	Mastitis, Menstrual disorders Scabies, Ringworm	10 g of root powder is taken with a cup of hot water once a day after having meal. Root paste applied topically	32
**Asparagus racemosus* Willd.	*Asparagaceae*	Kurilo (Nepali)	Root, tuber, fruit, stem	Tonic Kidney and liver problem Sore throat	2-3 spoonful of root powder is taken with a cup of milk BID until recovery. Paste of roots is applied topically in treatment of mastitis	32
Benincasa hispida (Thunb.) Cogn.	*Cucurbitaceae*	Kubhindo (Nepali)	Fruit, leaves	Alcohol poisoining, Tuberculosis, Colic	About 10 teaspoonful of juice of fruit is used BID as an antidote of alcohol poisoining	32
Berberis aristata DC.	*Berberiaceae*	Chutro (Nepali)	Root, bark	Fever, dysentery, skin troubles	5 teaspoonful of root juice is taken BID until recovery for fever, dysentery, skin troubles and purification of blood	30
**Betula utilis* D. Don	*Betulaceae*	Bhojpatra (Nepali) Buspath (Gurung, Thakali)	Bark, Leaves	Fever	Pulverized powder of bark and leaves is mixed with other plants, and a half spoonful is taken with cow ghee BID-TID until recovery	21
**Cannabis sativa* L.	*Cannabaceae*	Bhang (Nepali) Kantsya (Gurung, Thakali)	Leaves	Diarrhea and Dysentery Clairvoyance, Psychoactive	5-10 g of leaves powder is taken once a day with hot water until recovery. Powder of leaves smoked with tobacco	32
**Chlorophytum nepalense* Lindley	*Asparagaceae*	Ban pyaj (Nepali)	Root	Gout	Root is crushed on stone slab and paste is made. Root paste is mixed with mustard oil and applied topically to care gout	32
Clematis barbellata Edgew.	*Ranunculaceae*	Laharejhar (Nepali) Kramay (Gurung, Thakali)	Leaves, stem, flowers	Jaundice	1 cup of water decoction is taken BID orally until cure	25
Cinnamomum zeylanicum Garcin ex Blume	*Lauraceae*	Dalchini (Nepali)	Barks	Colic, diarrhea, indigestion Throat allergy	1-2 spoonful of powder of bark is taken with Tea or hot water BID-TID until recovery. Green leaves chewed to cure throat allergy	32
Cordyceps sinensis (Berk.) Sacc	*Clavicipitaceae*	Jibanbuti, Yartsagumba (Nepali, Gurung, Thakali)	Whole part	Tonic Sex stimulant	A half spoonful of yartsaghumba powder is taken with milk or honey when enervated. ½ spoonful yartsaghumba powder+½ spoonful Dactylorhiza powder+a cup of milk-honey during lethargic periods. One piece of Yartsaghumba is taken with either alcohol or milk BID to increase sex vigor	18
**Dactylorhiza hatagirea* D. Don	*Orchidaceae*	Panch aaunle (Nepali), Soo (Gurung)	Roots	Snake bite, scorpion stings, cuts, wounds, boils	Paste of root is usually applied around the site of snake bite, scorpion stings, cuts, wounds, boils once a day until recovery	32

(*Contd...*)

Table 1: ***(Continued...)***

Scientific name	Family	Vernacular name	Parts used	Conditions	Method of application	References
**Ephedra gerardiana* Wall. ex Stapf	*Ephedraceae*	Somlata, (Gurung) Chaya (Aamchi)		Chest pain, wounds, gastritis, Respiratory disease, nasal bleeding	Root paste is applied in cuts and wound twice a day until recovery. One spoonful root powder is taken once a day for the cure of asthma, cold, cough, altitude sickness, and dysuria until recovery	32
Girardinia diversifolia (Link) Friis	*Urticaceae*	Chanle sisno (Nepali) Ghyo (Thakali, Gurung)	Leaves and roots	Headache, Joint ache	Leaves are crushed on the stone slab and juice of leaves is applied topically to treat a headache and joint ache	30
Indigofera bracteata Baker	*Fabaceae*	Sakhino (Nepali)	Leaves	Leprosy Menstrual disorder Muscular swelling	About 5 teaspoonful of juice of leaves is taken BID until recovery. Paste of leaves is used to relieve muscular swellings	19
Juniperus communis L.	*Cupressaceae*	Phar, Chuksar (Gurung, Thakali)	Fruits and Leaves	Kidney diseases	2 spoonful of paste of leaves and flowers is taken with hot water or milk TID orally until cure	32
**Lyonia ovalifolia* (Wall)	*Ericaceae*	Angeri (Nepali)	Leaves	Ticks, Lice	About 15-20 g of leaves is pounded on a stone slab and squeezed through a muslin cloth, and liquid is applied on the body OD until recovery	32
Maharanga bicolor A. DC	*Boraginaceae*	Maharangi (Nepali)	Root	Ear pain	Liquid from pounded root extract is taken with 2 spoonful of boiled mustard oil. 1-5 drops of pounded root extract is put in ear BID-TID until recovery	30
Mentha longifolia (L.)	*Lamiaceae*	Patina (Nepali)	Leaves	Tonsilitis, headache, cold cough	10 g of leaves is boiled with 2 cups of water, and a half cup of decoction is drunk in the morning	29
**Mirabilis himalaica* (Edgew.) Heimerl	*Nyctaginaceae*	Nigghibulug, Khemba (Gurung)	Leaves and flowers	Fracture	25 g of leaves and flowers are crushed on the stone slab and paste is applied around fractured part once a day until recovery	30
Morchella esculenta (L.) Pers.	*Morchellaceae*	Guchichaue (Gurung, Thakali)	Whole plant	Heart disease	3 spoonful of dried powder taken with hot water SID until recovery. Taken as vegetables	32
**Nardostachys grandiflora*	*Caprifoliaceae*	Jatamasi (Nepali) Panghphoie (Gurung).	Roots	Diarrhea Conjunctivitis Gastritis Headache Chest pain	½ spoon of root powder+½ *Aconitum* naviculare plus Betula utilis+3 spoonful of Chauri ghee BID until recovery for diarrhea. A spoonful is poured on red coal fire and fragrance at night before sleeping until recovery. ½ spoonful root powder+a cup of hot water BID after meal until recovery	32
**Neolitsea pallens D. Don*	*Lauraceae*	Pya pya (Nepali)	Fruit, seed	Eczema Poisoining	Juice obtained from fruit is applied to treat scabies and eczema. Seeds are crushed and oil obtained is used 2 spoonful BID as an antidote of alcohol poisoining	32
**Neopicrorhiza scrophulariiflora* Hong.	*Plantaginaceae*	Kutki (Gurung, Thakali)	Roots	Diarrhea, Paralysis, Indigestion Scorpion and snake bite Scabies, Ringworm	10 g of root powder is boiled in a cup of water and 30-40 ml of filtered decoction is taken with a cup of milk BID-TID until recovery. Half spoonful of powder is mixed with two to three spoonful of Chauri ghee BID-TID until recovery. Paste of roots	32
**Notochaete hamosa Benth*	*Lamiaceae*	Kuro (Nepali)	Leaves	Snakebite Indigestion	About 5 teaspoonful of juice of leaves taken BID as an antidote to cure until recovery	32
**Paris polyphylla* Sm.	*Melanthiaceae*	Satuwa (Gurung)	Leaves, Flowers, Roots	Indigestion, Diarrhea	About 5 g of stems, leaves and flowers is taken with luke warm water once a day until recovery. About 5 teaspoonful of juice of rhizome is given twice a day in the treatment of Gastritis and menstrual pain	32
**Pedicularis siphonantha* D. Don	*Orobanchaceae*	Halhale (Nepali)	Roots	Plant poisoining		32
Piper nigrum L.	*Piperaceae*	Marich (Nepali)	Seeds	Indigestion, poisoining, mastitis	A spoonful of pulverized powder of is drunk with a cup of hot water BID until recovery	32

(*Contd...*)

Table 1: ***(Continued...)***

Scientific name	Family	Vernacular name	Parts used	Conditions	Method of application	References
**Pinus wallichiana* A.B. Jacks.	*Pinaceae*	Sallo (Nepali) Thansin (Gurung)	Resins	Wounds Fracture Tuberculosis	Paste of leaves and resins are applied topically at the site of injury. Bark cut into smaller parts and applied on fractured site until recovery. Half spoonful of bark powder is drunk BID after meal for 2 years	32
Prunus armeniaca L.	*Rosaceae*	Khurpani (Nepali) Khamba (Thakali, Gurung)	Fruit Seeds	Vitamin deficiency	Seeds are eaten raw 3 time a day until recovery. Sauce is made from seeds and fruits and eaten with meal	24
**Prunus persica* L.	*Rosaceae*	Aaru (Nepali)	Leaves	Maggoted wound	Juice of leaves when pounded on stone slab is poured on maggoted area	22
Rhodiola rosea L.	*Crassulaceae*	Solo (Gurung, Thakali) Sanjjevani, Jivanbuti (Nepali)	Whole plant	Cognitive improvement, Anti- aging, Altitude sickness	Leaves of plants taken as vegetables. About 20 g of the whole plant is pounded on stone slab, and a spoonful of powder is taken with a cup of hot water OD until recovery	1
Rhododendron anthopogon D. Don	*Ericaceae*	Palu (Gurung), Sangalin (Amchi)	Leaves and flowers	High BP	Leaves and flowers are ground to make powder, and a half spoonful of powder is drunk with a cup of hot water or milk BID after meal until recovery	26
Rhododendron lepidotum Wall. ex G. Don	*Ericaceae*	Bhale sunpate (Nepali) Bhaiunako (Gurung)	Plant paste (flower and leaves)	Blood purification	About 2.5-5 g is taken with a cup of hot water until recovery	29
Rumex nepalensis Spreng.	*Polygonaceae*	Somang (Gurung, Thakali)	Whole plants, roots	Fracture, joint pain, edema	A spoonful of powdered plants/roots is taken BID with a cup of hot water or milk until recovery	22
Swertia angustifolia Buch.-Ham. ex D. Don	*Gentianaceae*	Chiraito (Nepali) Tento (Gurung, Thakali)	Whole plant	Fever, indigestion, diarrhea, scabies	10 g of whole plant is boiled with 2 cups of water and half of the decoction is drunk OD-BID until recovery. Whole plant is pounded on stone slab, water extract is made and applied on the site of scabies until recovery	32
**Swertia chiraytia* Rob. ex Flem	*Gentianaceae*	Chiraito (Nepali)	Whole plant	Fever, indigestion	A spoonful of plant powder is taken with a cup of hot water BID until recovery. About 10 g of the plant is boiled with 2 cups of water, and a half cup of decoction is taken BID until recovery	32
Swertia multicaulis D. Don	*Gentianaceae*	Bhale chiraito (Nepali)	Plant and root paste	Cuts and wounds	Paste of plant is applied topically on the wound and cuts until recovery	32
Swertia racemosa C.B. Clarke	*Gentianaceae*	Lakhetikta (Gurung)	Whole plant	Fever, malaria, jaundice, diabetes, cold, cough, headache	About 5 gs of pulverized powder of whole plants is mixed is drunk with a cup of hot water BID-TID until recovery	31
Taraxacum officinale aggr.	*Compositae*	Tuki phool (Nepali)	Plant paste	As an emetics and treatment of altitude sickness	About 5 g of plant paste is drunk with hot water as emetics for the management of altitude sickness	15
Taraxacum tibetanum Hand.-Mazz.	*Compositae*	Khurmang (Thakali, Gurung)	Leaves, stem, and flowers	Vertigo, jaundice, gastritis, fever	A half spoonful of powder is taken with a cup of hot water BID until recovery	22
Taxus wallichiana Zucc.	*Taxaceae*	Silingi (Gurung)	Stem and leaves	Cancer	Plant powder is taken with cup of hot water until recovery	
**Triticum aestivum* L.	*Poaceae*	Gahun (Nepali)	Seeds	Regualation of oestrus cycle, bone fracture, constipation	About 20 g of young leaves powder is taken with hot water BID-TID. Paste of plant is applied topically over the skin at site of fracture and immobilized	32
**Valeriana jatamasi* Jones	*Caprifoliaceae*	Napu, Ghyapo (Thakali, Gurung)	Roots, leaves	Cuts, wounds, headache, fever	Paste of the roots and leaves is applied on cuts and wounds until recovery. ½-1 cup of decoction is taken orally BID until recovery for the headache and fever	32
**Zanthoxylum acanthopodium* DC.	*Rutaceae*	Aaankhe timur, Bhote timur (Nepali)	Fruit, leaves	Fever, cold, respiratory distress	Decoction of leaves used externally to cure abdominal pain. Paste of leaves is used topically to relieve a toothache	32
**Zanthoxylum armatum* DC.	*Rutaceae*	Prumo (Gurung, Thakali)	Fruits	Altitude sickness, vertigo, cold, cough, dysentery, diarrhea	One-fourth spoonful powder of fruits taken with a cup of water for diarrhea	28
**Zanthoxylum oxyphyllum* Edgew.	*Rutaceae*	Siltimur (Nepali)	Fruits	Indigestion, poisoining, tympany	5-10 g of powder of fruit is taken with water TID-QID until recovery	32

Figure (Number) indicates the frequency of citation of each species by the informants, *Are also used in Yaks in addition to humans, OD: Once a day, BID: Two times a day, TID: Three times a day

nasal bleeding, dizziness, altitude sickness, etc.), whereas, gastrointestinal disorders (diarrhea, indigestion, dysentery, gastritis, colic, etc.) treated with 17 species and musculoskeletal disorders (Joint pain, muscular swelling, fracture, etc.) were cured with 8 species. The form of remedies was primarily powder (49.05%), juice (22.64%), or decoction (18.87%), tablets, pills, and infusion were rare [Figure 4].

Tablets, pills, and infusions were usually made only by traditional healers, "Aamchi," as cited in previous studies [4,8]. Per oral use predominated topical use. Plants were generally prepared using cold or hot water, but occasionally other methods of preparation, such as alcohol, milk, ghee, or oils, were used [Table 1]. Medicinal preparations were found to be administered through various routes-oral was the most predominant route followed by topical, nasal, and other routes. While in animals intended oral formulations were found to be drenched by means of drenching tube from *Bambusa indica* (Bans). This was followed in only in young and debilitated animals, and adult animals were given medications either mixed with salt or mixed with oat flour.

DISCUSSION

Notably, a mixture of different plant products rather than a single one was used in the treatment of most diseases. Many nomads believed that combination of plant species increased the potency of medicines owing their synergistic actions unlikely that of Paliyar communities of Tamilnadu, India who selectively used single plant for specific ailments [18]. Similar combined formulations were reported from Kani communities in India [19]. Almost all the plant species were collected directly from their wild state during various seasons and thus were in different stages of growth and development. Without a doubt, the future practice of medicine must take into account traditional healing arts while adopting new scientific discoveries [20], that respects, documents and advocates these traditional healing arts. The yak herders are the major collectors of high altitude medicinal plants from the alpine meadow as mentioned by Oli and Nepal [21]. Though, the herders do not have traditional scientific knowledge which advocates sustainable harvesting of medicinal plants as, they are familiar with the nature of plants and their distribution [22,23]. They collect the medicinal plants in fresh and dried form, especially in spring and autumn when the climate is favorable for collection. Transhumant migrating nomads, they partly collect medicinal plants from grassland and forest and partly purchase from the traditional healers "Aamchi." They follow the rotational grazing system; seasonal and selective harvesting, which is the only management approach and had some contribution to sustainable management of herbal resources of high mountains. North and South trade to India and the Far East through China (now China is in itself a major market) have created huge demands for priced medicinal herbs of Nepalese highland [24]. However, greed is slowly creeping in as highland medicinal plants and materials find premium price leading to over harvesting and social ills which are having an eroding effect in social and ecological harmony.

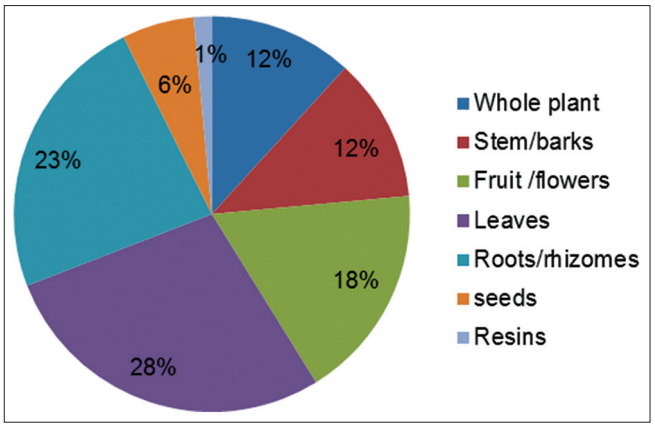

Figure 2: Different parts of plants used in preparation of medicine

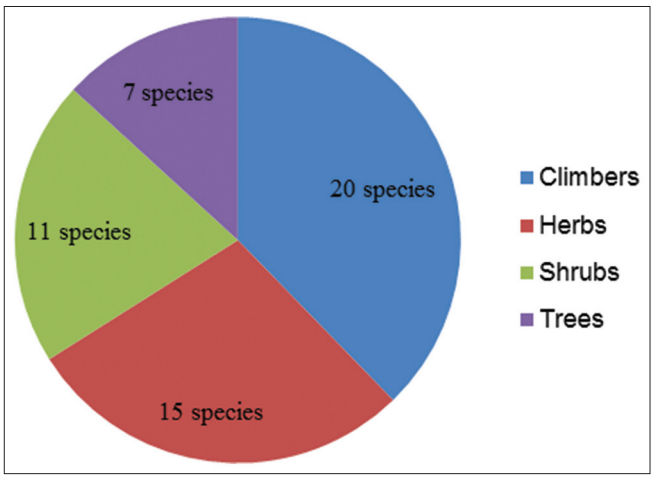

Figure 3: Life form (medicinal plants used by yak herders of Mustang, Nepal)

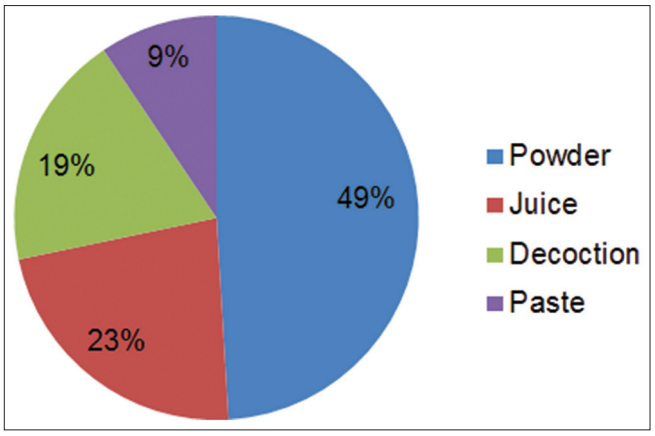

Figure 4: Forms used (Medicinal plants used by yak herders of Mustang, Nepal)

CONCLUSION

It is concluded that transhumant pastoralist nomadic communities have their own traditional ethno-botanical medicines that remains cost effective. Furthermore, method of choice for management of health disorders is passed down to

next generation usually by oral traditions. These communities have detailed and extensive knowledge regarding medicinal plants and their utility. They have their own way of collecting medicinal plants, method of preparation, dose and application. The lack of modern health facilities, coupled with rugged topography, and a strong belief towards herbal medicines, substantiate the preference for herbal medicines for health care. However, the long-term use of herbal medicinal plants, over-harvesting is risking many valuable medicinal plant species to the extent of becoming extinct. Thus, necessary steps towards conservation of these resources are needed. Continuous training of traditional healers and transfer of this knowledge to the younger generation is necessary. Although their traditional medicine is partially effective for management of ailments, they should be further strengthened by the scientific management of health.

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