

Ethnobiology and Indigenous Knowledge about Medicinal Animals and Plants in the Balami Ethnic Group in Nepal

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ABSTRACT

The main purpose of the study was to document the medicinal animals and plants used by the unique ethnic group; 'Balami', native of Okharpauwa VDC of Nuwakot district. The information was collected in the area using an integrated approach of zoological and botanical collections, group discussions, interviews and questionnaires. It enumerates an account of ethnography with the list of 65 animal species belonging to 31 orders, 46 families and 62 genera. Out of which 55 species are wild and 10 species are domesticated. The Balami utilize these animals mainly for food, medicine, companion, ceremony, agriculture etc. They use 15 species of animals for medicinal purpose among which 13 are wild and 2 are domesticated to cure 16 different types of diseases. Balami have brought altogether 185 different plant species into use. Among them 80 species are brought from the local forest, 87 species are cultivated and 18 species of the plants are purchased from the nearest market. These plant species are included under 65 families and 151 genera. They use 45 different plant species to cure 55 different diseases out of which 32 are wild, 12 are cultivated and 1 is purchased from the remote area. The present inventory will play a catalytic role for implementation of development programs in the region, recommendations of the conservation and sustainable use based on indigenous knowledge from the elder to the younger generations.

Keywords: Ethnobiology, indigenous knowledge, traditional medicine, medicinal animals and plants, Balami.

INTRODUCTION

Dynamic and intimate relationships have been established between human, plants and animals. Human being has been always inspired about the uses of various plants and animals species. As a result, they used different vegetational resources, animal and animal extracts for manifold purposes like food, medicine, fibre etc. Generally, ethnobiology is a discipline of recording knowledge of indigenous people about uses of animals and plants inherited through generations. It has multidisciplinary endeavour that contributes to explore how local people interact with plant and animal resources. Ethno-medicine consists of those beliefs and practices relating to diseases which are products of indigenous cultural development and are not explicitly derived from the conceptual framework of the modern medicine (Mishra *et. al.* 2006). Ethno-medicinal practices and beliefs are moulded in the nooks and corners of the world even after the revolution brought by the modern medicine. It is because of the relationship of the local people with the elaborate patient healers, low cost and cultural acceptability.

Traditional medicines are still the only defense for the poor people living in remote areas far from modern health care facilities. However, documentation and analysis of such knowledge is lagging and in verge of extinction. Thus, it is our responsibility to preserve indigenous knowledge system for providing affordable and sustainable health

care. Balami are among the least known of Nepal's indigenous people. Apart from the ancient agricultural activity, they were traditionally woodcutters and firewood sellers living near forested areas all around the ridge encircling the Kathmandu valley. Most of them have given up traditional woodcutting activity, as there is no adequate firewood to satisfy the need of Kathmandu valley. Porterage was formerly another major occupation of this group. They used to carry goods along the Bhimphedi-Kathmandu track, along the old footpath from the Kathmandu valley to India where all transportation is still ensured by porters (Toffin, 2007). They are good field workers and buffalo traders. They are the mediators between civilized world of villages and towns undergoing socialization and acculturation. In these circumstances this indigenous group is waning in Nepal. This research work is an effort to document such indigenous knowledge in Balami, a minor group under Newar ethnic community. Thus, the main objective of this study was to document ethnobiology, ethnomedicine and preserve indigenous knowledge system of Balami.

MATERIALS AND METHODS

Study area

Okharpauwa VDC is the study area which lies in the Nuwakot district of Bagmati zone. It is one of the underdeveloped VDC out of 62 VDCs of Nuwakot

district (CBS, 2012). It is located in between the latitude 27°46'32.59"N to 27°48'11.00" North and longitude 85°14'46.32" E to 85°17'52.69" East and within an elevation range from 1200 m to 1900 m from the sea level. The village entirely lies in Kolpu Khola watershed, which is north western part of Kathmandu. In its east, Jitpur Fedi VDC of Kathmandu, west, Chauthe VDC of Nuwakot, north, Kakani VDC of Nuwakot and south, Deurali VDC of Dhading districts are located. The area is rather sloppy. Like the general hilly area, Brahmin, Chhetri, Tamang, Balami, Newar, Damai, Kami etc., live here. They all have their own language and religion.

From north to south, the study area is underlain by Himalayan gneiss group composed of various gneisses forming the Kakani-Shivapuri ridge; Tibetan sediments composed of quartzite, phyllite, siltstone, sandstone and schists in the centre and marble in the south (Caine & Mool, 1982). The climate of Okherpauwa varies from subtropical sub-humid in the river valleys to warm temperate humid in the upper ridges and mountain tops. The maximum and minimum temperatures vary from 22.1 to 11.4°C in summer and 13.5 to 1.1°C in winter. More than 80% of the annual precipitation is received during the rainy season which normally occurs between Mid Junes through late September.

Okherpauwa supports subtropical vegetation consisting of *Schima wallichii* (chilaune) and *Castanopsis indica* (Katus). The middle slopes of the mountains have *Pinus roxburghii* (Sallo), *Quercus lanata* (Banjha) and *Rhododendron spp* (Laligurus). *Alnus nepalensis* (Uttis) occupies almost all wet ravines and gullies. *Eupatorium sp.* (Banmara) occurs extensively in degraded forest and scrubland. Some trees of *Toona ciliata* (Tuni), *Dalbergia sisso* (Sisau), *Albizia lebbek* (sirisi) are also found. Among mammalian fauna *Canis aureus* (Jackal), *Panthera pardus* (Chituwa), *Macaca mulata* (Bandar) etc., are found.



Fig. 2. Map of Nuwakot District



Fig. 3. Map of Okherpauwa VDC

To undertake this research, ethnomedicinal data as primary data were collected from the study area through observation, participation and interviews. A standard set of questionnaires were used in order to obtain the detail information about the medicinal plants and animals. Informal interviews were taken with reliable persons and the local people such as old persons and traditional faith healers. Photo collection was made. Four major field visits of five days each during 2007 and 2008 and many informal field visits were made there after. Random sampling techniques were employed to recruit 29 interview subjects. The actual condition of ethnobiology and indigenous knowledge about medicinal animals and plants were observed directly and recorded from the key informants and faith healers. The plant specimens were collected and identified on the spot with the help of the local people and some were identified with the help of botanists and zoologists from the Central Department of Zoology and Botany (T.U.) respectively and the National



Fig. 1: Map of Nepal

Herbarium, Godawari, Kathmandu. Various tables were made for the identification, classification and medicinal uses. Similarly, the secondary data were used for the study, which were collected from experts, organizations, national and international journals, publications and text books.

RESULTS

Balami from time immemorial were relying on the forest and the forest products. Later on they changed themselves as good field workers. They utilized a wide variety of plant and animal species. They have keen love to the animals they domesticate and the forest products. They are more cultural in the protection of the forest. The study of ethnozoology of Balami reveals that 65 different kinds of animals both vertebrates and invertebrates. The vertebrates numbering 51 species include mammals, aves, reptiles, amphibians and fishes whereas, the invertebrata include 14 species, together with annelids, crustaceans and molluscs. The vertebrata belongs to 21 orders, 34 families, 49 genus and 51 species whereas the invertebrata include 10 orders, 12 families 13 genus and 14 species. Thus, the total faunal resources of ethnobiological significance to Balami encompass 31 orders, 46 families, 62 genuses and 65 species among them 55 species are wild and 10 species are domesticated. They utilize these animals mainly as food and medicinal purposes. Some of the animals are used as companion, ceremonial, agricultural etc.

Balami have brought altogether 185 different plant species into use. Among them 80 species are brought from the local forest, 87 species are cultivated and 18 specie are Purchased from the nearest market. These plant species are included under 65 families and 151 genera. Among 185 species, Mycophyta consists of 1 family, 1 genus and two species. Both of them are wild. Pteridophyta consists of 3 families, 3 genus and 3 species. All the 3 species are wild. Gymnosperms are included under 2 families, 2 genera and 2 species. These are also wild. Monocots are included under 12 families, 33 genera and 35 species. Among them 12 species are wild, 19 are cultivated and 4 are purchased. Dicots consist of 47 families, 112 genera and 143 species. Out of them 61 species are wild, 68 are cultivated and 14 are purchased.

Medico-ethnobiology

Balmi has the profound indigenous knowledge to cure various diseases. While using the medicine, local healer, the Jhankri enchants mantras. This seems quite an unusual in comparison to the modern allopathic medicine systems. There are 12 orders and 13 families of animals which include 15 genera and 15 species. Among them 13 are wild and 2 are domesticated. They use the fats, sting, total animal body, blood, web, meat, bile juice, head and the mud where the animal live, and the eggs of animals for the medicinal purposes.

Table 1. Animals of Medicinal Importance to the Balami

S. N.	Diseases	Order	Family	Animal Species/	Common/ Local name	Animal parts
1.	Headache Rheumatism	Carnivora	Canidae	<i>Canis aureus</i>	Siyal	Meat
2.	Arthritis	Carnivora	Felidae	<i>Felis chaus</i>	Habsilo	Meat
3.	Rheumatism (Bath rog)	Carnivora	Felidae	<i>Selenarctos thibetanus</i>	Bhalu	Fats and bile
4.	Asthma	Rodentia	Hystricidae	<i>Hystrix brachyura</i>	porcupine	Bile juice
5.	Dysentery	Galliformes	Phasiniidae	<i>Gallus gallus domesticus</i>	Kukhura	Egg
6.	Infertility	Passeriformes	Ploceidae	<i>Passer domesticus</i>	Vangera	Blood
7.	Asthma	Stringiformes	Stringidae	<i>Bubo bubo</i>	Huchil	Head
8.	Leprocy	Squamata	Gekkonidae	<i>Hemidactylus flaviviridis</i>	Mausuli	Body
9.	Pneumonia, Typhoid, Small wounds	Anura	Bufonidae	<i>Bufo malanosticus</i>	Toad	Legs and eggs with water
10.	Weakeness in animals	Pectinibranchia	Pilidae	<i>Pila sp.</i>	sankhekira	Body
11.	Backpain and bone fracture	Stylomnatophora	Helicidae	<i>Helix sp.</i>	Chiplikira	Whole part
12.	Head fracture	Arania	Araneae	<i>Araneae sp.</i>	spider	Web
13.	Paralysis and various diseases of nervous system	Hymenoptera	Vespidae	<i>Plytis stigma</i>	wasp	Sting
14.	Cough	Isoptera	Termitidae	<i>Termite sp.</i>	Dhamira	Mud
15.	Neural disease	Hymenoptera	Vespidae	<i>Vespa sp.</i>		Sting and saliva

Balami has great faith upon the healing property of wild herbs, medicinal plants and advice of tribal healers. They don't visit the nearest health post for the treatment of simple diseases like cuts, wounds, diarrhoea, cold, asthma etc. They use 45 different species of plants for

the medicinal purpose. Among them 32 are wild, 12 are cultivated and 1 is purchased. All these medicinal plants can be catagorised under 36 families and 44 different genera. They use the leaf, fruit, bark, stem, total shoot, seed, rhizome and flowers of the plant for the medicinal

purposes. The animals and plants used for particular disease with their parts and administration have been given in the table below.

Table 2. Plant species of Medicinal Importance to the Balami

S. N.	Families	Plant Species	Common Local Name	Parts Used	Diseases/ Problems
1.	Acanthaceae	<i>Justicia adhatoda</i> Linn.	Asuro	leaf	Bronchitis/ Dendruff
2.	Amaranthaceae	<i>Achyranthes bidentata</i>	Datiwan	Stem	Fever and toothache.
3.	Amaryllidaceae	<i>Allium hyposistum</i> (Sternan)	Jimbu	Leaf	Cough and cold
4.	Araceae	<i>Acoras calamus</i> L.	Bojho	Rhizome	Cough and Bronchitis
5.	Berberidaceae	<i>Berberis asiaticaa</i> Dc.	Chutro	Fruit	Skin disease, Diarrhoea & Jaundice
6.	Boraginaceae	<i>Cynoglossum lanceolatum</i> Forsk	Kuro	Entire plant	Mumps and cuts
7.	Betulaceae	<i>Betula alnoides</i> Buch-Ham. ex.D.Don	Saur	Bark	Excessive mensuration
8.	Capparaceae	<i>Crataeva unilocularis</i> Buch. Ham,	Siplican	Seed/ Bark/ leaf	Disorder of urinary organ/ Loss of appetite
9.	Combretaceae	<i>Terminalia bellirica</i> (Gaertn) Roxb.	Barro	Seed	Anemia, Ulsers, cough, fever, skin diseases
		<i>Terminalia chebula</i> Retz.	Harro	Seed	Dysentery, Diarrhoea, ulsers, wounds, jaundice, cough, neuropathy, blood pressure.
10.	Compositae	<i>Artemisia vulgaris</i> L.	Titepati	Shoot	Cough, asthma, cuts, wounds & scabies.
		<i>Eupatorium adenophorum</i> Spreng	Banmara	Leaf	Cuts and Wounds
		<i>Helianthus annus</i> L.	Surya mukhi	Leaf/seed	Ulcers and wounds burnt skin.
11.	Convolvulaceae	<i>Cuscuta reflexa</i> Pl.	Akasbeli	Stem	Jaundice, asthma, diarrhoea
12.	Cucurbitaceae	<i>Melothria heterophyla</i> (Lour)	Bankakra	Fruit	Neck ache and Fever
13.	Nephrolepidaceae	<i>Nephrolepis auriculata</i> (L)	Paniamala	Fruit	Indigestion, fever, Uteritis in buffalo
14.	Dryopteridaceae	<i>Tectaria coadunata</i> (Wall ex)	Kalo niuro	W. Plant	Diarrhoea and dysentery
15.	Ericaceae	<i>Gaultheria fragrantissima</i> Wall	Dhasingare	Fruit	Rheumatism and against hook worms
		<i>Rhododendron arborium</i> Smith.	Laliguras	Flower	Blood dysentery, diarrhoea.
16.	Euphorbiaceae	<i>Phyllanthus emblica</i> Linn.	Amala	Fruit	Haemorrhage, diarrhoea and dysentery
17.	Gramineae	<i>Cynodan dactylon</i> Linn. Pers	Seto dubo	Leaves	Cuts and wounds, epilepsy
18.	Hypericaceae	<i>Hypericum uralum</i> Buch-Ham.	Khareto	Leaves, Stem	Cut
19.	Labiatae	<i>Pogostemon bengalensis</i> (Burm. f.) Kuntze	Rudilo	Shoot/root	Cough sinusitis, diarrhoea and vomiting.
		<i>Ocimum sanctum</i> L.	Tulasi	Shoot/Seed	Bronchial infection and fever
20.	Lauraceae	<i>Lindera neesiana</i> (Nees) Kurz.	Siltimur	seed	Diarrhoea, Abdominal pain & fever
21.	Leguminosae	<i>Abrus precatorius</i> L.	Ratigedi	Fruit	Itching of eye
		<i>Cassia fistula</i> L.	Raj briksha	Seed	Snake bite, rheumatism, Diarrhoea and inflammation
		<i>Mimosa pudica</i> L.	Lazawati	shoot	Bite of the scorpion sting, Rheumatism
22.	Liliaceae	<i>Aloe barbadensis</i> Mill.	Gheekumari	Leaves	Intestinal worms
23.	Meliaceae	<i>Azadirachata indica</i> (Juss)	Neem tree	Leaf	Blisters and Allergy
		<i>Toona ciliata</i> Roxb.ex Rotti & Willd	Tuni	Bark	Dysentery, cough, Bronchitis
24.	Myrtaceae	<i>Pisidium guajava</i> Linn.	Amba	Fruit/Leaf	High blood pressure, Bleeding gum
25.	Oleaceae	<i>Nyctanthes arbor-tristis</i> (L)	Paarijaat	Flower	Blisters and wound in the neck
26.	Orchidaceae	<i>Dactylorhiza hatagirea</i> (D. Don)	Paanch aunle	Tubers	Diabetes, Dysentery, Diarrhoea, Seminal weakness.

27.	Punicaceae	<i>Punica gromatum</i> L.	Anar	Fruit	Low blood pressure.
28.	Rhamnaceae	<i>Zizyphus mauritiana</i> Lam.	Bayer	Root	Measles and boils
29.	Rosaceae	<i>Pyrus pashia</i> Buch- Ham	Mayal	Fruit	Wounds, eye strain, excessive menstrual cycle
30.	Rutaceae	<i>Zanthoxylum armatum</i> (D.C.)	Timur	Fruit/leaves	Skin diseases and ring worms
31.	Solanaceae	<i>Solanum xanthocarpum</i> Schar.	Kantakari	Fruit	Toothache, sore throat.
32.	Theaceae	<i>Schima wallichii</i> (DC.) Korth.	Chilaune	Bark	Taeniasis
33.	Umbelliferae	<i>Cantella asiatica</i> L.	Ghodtapre	Leaves	Fever, Uric acid
		<i>Foeniculum vulgare</i> (Mill)	Madhesi Sunmps	Seed/Shoot	Chest, kidney and spleen trouble
34.	Urticaceae	<i>Utrica dioica</i> L.	Sisnu	Shoot/Root	Fracture, Jaundice and toothache
35.	Verbenaceae	<i>Vitex negundo</i> L.	Simali	Shoot/Flower	Headache, Sinusitis (pinash)
36.	Zingiberaceae	<i>Hedychium ellipticum</i> (Buch-Ham)	Ban Besar	Rhizome	Fever

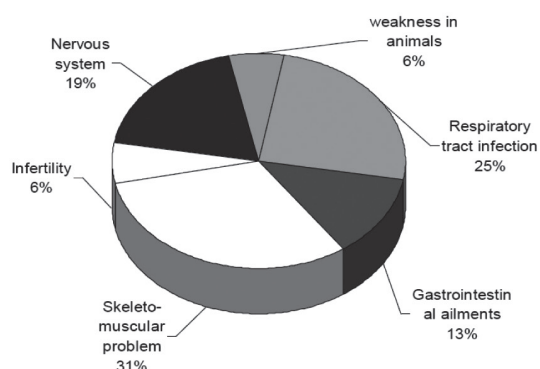


Fig. 4. Major disease categories and associated animal species

Indigenous knowledge

The kind of knowledge which is inherited from one generation to another generation is called indigenous knowledge. The Balami were woodcutter and seller spending the semi-nomadic life at the periphery of the valley. Still some groups cut and sell the woods to the city. More than this they are good field workers. They have good knowledge in making plough. Women make mats out of straw. They have good knowledge of making wine (jand) and alcohol (raksi). Some of the Balami people are busy at making houses and carpentry. They are famous in the periphery as the collector of old buffaloes and goats and sell them in the butcher shops in the valley. One of the interesting things about Balami is that they should rare oxen and plough the field which can be taken as one of the indigenous knowledge.

DISCUSSION

Balami are very much resourceful in terms of ethnobiological knowledge. Though they occupy a comparatively small geographic range, they use wide variety of floral and faunal species. The present study documents 65 different kinds of animal species both wild and domesticated and 185 different plant species, both wild and cultivated for different utilities. Comparatively

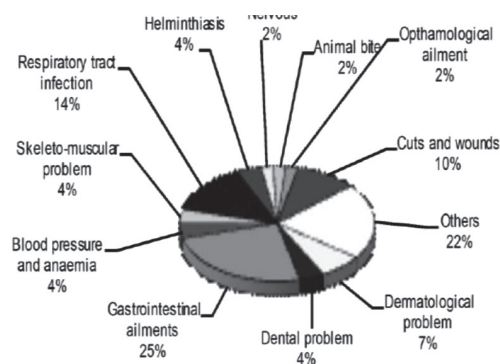


Fig. 5. Major disease categories and associated plant species

354 plants species and 127 animal species were used by Chepangs of Makawanpur district (Manandhar, 2000). The Danuwars of Peple VDC of Chitwan used 48 animal species and 224 plant species (Pathak, 2000). Bankariya of Makawanpur district used 58 species of animals both wild and domesticated, 268 different species of plants both wild and cultivated (Pokhrel, 2006). Magars of Salija VDC of Parbat district used 85 species of plants and 18 species of animals for medicinal purposes (Thapa, 2008).

The health care system of Balami was found to make extensive use of plants and animal products. The treatment of ailments with remedies made from animals and their products is known as zotherapy (Alves & Rosa, 2005). Since ancient times, zotherapy has been integral to the traditional pharmacopoeias of many cultures (Mahawar and Jaroli, 2007). And has comprised a fundamental element to well known traditional medicinal systems, such as Ayurvedic medicine, Traditional Chinese medicine and ancient Egyptian medicine. Records of the medicinal use of animals and their byproducts date back to the invention of writing. Balami make use of 12 orders and 13 families of animals which include 15 genera and 15 species for the treatment of various diseases. Among them 13 are wild and 2 are domesticated. They

use fats, sting, total animal body, blood, web, meat, bile juice, head, mud where the animal live, and eggs of animals for the medicinal purposes. 32 species out of 127 animal species used by Chepangs of Makawanpur have medicinal value (Manandhar, 2000). Among the 58 animal species 8 species are considered to be of medicinal utility in treatment of 7 diseases or ailments by Bankariya (Pokhrel, 2006). 18 animal species were used for of 21 different ailments by Magars of Salija VDC of Parbat district (Thapa, 2008).

Medicoethnobotanical study of Balami reveals that they utilize most of the plant species found in their locality. They use 45 different species of plants for the medicinal purpose. Among them 32 are wild, 12 are cultivated and 1 is purchased. All these medicinal plants can be categorized under 36 families and 44 different genera. They use the leaf, fruit, bark, stem, total shoot, seed, rhizome and flowers of the plant for the medicinal purpose. 59 species of plants were listed for the Chepangs of Makawanpur district among 121 (Manandhar, 2000). People of Padampur used 130 medicinal plants (Rijal, 1994). Danuwars of Deuvumi of Baluwa VDC of Kavrepalanchok used 37 species out of 218 species of plants for medicinal purposes (Ghimire, 2000). Out of 227 plant species Gurungs of Waling Municipality of Syangja used 39 species of plants as medicinal value (Pangeni, 2005). Bankariya were found to use 82 plant species to cure more than 35 different diseases (Pokhrel, 2006). Magars of Salija VDC of Parbat district used 85 species of medicinal plants for the treatment of various diseases (Thapa, 2008).

The Balami use animal products to cure diseases like headache, arthritis, asthma, dysentery, infertility, cough, paralysis, Typhoid etc. The animal species used by Balami having medicinal utility are also supported by the findings of other researchers. For example; the cooked meat of *Canis aureus* was used for the treatment of rheumatism in the present research was also reported by Kaundinya (1998), Acharya (1999), Dhakal (2004), Koirala (2004), Pangeni (2005), Pokhrel (2006) and Thapa (2008). *Hystrix brachyuran* (porcupine) is used for the treatment of Asthma similar to the study conducted by Kaundinya (1998), Acharya (1999), Tamang (2003), Dhakal (2004), Pangeni (2005) and Thapa (2008). *Helix* species (Chiplikira) in the the present research is used for the backpain and the bone fracture which was similar to the study conducted by Pangeni (2005), Ghimire (2000) and Thapa (2008). Cooked meat of *Felis chaus* (habsilo) is used for arthritis in the present study. Pokhrel (2006) also reported for the same use. In the present finding *Arnea* species is mixed with bitten rice and red mud to cover the fractured part of bones. Pokhrel (2006) reported the same species used by Bankariya for the treatment of bone fracture in case of fowl and Pangeni (2005), reported for the treatment of corneal ulcer. In the present study the bile of *Selenarctos thibetanus* (Bhalu) was used

for rheumatism. But, the other species *Melursus ursinus* was used for unconsciousness in the finding of Pokhrel (2006).

Similarly, Balami use plant parts and plant extracts to cure the diseases like allergy, cut, wound, cough, jaundice, anaemia, asthma, rheumatism, diarrhoea, mumps, fracture, urinary disorder, taeniasis, scabies etc. The medicinal plant species reported to have folk medicinal utility by Balami in the present study are also supported by the findings of the other researchers. For example; the juice of the *Justicia adhatoda* (asuro) was found to be used in the treatment of bronchitis in the present study. Thapa (1998) also reported similar uses in his study. Thapa (2008) has reported the use of the same plant decoction with hot ash fire for the treatment of sinusitis. Stem of *Achyranthes bidentata* (Datiwan) infusion is used for fever in the present study. Pangeni (2005) and Thapa (2008) reported for the same purpose with inappetence due to evil eyes (Bigar Pareko). But, Thapa (1998) has reported its infusion for the treatment of fever and Ghimire (2000) has reported its root will be rubbed in waist or head if placenta of baby does not come. *Acoras calamus* (Bojho), its rhizome is used for cough and bronchitis in the present study. Thapa (1998) and Pangeni (2005) reported for the same purpose. But, Ghimire (2000) reported for sore throat, Pokhrel (2006) reported for sore throat and bronchial catarrh. Thapa (2008) reported the use of same plant species for cough and cold. *Berberis asiatica* (chutro) in the present study was found to be used in skin disease, diarrhea and jaundice whereas Thapa (2008) reported for eye boils. *Eupatorium adenophorum* (Banmara) is used for cuts and wounds. Thapa (1998) reported for the same purpose. Ghimire (2000) reported for lung cancer, Pokhrel (2006) for cut, wound, cough and cold and Thapa (2008) reported the use of same plant species for cut and wound.

CONCLUSION

Balami, mediators between the villages and towns are resourceful in ethnobiology, indigenous knowledge and ethnomedical practice. Ethnomedicine is one of the important systems of primary health care in this community. At present the use of plant and animal products are sustainable in terms of environment. However, poor sanitation, soil erosion, ignorance are the problems of the community. Immediate actions are to be implemented for the diversified utilization of plant and animal species. For the conservation of the ecology and their indigenous knowledge about ethnomedical biology, the following recommendations are made:

- Conservation of their indigenous knowledge systems along with the use of medicinal plants and animals, providing guidelines for sustainable development, documentation, chemical research and feeling of ownership are required.
- Public awareness about the proper sanitation,

modern agriculture, education, social evils like alcoholism and smoking should be launched.

- Mitigation measures should be implemented for the damage caused by the landfill site. Foul smelling, leachate disposal, pollution and environment degradation should be immediately controlled for the conservation of natural flora and fauna.
- Traditional healers should be motivated to inherit their knowledge.

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