

**Comparative Use of Medicinal Plants among the Indigenous
People of Manakamana VDC, Nuwakot District**

**A Dissertation submitted for the partial fulfillment of the Master
of Science in Botany (Plant Systematics and Phytogeography)**

Submitted by

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DECLARATION

I hereby declare the dissertation entitled “**Comparative Use of Medicinal Plants among the Indigenous People of Manakamana VDC, Nuwakot District**” submitted as the partial fulfilment of Master Degree (M.Sc.) in Botany (Plant Systematics and Phytogeography) is based on the field survey in Nuwakot District , literature survey on indigenous use of the medicinal plants and information obtained from the secondary sources. The work was carried out under the regular support and the proper guidance of Prof. Dr. Krishna K Shrestha .This dissertation has not been submitted for the award of any degree of Universities or Institutions.

Sharmila Kandel

October 2012

RECOMMENDATION

This is to certify that the dissertation entitled “**Comparative Use of Medicinal Plants among the Indigenous People of Manakamana VDC, Nuwakot District**” submitted by Mrs. Sharmila Kandel for the partial fulfilment of Masters Degree in Botany has been carried out under my supervision. The entire work is based on the results of her research work and has not been submitted for any other degrees. Hence, I recommend this dissertation work to be accepted for the partial fulfilment of Master of Science in Botany (Plant Systematics and Phytogeography), Tribhuvan University, Kirtipur, Kathmandu, Nepal.

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LETTER OF APPROVAL

The dissertation entitled “**Comparative Use of Medicinal Plants among the Indigenous People of Manakamana VDC, Nuwakot District**” submitted by **Mrs. Sharmila Kandel** has been accepted for the partial fulfillment of the requirement of M.Sc. degree in Botany (Plant Systematics and Phytogeography).

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ABSTRACT

The present research has been undertaken in the Manakamana VDC of Nuwakot district in Central Nepal to explore and document the indigenous knowledge and practices on the use of plants for medicinal purpose among five ethnic/caste groups, viz. Brahmin, Kami, Tamang, Gurung, and Ghale in the study area. Among which Tamang ethnic group is the dominating group in this district. The study has been undertaken primarily to document the ethnomedicinal information of Manakamana VDC, which was accompanied by three field visits made between 2009-2010. Multiple uses of medicinal plants among five ethnic/caste groups are also included in this present study. The ethnobotanical data were collected for medicinal purposes among the five ethnic/caste groups through key informant interview, group interview, observations, focus group discussion and informal interview with all groups of people viz. local healers (Dhami/Jhankri/Lama), and knowledgeable elder people, etc.

The findings showed the presence of altogether 70 plants of medicinal values belonging to 43 families and 63 genera, among which the family Asteraceae, Lamiaceae, Fabaceae, Moraceae and Euphorbiaceae were observed as the largest family comprising 4 species each. These plant species were evaluated in terms of parts use category, habit category, disease use category, ethnographic validity, multiple uses, and number of taxa use to treat different ailments. The reported plant species were used for the treatment of 55 different diseases/ailments. Among which 23 species were used to treat gastritis, and 14 species were used to treat headache and 13 species were used to treat fever, etc.

The ethnobotanical study indicates that large number of plant species is used as traditional medicine. About 70 plant species are used as traditional medicine, of which 20 species of plants were used by all ethnic /caste groups to treat different diseases /disorders, and 5 species were used by all ethnic /caste group to treat nine common diseases/disorders. Analysis of data by ethnographic validity (EV) revealed that five plant species had high validity score (200-320) for different diseases/disorders; among them *Centella asiatica* has high ethnographic validity (320), which is being used as cooling agent. Similarly, seven plants have moderate ethnographic validity, and 20 plant species have low ethnographic validity. From the literature review it was found that most of the plant species used as medicine cited in the present study have also been supported by similar works done in other parts of the country.

Key words: Ethnobotany, ethnographic validity, diseases, disorders, traditional healers.

Abbreviations and Acronyms

CBS	Central Bureau of Statistics
DPR	Department of Plant Resources
ESON	Ethnobotanical Society of Nepal
KATH	National Herbarium & Plant Laboratories, Godavari, Lalitpur
TU	Tribhuvan University
TUCH	Tribhuvan Universtiy Central Herbarium
WWF	World Wide Fund for Nature
VDC	Village Development Committee
MAPs	Medicinal and Aromatic Plants
GoN	Government of Nepal
NAST	Nepal Academy of Science and Technology
NGO	Non Governmental Organization
INGO	International Non Governmental Organization

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Chapter I - Introduction

1.1 Background

Ethnobotany deals with the study of the relationship between people and plants and most commonly refers to the study of how people of a particular culture and region make use of indigenous plants. Ethnobotany is now recognized as a multidisciplinary science which comprises many aspects of plants science history, anthropology, culture, botany, ecology, literature, etc. (Shengji, 1998).

Nepal is multiethnic and multilingual country. People live in climatically hot area in the south through the cold area in the north are diversified into many social, cultural, ethnic and language groups. There are 102 ethnic/caste groups in Nepal speaking 92 mother tongues in different geographic belts (CBS, 2005). Nepal thus provides a great opportunity for the ethnobotanical study (Rajbhandari, 1990, 1994). Medicinal plants play a crucial role in primary healthcare of majority of indigenous people of different ethnic groups. More than 60 tribals communities, mainly depending on natural plants resource for their day to day life (Manandhar, 1993).

The entire ethnic groups have their own culture and traditional way of living. So the traditional healing practices differ from one ethnic group to another. Different ethnic /caste groups are residing in Nepal have their own way of using plants in various purposes. People living in rural area have very well indigenous knowledge about the use of plants for different purposes. They have an idea about the use of plants for retain different diseases/disorders. Even within the same ethnic group, the healing system differs from one district to another due to geographical, cultural, religious and social differences.

It is estimated that various communities in Nepal use approximately 1000 species of wild plants in traditional medicinal practice and majority of which awaited proper documentation (Chaudhari,1998). Though the ethnobotanical uses and practices were known form ancient times. In Nepal study of ethnobotany probably started with the publication of a paper on medicine and food plants by Banerji in 1995. Since then many scientists (Manandhar, 2002) have focused on uses of plants by different ethnic groups.

Nepal is well known for its high biological and cultural diversities. Variations in physiographic structures and climate have enriched the country with a high diversity of flora, fauna, ecosystem and cultural heritage (Chaudhary, 1998). Plants are used as medicine since ancient time. In Nepal there is a strong tradition in the use of medicinal and aromatic plants, both as part of the Ayurvedic and the widespread home remedies (Bashyal *et al*, 1994). The rural communities of Nepal rely on traditional medicine for their primary health care needs. There are about 1624 to 1792 species of medicinal and aromatic plants (MAPs) in Nepal (Shrestha *et al*; 2002, Baral & Kurmi, 2006). In Nepal, about 80% of the rural communities depend upon herbal plants and medicine for their primary healthcare (Ghimire *et al.*, 2000).

Department of plant resource published a document of medicinal plants of Nepal in 1970 and 1997 which provides information of 571 medicinal plants species, their traditional uses, habitat and distribution. In the same way, there is a record of 630 species of plants of possible medicinal uses (Malla and Shakya, 1984). Manandhar (1985) carried out the ethnobotanical notes of certain medicinal plants used by tharu of Dang district. In his study, he reported 79 medicinal plant species. Manandhar (1988) carried out the ethnobotanical notes of 102 medicinal plant species used by Chepang of Makawanpur district, Nepal. In this study, 17 species were found to be used in cases of cuts and wounds.

Manandhar (1991) studied the medicinal plant-lore of Tamang tribe of Kabhrepalanchok district, Nepal. Among 95 plant species, 17 species were used to treat cuts and wounds. Bhattarai (1993a) carried out the folk medicinal use of plants for respiratory complaints in Central Nepal. A total of 56 plant species were enumerated to cure for respiratory complaints. Bhattarai (1993b) reported 42 plant species of folk herbal remedies for diarrhoea and dysentery in Central Nepal. There is a record of 212 species of medicinal plants in Terai of eastern Nepal (Siwakoti and Varma, 1996). The medicinal and aromatic plants data base in Nepal (MAPDON) has listed 1624 medicinal and aromatic plants, which are available in crude drug market, under cultivation and in wild form (Shrestha *et al*, 2000). There is a record of 562 species of medicinal plants of ethnobotanical uses in which most of the species are medicinal and aromatic plants widely used by various ethnic communities and tribes of Nepal (Rajbhandari, 2001).

Joshi and Joshi (2000) reported 31 species of medicinal plants from hilly villages of the central development region of Nepal. Out of 31 species 48% were used to combat gastro- intestinal disorders and stomachache. Oli (2001) studied 127 useful plant

species, among the major ethnic groups (Rai, Limbu, Magar, Tamang, and Brahmin-Chhetry). He documented 88 medicinal plant species for curing 35 types of different ailments. Gurung (2002) carried out her study on the medicinal practice using local plants among Gurung, Kami, Sarki, Pariyar, etc. of Chitre, Parbat and Bahadure VDCS of Kaski district. She documented 83 medicinal plant species for curing 52 different ailments. Rai *et al.* (2004) carried out their study in Thumpakhur VDC, Sindhupalchok, among different communities of Brahmin, Chhetri, Damai, Kami, Tamang and Sarki. The study focused on utilization pattern of plants as medicine by the local people and documented 42 species of plants that were used to cure 45 types of ailments. Shrestha (2004) documented 50 medicinal plant species in which 20 plant species were found to be used for curing cuts and wounds from Tokha area of Kathmandu district. Parajuli (2004) studied ethnobotanical knowledge of Tharu of Nawalparasi district. A total of 42 plant species of medicinal plants were reported among which 29 species were used to treat diarrhoea and dysentery. Similarly, including the information of 701 species of medicinal plants, with their description, uses, flowering, fruiting and distribution in Nepal, the book entitled 'Medicinal plants of Nepal' is published (GoN, 2007). There are many other studies to enumerate the medicinal plant of different parts of the country.

Joshi and Joshi (2007) documented 73 medicinal plants in different ethnic/caste groups viz. Brahmin, Tamang, Gurung, Kami, etc. from Bagmati and Tadilikhu water sheds of Nepal, used against skin diseases. Thapa (2008a) studied 170 species of medicinal plants used by eight ethnic/caste groups of Benimanipur VDC of Nawalparasi district by using Ethnographic validity method. In this study, plants were divided into four validity rank and *Aloe vera* has high ethnographic validity for burns. Acharya and Acharya (2009) studied 45 species of medicinal plants used by Tharu community of Parroha VDC of Rupendehi district. Among them 26 species were used to treat headache and fever, 8 species were used to treat respiratory tract, 4 species were used to cure dermatological problems. Pageni (2009) studied ethnobotanical study of Magar community of Palpa district. A total 63 plant species were reported, among which 40 species were used for medicinal value.

Some sporadic works have been already done to collect the ethnobotanical data and traditional knowledge systems of different indigenous people from the different parts of the country. Several papers were published on different aspects of ethnobotany by different workers. Ethnic groups live in different geographical areas and possess a wide

range of traditional knowledge regarding different uses of plants such as medicine, fodder, timber, food, handicraft, etc. Many ethnobotanical works have been done focused on ethnic groups residing in different geographical regions, such as Tamang community (Shrestha 1998, Manandhar 1991, Tamang 2003), Tharu community (Manandhar 1985, Dangol and Gurung 1991, Adhikari 1997, Thapa 2000, Chaudhary 2001, Parajuli 2004, Acharya and Acharya 2009, Singh *et al.* 2011), Kumal community (Dhakal 1996, Dangol 2002, Shrestha *et al.* 2004), Chepang community (Manandhar 1988, Khan 1998, Karki 2001), Sherpa community (Bhattarai 1989c, Nepal 1999, Bhattarai 2002), Magar community (Paudel and Gautam 2008, Pangen 2009, Singh *et al.* 2011), Gurung community (Coburn 1984, Shrestha 1998), Limbu community (Chhetri 1996, Siwakoti and Siwakoti 1998, Oli 2003), Danuwar community (Thapa 2000, Ghimire 2000), Darai community (Dangol and Gurung 2000).

Similar works have been done in Multi ethnic/caste groups viz. Brahmin, Chhetri, Kami, Sarki, Gurung, Tamang, etc. (Manandhar 1995a, Basnet 1998, Joshi and Joshi 2000, Oli 2001, Gurung 2002, Rai *et al.* 2004, Joshi and Joshi 2007, Thapa 2008, Malla and Chhetri 2009, Joshi *et al.* 2011).

In the rural areas local healers like *Dhamis*, *Jhankris*, *Lamas*, *Vaidyas*, *Guruwas* use medicinal plants to treat different diseases/disorders like diarrhoea, dysentery, cuts and wounds, stomachache, etc. Some publications are focused on diseases/disorders such as in respiratory complaints (Bhattarai 1993a), diarrhoea and dysentery (Bhattarai 1993b, Parajuli 2004), in cuts and wounds or injuries (Bhattarai 1997b, Parajuli 2001), skin diseases (Joshi and Joshi 2007), jaundice or hepatitis (Tiwari 2000, Paudel 2002).

Ethnobotanical works on medicinal plants have been carried out in different parts of Nepal by various researchers such as in Terai region (Siwakoti and Varma 1996, Yadhav 1999, Dangol 2008, Parajuli 2011). Similarly, in mid hill (Bhattarai 1991b, Manandhar 1993c, 1995, 1998; Sapkota 1994, Mahato 1998, Mishra 1998, Shrestha 1998, Gurung 2002, Paudel *et al.* 2010), in high hill (Bhattarai 1993c, Bohara 1998, Chhetri 1999, Ghimire *et al.* 1999, Joshi 2000, Parajuli 2000, Niraula 2001, Lama *et al.* 2001, Chhetri and Joshi 2003, Joshi *et al.* 2003, Shrestha and Dhillon 2003, Bhattarai *et al.* 2006, Yadhav 2007, Bhattarai *et al.* 2008, Kunwar and Bussmann 2008).

Similar work was carried out by various workers. They reflect the plant people relationship in Native communities with their culture but the effort of summarization, planning and conservation of their identity is not started till now. The present study,

therefore, aimed to investigate and document the oral heritage of ethnobotanical knowledge of the indigenous people of Manakamana VDC of Nuwakot district.

1.2 Objectives

General objective of this study is to document the ethnobotanical knowledge of the five ethnic/ caste groups of Manakamana VDC of Nuwakot district. The specific objectives are as follows.

- To explore ethnobotanical knowledge among five ethnic/caste groups of study area.
- To document the methods of traditional use of plants for medicinal purpose.
- To explore the popularity of the medicinal plants among indigenous people by using ethnographic validity method.

1.3 Justification of study

Manakamana VDC of Nuwakot district is very rich in biodiversity as well as such in cultural heritage. The major ethnic /caste groups of this VDC are Brahmin, Tamang, Gurung, Kami, Ghale, etc. The most dominant ethnic group in this study area is Tamang.

The ethnobotany and traditional knowledge in Manakamana VDC of Nuwakot have not been previously explored. Therefore, the study was mainly addressed to document the indigenous knowledge of five ethnic/caste communities and the utilization of wild plant resources to fulfill their requirement in different forms.

The study was also mainly focused on parts use as well as mode of use of medicinal plants to cure different ailments and ethnobotanical knowledge variation among different ethnic/caste groups present in the study area. Multiple uses of medicinal plants are also documented among different ethnic/caste groups. The importance of this study is also justifying the urgent need in conservation of the indigenous plant resources along with traditional knowledge for the survival of the local people.

1.4 Limitations of study

The present work has been carried out in a small geographical area of the Nuwakot district so the present finding may not be generalized for five ethnic /caste groups i.e. Brahmin, Tamang, Gurung, Ghale and Kami people throughout the country. Due to limited time, poor transportation facilities only a few medicinal plants are collected far sample of specimens from the study area. It was not possible and time consuming to visit each and every house to take interview with local people due to scattered nature of settlement. The informants had to be short listed but attempt was tried to interview all the members of each ethnic /caste groups from each ward. So, the study brings to light ethnobotanical knowledge of medicinal plants of Nuwakot district from Manakamana VDC.

Chapter II - Study area

2.1 Geographical location and climate

The Manakamana VDC lies in Nuwakot district of Bagmati zone of Central Developmet region of Nepal. Nuwakot lies between $27^{\circ} 45' - 28^{\circ} 20'$ N Latitude and $85^{\circ} 0' - 85^{\circ} 45'$ E longitude with the range of elevation from 520 m to 2010 m. It is surrounded by Rasuwa district to the north, Sindhupalchok district to the east, Dhading district to the west and Kathmandu district to the south. The district consists of 61 VDCs and one municipality covering an area of 1121 km^2 . The total

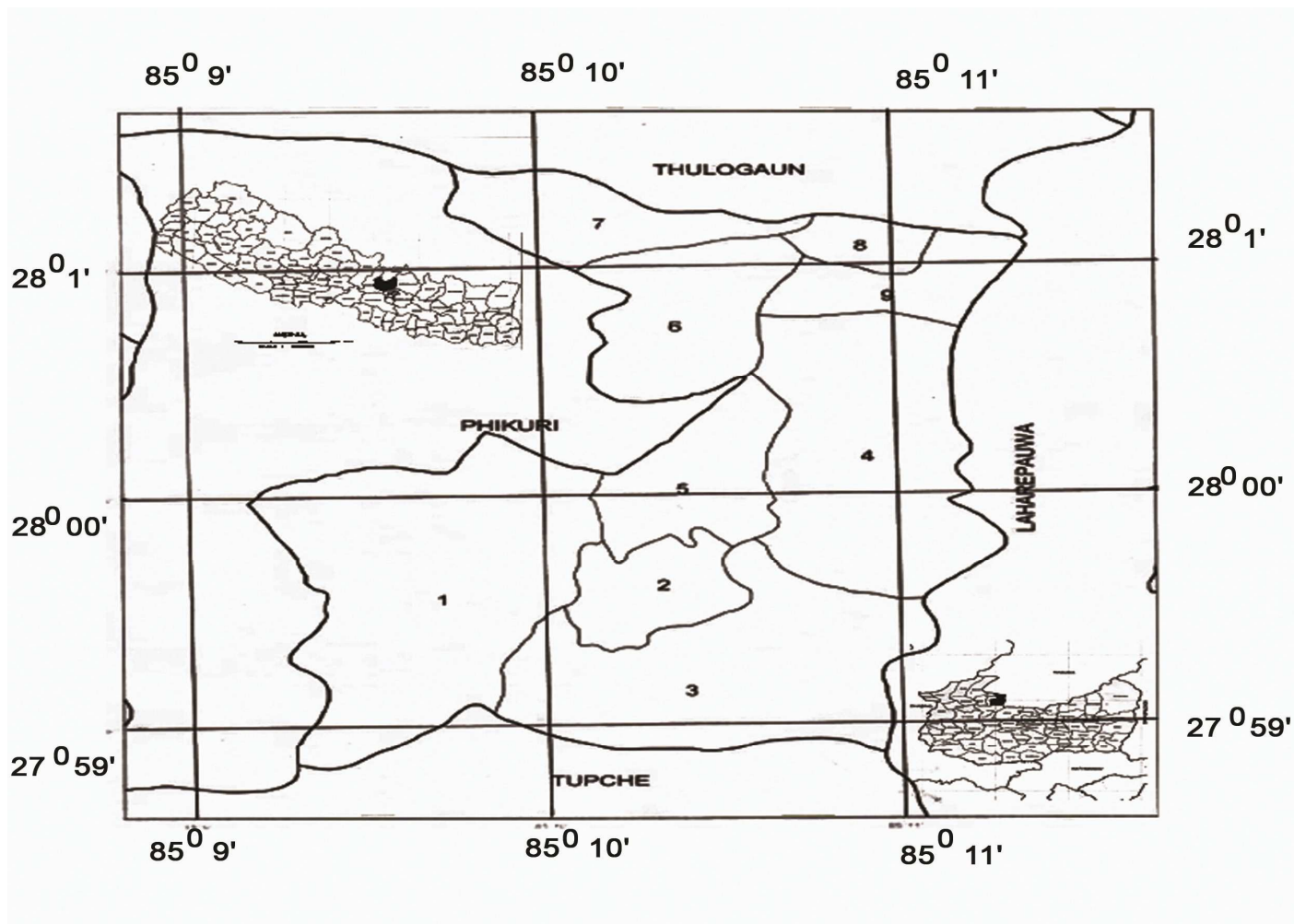


Fig. 1 Map of Nuwakot District showing Manakamana VDC 2001

population of Nuwakot district is 288,478 (HMG/N,

The study area was conducted in Manakamana VDC of Nuwakot district which covers an area of 933 km^2 . The Manakamana VDC lies between $27^{\circ} 58' 51'' - 28^{\circ} 13' 6''$ N Latitude and $85^{\circ} 09' 09'' - 85^{\circ} 12' 24''$ E longitude, with the average elevation range from

640 m – 1435 m. The VDC is bordered by Thulogaun VDC to the north, Phikuri VDC to the west, Laharepauwa VDC to the east and Tupche VDC to the south.

2.2 Climate

Climate varies from place to place depending upon the land structure and altitude of the area. The climate of Manakamana VDC is tropical and sub tropical. Based on the meterological records of five years (2006-2010), Nuwakot station, it has been revealed that the maximum temperature is highest during May (31.9° C) and lowest in December (22° C), whereas the minimum temperature is highest in July (21.9° C) and the lowest in January (8.5° C). The average relative humidity is maximum in July (92.2%) and minimum in February (65.3%). Similarly, five years data show that the maximum average precipitation is 426.46 mm during August and minimum average precipitation is 0 mm during November (Fig. 2).

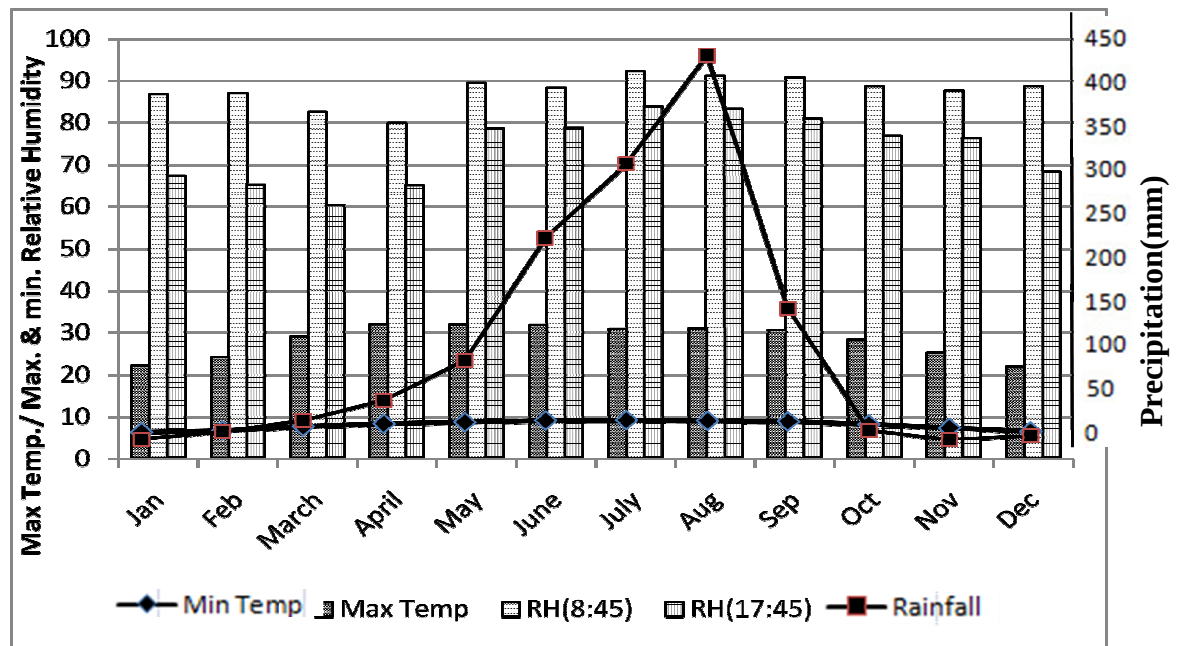


Fig. 2 Climatic data of Nuwakot Station

Source: Department of Hydrology and Meteorology, Kathmandu (2006-2010)

2.3 Vegetation

Different types of vegetation are found in Nuwakot district. The present work is carried out in tropical and subtropical zone. Tropical zone (600m-1000m) includes Sal-forest, *Shorea robusta* is the predominating species in this area and the associated species are *Terminalia alata*, *T. chebula*, *T. bellirica*, *Dalbergia sissoo*, *Phyllanthus emblica*, *Aegle*

marmelos, etc. Shrubs like *Colebrookea oppositifolia*, *Woodfordia fruticosa*, *Justicia adhatoda*, *Mimosa pudica*, etc. Whereas, *Artemisia indica*, *Oxalis corniculata*, *Achyranthes bidentata*, *Ageratum conyzoides*, etc. are the common herbs of the tropical zone in the study area.

Subtropical zone (1000-1400m) includes the *Schima wallichii* forest, *Alnus nepalensis* forest, and pine forest. *Pinus roxburghii* is the predominant species in this zone and the associated species are *Myrica esculenta*, *Schima wallichii*, *Castanopsis indica*, etc. The most common shrubs are *Osbeckia stellata*, *Berberis aristata*, *Rubus ellipticus*, etc. *Desmodium microphyllum*, *Trifolium repens*, *Ageratum conyzoides* are common herbs of the study area in subtropical zone.



Photo 1. Vegetation of study area dominated by *Shorea robusta*

2.4 Ethnic Composition

The total population of Manakamana VDC is 4063 (CBS, 2005), in which 1963 are male and 2100 are female. The major ethnic/caste groups of Manakamana VDC are Tamang, Brahmin, Gurung, Kami, etc. Tamang is most dominating ethnic group among the other ethnic/caste groups. The major castes of this district are Tamang (63.49%), Brahmin (34.06%), Chhetri (21.92%),

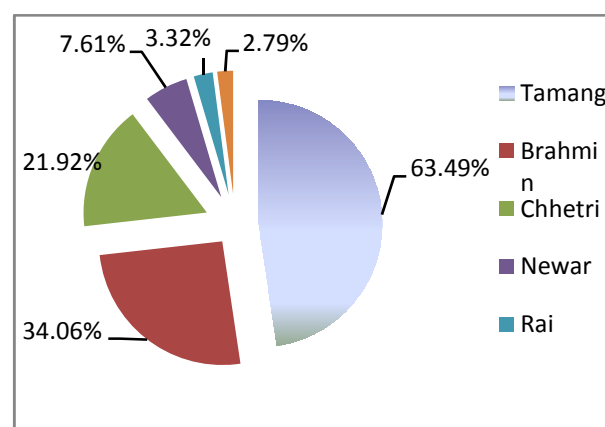


Fig. 3. Ethnic/ caste group composition

Newar (7.61%), Rai (3.32%), Kami (2.79%), etc. (Fig.3) . Ghale and Gurung caste groups are considered separate caste groups in the study area because they reside in different villages which are known as Ghale Gaun and Gurung Gaun respectively.

Chapter III - Materials and Methods

This research has been carried out in order to document the ethnobotanical knowledge of medicinal plants used by the different ethnic/caste groups present in the study area and comparing knowledge among them. The following are the brief information of the research method employed to obtain the relevant data and analyse them.

3.1 Selection of research site

The Manakamana VDC is one of the remote places of Nuwakot district of Nepal where more than 10 ethnic/caste groups are found. Rather than utilizing modern health care facilities, most of the population in such a remote area depends on their own traditional knowledge to treat different diseases/disorders. The people of Manakamana VDC have a good knowledge about the pattern of use of plants. In addition they have more knowledge about multiple uses of medicinal plants. Although many works have been done in different parts of the country, no work has so far been done in Nuwakot district. The study area was chosen due to the presence of over 10 ethnic caste groups within a small area and their rich traditional ethnobotanical knowledge and high biological diversity in the study area.

3.2 Collection of ethnobotanical information

The information about traditional knowledge on medicinal plants was documented during the empirical field work in the study area with the help of a standardised set questionnaire prepared by following guidelines of Martin (1995), Shrestha *et al* (1998), etc. The field work consists of two approaches i.e. survey technique and inventory technique (Martin, 1995, Cunningham, 2001).

In the survey technique included individual and in depth interviews and focus group discussion among the local plant users, community members and traditional faith healers, villagers heads, etc. The inventory technique comprises the collection of different plant specimens from the study area and identification of their local names, part(s) used and purpose of use, etc. with the participation of knowledgeable key

interviewees/people as well as by transect walk (survey) with local people. So, for the collection for information, following methods were followed.

3.2.1 Field Visits

The study was carried out in different villages of Manakamana village development committee which was surveyed during field work period of 2009 to 2010. A total of three field visits were made for the collection of information. The first field visit was done from July 2nd to July 14th 2009. During the first field visit, general survey of study area was undertaken in order to obtain primary information on diversity of plants with the help of local key informants and also plants were collected as well as ethnobotanical knowledge from local people was also collected.

The second field visit was done from September 28th to October 9th 2009 and in this visit mainly focused on collection of plants and information from local healers viz. "Dhami", "Jhankri", "Lama" and social workers from this VDC. In the visit from March 21st to March 26th 2010, comparative ethnobotanical knowledge among 5 ethnic/caste groups was undertaken and multiple uses of plants as well as collection of plant specimens were also collected.

3.2.2 Primary data collection

The information about indigenous knowledge on plants resources was obtained by using PRA (Participatory Rural Appraisal) method. A standard set questionnaire was prepared following the guidelines of Martin (1995) and Chaudhary (1998). The primary information regarding the use and values of medicinal and other plant resources were collected with the help of interviews and focus groups discussions. The interviews were conducted among the different ethnic groups with the active participation of healers (Dhami, Jhankri, Lama), knowledgeable villagers, heads of household, elderly people, etc. who had knowledge and experience about medicinal plants and their uses. They provide information on the uses, vernacular name; plant parts use, purpose of use, mode of preparation and modes of administration, etc. for medicinal and other purposes.

3.2.3 Voucher specimens collection and Herbarium preparation and identification

The voucher specimen collections were collected along with the information provided by local people. The collected plants are cross checked with interviewers to confirm their identity in terms of vernacular names and uses. The plants were dried carefully and pressed. The specimens were identified and described with the help of standard botanical literatures (Hooker 1862-1887, Polunin and Stainton 1987, Stainton 1988, Grierson and Long, 1983-2002), etc. Each specimen was mounted on the standard herbarium sheet. Nomenclature of the identified species follows Hara *et al.* 1978, Press *et al.* 2000 and Rajbhandary 2001. The collected plants specimens were deposited at Tribhuvan University Central Herbarium Kirtipur, Kathmandu (TUCH).

3.3 Data analysis

The indigenous knowledge of medicinal plants was collected among five ethnic /caste groups viz. Brahmin, Tamang, Gurung, Ghale and Kami. The information was collected by interviewing with “Dhami”, “Jhankri”, “Lama”, traditional healers, key informants, local people including both male and female about diversity of plants that is found in Manakamana VDC. The information was obtained on the use, preparation, application, properties of plants, description of the illness and also how to treat different diseases and disorders.

Ethnobotanical data obtained in the field were compiled and compared with published literatures. The species were listed in alphabetical order by family, their vernacular name, medicinal use, plants used and herbarium number. The data were analyzed by the Ethnographic validity method which was followed by Oli (2001) and Thapa (2008a), which shows the popularity of medicinal plants among five ethnic/caste groups.

3.3.1 Ethnographic Validity

Ethnographic validity method gives an idea about popularity of medicinal plants among different ethnic/caste groups residing within the same locality. The plants with high ethnographic validity mean that it is very popular among the all ethnic / caste groups. The ethnographic validity was calculated using the following formula (Oli 2001, Thapa 2008a).

$$\text{Validity score} = \text{MF} \times \text{EG}$$

Where MF= mean use frequency for a common medicinal use (average percent of the respondents among the focused ethnic/caste groups using the plant for a common disease or disorder), and EG = number of ethnic/caste groups using the plant for a common medicinal purpose.

Oli (2001) divided the plants in three validity ranks according to ethnographic validity score of plants he obtained. Thapa (2008a) divided the plants in four validity ranks according to the ethnographic validity score of plants she obtained. In this study, plants were divided into three validity ranks as follows:

1. High validity (HV): Plants with validity score >200, i.e. plants known to a large number of people for common medicinal use by 5 ethnic /caste groups.
2. Moderate validity (MV): Plants with validity score 100-200, i.e. plants known to people for common medicinal use by 4 ethnic/caste groups.
3. Low validity (LV): Plants with validity score < 100, i.e. plants known to people for common medicinal use by 3 ethnic/caste groups.

3.4 Secondary Data

The secondary data were collected from published books and journals, articles on newspapers deposited in libraries of different offices, NGOs and INGOs, such as Department of Hydrology and Meteorology, Babarmahal; Central Bureau of Statistics, Nepal Academy of Science and Technology (NAST), Department of Plant Resource (DPR), Union for Conservation of Nature (IUCN), Central Library, Tribhuvan University; National Herbarium & Plant Laboratories (KATH), and Ethnobotanical Society of Nepal (ESON), etc.

Chapter IV - Results

The floral diversity of medicinal plants is found rich in Manakamana VDC. People of this VDC have high knowledge of medicinal plants as well as other uses of these plants, viz. fodder, fuel wood, cultural use, edible, furniture, etc. Most of the people of this area are highly dependent on forest and forest products. Similarly the ethnic/caste groups have high indigenous knowledge about the use of medicinal plants for different diseases/disorders.

4.1 Diversity of Medicinal plants

In the present findings a total of 70 plants species belonging to 43 families and 63 genera used by the local people of the study area have been documented. Among them the family Asteraceae, Euphorbiaceae, Fabaceae, Lamiaceae and Moraceae are comprised of four genera each. Family Combretaceae has 3 genera. Families Amaranthaceae, Anacardiaceae, Araceae, Begoniaceae, Dipterocarpaceae, Liliaceae, Meliaceae, Menispermaceae, Myrtaceae, Rutaceae, Solanaceae and Zingiberaceae have 2 genera each, and remaining families have one genus and one species. Among 43 families, 18 families were taken for graphical analysis. Among the total plants, 68 are categorized as angiosperms, including 62 dicot species and 4 monocot species, and 2 species as pteridophytes (Fig. 4).

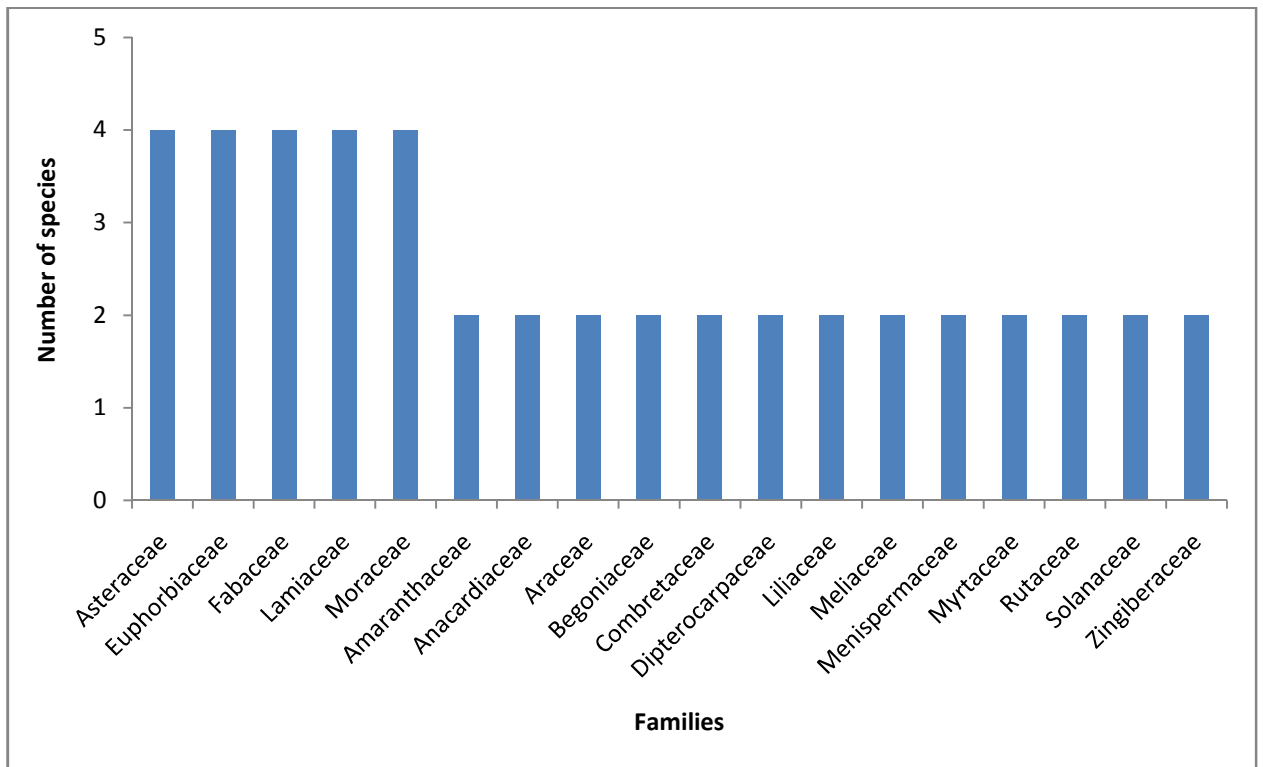


Fig. 4. Most dominant plant families in study area

4.2 Habit of the plant species

Among 70 plant species used by the local communities in the study area, trees includes 27 species (38.57%), shrubs 4 species (5.11%), herbs 35 species (50%) and climbers 4 species (5.71%). It was found that among all habits herbs are highly used plant habits in that area (Fig. 5).

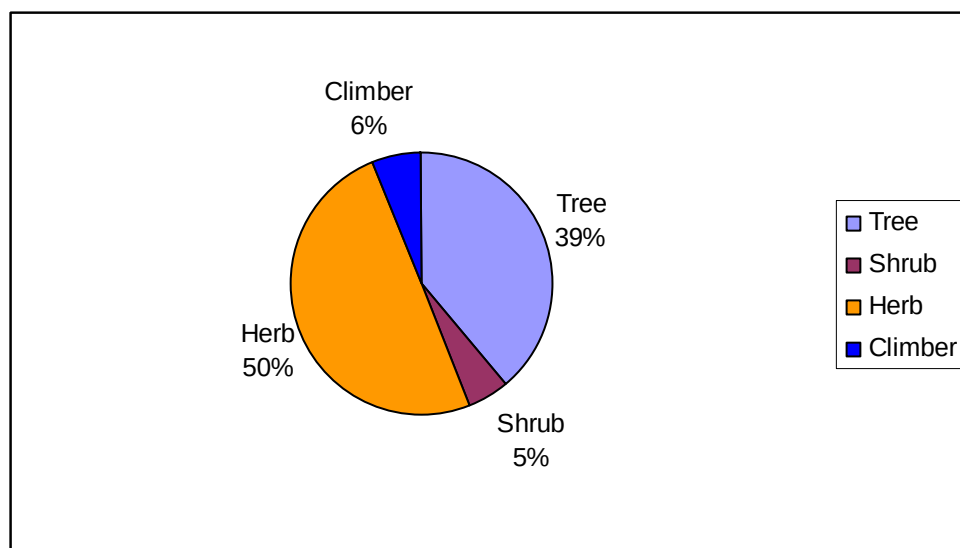


Fig. 5. Habit of plant species

Table 1. Medicinal plant use pattern among five different ethnic/caste groups

S.N.	Latin name	Brahmin	Kami	Tamang	Gurung	Ghale
1	<i>Achyranthes bidentata</i> Blume	Leaf and stem is given to domestic animals to treat expulsion of placenta of cow and buffalo.	Juice of root is given to treat fever.		Root of juice is given to treat anorexia.	Juice of leaf is given to treat marasmus.
2	<i>Acorus calamus</i> L.	Paste of root is given to treat cold and cough.	Juice of root is given to treat throat pain and child sickness.	Paste of root is given to treat cold and cough.	Juice of root is given to treat body pain.	Juice of root is given to treat pneumonia to children.
3	<i>Aegle marmelos</i> (L.) Corr.	Powder of fruit is given to treat gastritis.	The powder of unripe fruit is used as cooling agent.		Fruit is given to treat cold	Fruit is given to treat cold.
4	<i>Aloe vera</i> (L.) Burm.f.	Sticky fluid of leaf is applied on burns. Sticky fluid of leaf is drunk as cooling agent.	Sticky fluid of leaf is applied on burns. Fluid from leaf is drunk as cooling agent.	Sticky fluid of leaf is applied to treat headache, burns and as cooling agent.	Sticky fluid of leaf mixed with water is given early in the morning as cooling agent in empty stomach. Sticky fluid of leaf applied on burns and headache.	Sticky fluid of leaf is applied to treat burn.
5	<i>Alstonia scholaris</i> (L.) R.Br.	Powder of bark is given to treat gastritis.	Juice of bark is given for abortion.	Powder of bark is applied on broken part.		Sticky fluid of bark is applied to treat chest pain.

6	<i>Amaranthus spinosus</i> (L.) R.Br.	The juice of root is given as cooling agent. Root paste is applied on sprain and swelling.	Juice of root is given to treat gonorrhea and also given as cooling agent.		The juice of root is given to treat retention of urine leaf is eaten as vegetable.	Juice of root is given to treat gonorrhea.
7	<i>Ananas comosus</i> (L.) Merr.	Fruit is edible and given as cooling agent.	Juice of leaves or fruit is given as cooling agent.	Fruit is edible.	Fruit is edible.	Fruit is edible.
8	<i>Artemisia indica</i> Willd.	Paste of shoot apex is applied to treat fever and scabies. The juice of the root is given to treat gastritis and anorexia.	Juice of root is given to treat gastritis.	Juice of shoot apex is given to treat asthma. Juice of shoot apex is applied on wounds.	Juice of root is given to treat gastritis.	Juice of root is given to treat heart pain and gastritis and is applied on scabies.
9	<i>Artocarpus lakoocha</i> Wall. ex Roxb.	Sticky fluid from stem is applied on foot swelling toothache and boils.	Sticky fluid from stem is applied on mumps.	Sticky fluid from stem is applied on boils.	Sticky fluid from stem is applied on tooth to treat toothache plant is used as fodder.	Sticky fluid from stem is applied on tooth to treat toothache. Plant is used as fodder.
10	<i>Asparagus racemosus</i> Willd.	Juice of root is given to treat stomach pain and to cow and buffalo to treat breast engorged.	Boiled juice of root is given for more production of milk. Root is used in making soap.	Boiled juice of root is given for more production of milk. Root is used in making soap.	Juice of root is given to domestic animal as cooling agent. Shoot apex is pickled.	Root is used in making soap.
11	<i>Azadirachta indica</i> A. Juss.	Juice of leaf poured in water and drunk to treat fever, worm infection and as cooling agent.	Juice of leaf is used to bath to treat wounds, boils, fever and high blood pressure.	Leaf juice is used to wash wounds and boils.	Paste of leaf is given to treat headache and fever.	Stem is used as brush.
12	<i>Bauhinia purpurea</i> L.	Powder of seed mixed with other medicinal plants and is given to treat gastritis.	Plant is used as fodder.	Plant is used as fodder.	Plant is used as fodder and firewood.	
13	<i>Bauhinia variegata</i> L.	Powder of bark is given to treat gastritis.	Flower is pickled.	Flower is used as pickle.	Boiled flower is given to treat diarrhoea. Flower is pickled and plant is used as fodder.	Powder of bark is given to treat gastritis.
14	<i>Begonia picta</i> Sm.	Paste of leaves is applied to treat wounds made by mud on foot.				
15	<i>Bergenia ciliata</i> (Haw.) Sternb.	Powder of root is given to treat rheumatism.	Juice from the rhizome is taken to get relief from fever.	Powder of root is given to treat diarrhoea and dysentery.		

16	<i>Blumea lacera</i> (Burm.f.) DC.	Juice of leaves is applied in injury.	Juice of leaves is applied in injury.	Juice of root is given as cooling agent.		
17	<i>Bombax ceiba</i> L.	Juice of bark of root is given to treat gonorrhoea and as cooling agent.	Juice of shoot apex, root or bark is given as cooling agent and gastritis.	Juice of bark root is given to treat gonorrhoea and as cooling agent.	Juice of root of juvenile plant is used to treat gonorrhoea .plant is used fodder and firewood.	Powder of spine is used to treat dandruff.
18	<i>Calotropis gigantea</i> (L.) Dryand.	The sticky fluid from stem is applied on cuts and sprains.Fa	Feathers are used to make pillows to treat headache.	The sticky fluid from stem is applied on sprains.	Sticky fluid from stem is applied on sprains.	Sticky fluid from stem is applied on cuts and sprains.
19	<i>Cannabis sativa</i> L.	Seed is mixed with other medicinal plants and given to domestic animals to treat dog bites.	Seed is given to domestic animals suffering from stomach swelling.	Seed is fried with mustard oil and given to treat children and domestic animals suffering from cold.	Seed is mixed with garlic and fried in mustard oil and given to domestic animals to treat dysentery.	To treat cold. Fried seed or leaf is given
20	<i>Carica papaya</i> L.	Fruit is given to treat jaundice, gastritis and also given as cooling agent.	Sticky fluid of leaves is applied to treat toothache.	Fruit is given to treat jaundices.	Fruit is given to treat jaundice and as cooling agent fruit is edible.	Fruit is given as cooling agent.
21	<i>Cassia fistula</i> L.	Juice of seed is given to treat retention of urine.	Seed is poured into water and drunk to treat headache and sprain.	Paste of bark is applied to treat ringworm.	Juice of seed is given to treat retention of urine and paste of bark is applied to treat ringworm.	Seed is taken in mouth to treat diarrhoea.
22	<i>Centella asiatica</i> (L.) Urban	Whole part is mixed in water and drunk to treat red urine	Whole part is burnt in ghee and given as cooling agent.	Juice of whole part is given to treat headache, fever, and as cooling agent.	Juice of whole part is given as cooling agent.	Juice of whole part is given as cooling agent.
23	<i>Cheilanthes anceps</i> Blanford	Paste of leaf is mixed with other plants and is given to treat gastritis.	Juice of root is given to treat gastritis.	Juice of root is given to treat gastritis.	Juice of whole part is given to treat gastritis.	Juice of whole part is given to treat gastritis.
24	<i>Cissampelos pareira</i> L.	Juice of whole part is given to treat gastritis.	Juice of root is given to treat gastritis.	Juice of tuber is given to treat gastritis.	Juice of root is given to treat gastritis.	Paste of fruit is applied to treat dandruff.
25	<i>Citrus limon</i> (L.) Burm.f.	Juice of fruit is given as cooling agent; fruit is edible.	Chuk made from its fruit is applied on legs to treat wounds made by mud on foot.	Fruit is edible.	Fruit is edible.	Fruit is edible.
26	<i>Cleistocalyx operculata</i> (Roxb.) Merr. & Perry	Juice of bark is given to treat sinusitis and headache.	Juice of bark is given to treat sinusitis.			

27	<i>Colocasia esculenta</i> (L.) Schott	Leaves are edible and sticky fluid of leaf is applied on bits of wasp.		Sticky fluid of leaf is applied on immature boils.		
28	<i>Curcuma amada</i> Roxb.	Powder of rhizome paste is applied in the infected part of body for skin allergy.	Powder of rhizome paste is applied in the infected part of body for skin allergy.			
29	<i>Cuscuta reflexa</i> Roxb.	Stem of plant is squeezed, and its juice is consumed to treat jaundice.	Stem of plant is squeezed, and its juice is consumed to treat jaundice.	Stem of plant is squeezed, and its juice is consumed to treat typhoid.	Stem of plant is squeezed, and its juice is consumed to treat gastritis.	Stem of plant is squeezed, and its juice is consumed to treat jaundice.
30	<i>Datura metel</i> L.	Seed is mixed with medicinal plants and given to ox to treat dog bites.	Few amount of paste of seed is given to treat cold.	Paste of seed is given to domestic animals to treat dog bites and a snake bites.		
31	<i>Drymaria</i> sp.					Burnt leaf is inhaled to treat sinusitis.
32	<i>Eclipta prostrata</i> (L.) L.	Juice of leaf is applied on cuts.				Aerial part of the plant is wrapped in leaf of <i>Shorea robusta</i> is steamed and squeezed, then the juice is given to treat diarrhoea.
33	<i>Eryngium foetidum</i> L.	Juice of leaves is taken for relief of headache.			Juice of leaves is taken for relief of headache.	
34	<i>Euphorbia hirta</i> L.	Sticky fluid of plant is applied on cataract.	Sticky fluid of plant is applied on cataract.	Flower is given to treat dysentery.	Sticky fluid of plant is applied to treat burning sensation of chilli.	Sticky fluid of plant is applied on wounds.
35	<i>Euphorbia royleana</i> Boiss	Sticky fluid from stem after burning is given to treat anorexia.	Burnt fluid from stem is given to treat anorexia.	Sticky fluid from stem is given to treat anorexia.	Sticky fluid from stem is given to treat anorexia.	Sticky fluid from stem is given to treat anorexia.
36	<i>Ficus benghalensis</i> L.	Plant is use as fodder an also used in different cultural program.	Plant is used as fodder.	Sticky fluid from leaf petiole is kept in tooth to treat toothache.	Sticky fluid from leaf petiole is applied on tooth to treat toothache.	Plant is used as fodder.
37	<i>Ficus religiosa</i> L.	Plant is used to worship.	Plant is used as worship.			Paste of bark is applied on cut wounds for tumor

						formation.
38	<i>Ficus semicordata</i> Buch.-Ham. ex Sm.	Fruit is edible, plant is used as fodder.	Sticky fluid from stem is applied to treat immature boils.	Sticky fluid of stem is applied to treat boils.	Fruit is edible.	Fruit is edible.
39	<i>Justicia adhatoda</i> L.	Whole part of plant is boiled in water and small amount of paste is taken to treat fever.		Past of bark is applied to treat wound.	Juice of cooked shoot apex is given to treat fever and cough.	
40	<i>Mangifera indica</i> L.	Fruit is edible.	Fruit is edible, Bark juice is given to treat gastritis.	Juice of bark is given to treat diarrhoea and gastritis.	Juice of bark is mixed with water and used to bath as cooling agent.	Juice of bark is given to treat gastritis.
41	<i>Melia azederach</i> L.	Juice of bark is given to treat gastritis.	Plant is used as fodder.	Timber is used as furniture.	Juice of bark is given to treat gastritis.	.
42	<i>Mentha spicata</i> L.	Juice of whole part is given as cooling agent, and leaf is pickled.	Leaf is pickled.	Juice of whole part is given as cooling agent.	Juice of whole part is given to treat gastritis.	Juice of whole part is given to treat gastritis.
43	<i>Mimosa pudica</i> L.	Juice of root is given to treat anorexia.	Juice of fruit is given to treat anorexia.	Boiled root is given to treat gastritis.	Juice of whole part is given to treat fever, anorexia and stomach pain.	Juice of root is given to treat dysentery.
44	<i>Mirabilis jalapa</i> L.	Juice of rizome is given to treat diarrhoea and can be used as cooling agent and body pain.			Juice of rhizome is given to treat waist pain.	Rhizome extract is given to treat women bleeding.
45	<i>Nephrolepis auriculata</i> (L.) Trimen	Juice of boiled fruit is given to control women bleeding during delivery.	Juice of boiled fruit is given to treat women bleeding during delivery.	Fruit is given to treat uterus prolapsed of buffalo.		Juice of boiled fruit is given to control women bleeding during delivery.
46	<i>Nicotiana tabacum</i> L.	Juice of whole part is applied to goat to remove flea.		Juice of leaf is applied on skin to remove leeches.	Juice of leaf is given to treat worm infection.	Juice of whole part is used as insecticide.
47	<i>Nyctanthes arbortristis</i> L.	Juice of bark or flower or leaf is given to treat sugar.				Shoot apex is boiled with other medicinal plants, and steam is taken to treat sinusitis.

48	<i>Ocimum basilicum</i> L.	Seed is poured into water and drunk as cooling agent.	Juice of the boiled shoot apex is given to treat fever, pneumonia cold and cough.	Leaf is eaten to treat headache.	Juice of bark is given to treat gastritis.	Juice of bark is given to treat gastritis.
49	<i>Ocimum tenuiflorum</i> L.	Juice of boiled leaf is given to treat cough and fever.	Juice of leaf mixed with juice of ginger and given to child to treat pneumonia.		Boiled juice of whole part is given to treat cold and cough.	Boiled leaf is drunk to treat cold, cough and fever.
50	<i>Oroxylum indicum</i> (L.) Kurz	Paste of bark of stem is applied to treat wounds.	Juice of seed is given to treat typhoid and headache.	Paste of bark of stem is applied to treat wound.	Parts of bark of stem is mixed with other medicinal plants and applied to treat wounds.	Flower is used to satisfy the ghosts.
51	<i>Oxalis corniculata</i> L.	Juice after grinding whole part is dropped to eyes to treat conjunctivitis.	Paste of whole part is applied on sprain.	Juice mixed with juice of whole part of <i>Centella asiatica</i> is given to treat fever.	Juice is given to treat headache.	Juice is given to treat joint pain.
52	<i>Phyllanthus parviflorus</i> Buch-Ham. ex D. Don		Powder of seed is applied to treat immature boils.	Powder of seed is applied to treat wound (ghaukhatira).	Powder of fried seed is applied in wound.	Seed powder is applied to treat immature boils.
53	<i>Phyllanthus emblica</i> L.	Fruit is mixed with oil of <i>Sesamum</i> for one month and applied to head to treat dandruff; and also taken to treat gastritis.	Fruit is edible.	Fruit is edible.	Powder of fruit mixed with other medicinal plants and is given to treat gastritis.	Powder of fruit mixed with other medicinal plants and is given to treat gastritis.
54	<i>Piper longum</i> L.	Burnt fruit is applied to neck to treat fever and cough.	Fruit is given to treat cough and gastritis.	Fruit is given to treat cough.	Fruit or juice of root is given to treat cough and gastritis.	Fruit is given to treat cough.
55	<i>Pogostemon benghalensis</i> (Burm. f.) Kuntze	Juice of boiled shoot apex is given to treat fever, pneumonia, cold and cough.	Juice of boiled shoot apex is given to treat fever, pneumonia, cold and cough.	Boiled juice of whole part is given to treat cold.	Boiled juice of shoot apex is given to treat cough.	Juice of shoot apex is given to treat running nose and headache.
56	<i>Psidium guajava</i> L.	Juice of bark is given to treat gastritis and diarrhoea.	Juice of shoot apex or bark is given to treat headache, dysentery and sinusitis.	Juice of shoot apex is given to treat diarrhoea.	Juice of shoot apex is given to treat diarrhoea.	Juice or shoot apex is given to treat pneumonia.
57	<i>Rhus javanica</i> L.	Flower is eaten to treat diarrhoea.	Powder of seed is given to treat dysentery.	Flower is eaten to treat diarrhoea.		

58	<i>Rubus ellipticus</i> Sm.	Juice of root is taken for dysentery and pneumonia.	Juice of root is taken for gastritis.		Juice of root is taken for gastritis.	Fruit is edible.
59	<i>Saccharum officinarum</i> L.	Juice of stem is given to treat jaundice.	Juice of stem is given to treat jaundice.	Juice of stem is given to treat jaundice and as cooling agent.	Juice of stem is given to treat jaundice.	Juice of stem is given to treat jaundice.
60	<i>Schima wallichii</i> (DC.) Korth.	Powder of burnt fruit is applied on scabies and burnt part.	Powder of burnt fruit is applied on burnt part.			
61	<i>Shorea robusta</i> Gaerten.	Resin of plant is mixed with milk and applied to treat waist pain.	Juice of bark is given to treat diarrhoea.	Juice of bark is given to treat diarrhoea and dysentery.	Juice of boiled bark is given to treat gastritis.	Powder of bark is given to treat gastritis.
62	<i>Spilanthes calva</i> DC.	Paste of fruit is put on tooth to treat toothache.				
63	<i>Tectaria coadunata</i> (Wall. ex J. Sm.) C. Chr.	Juice of root is given to treat lower abdominal pain.	Juice of root is given to treat diarrhoea.	Juice of root is mixed with other medicinal plants and is given to treat gastritis.	Juice of root is given to treat headache and fever.	Juice of root is given to treat diarrhoea and gastritis plant is also eaten as vegetables.
64	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Powder of seed is given to treat gastritis.	Powder of seed is given to treat gastritis.	Powder of seed is given to treat gastritis.		
65	<i>Terminalia chebula</i> Retz.	Burnt seed is given to treat cough.	Burnt seed is given to treat cough.	Powder of seed is mixed with other medicinal plants and is given to treat gastritis.	Burnt seed is given to treat cough and gastritis.	Burnt seed is given to treat cough.
66	<i>Thallictrum</i> sp.		Powder of root is given to treat fever.			Plant is smelled to treat common cold and headache.
67	<i>Tinospora sinensis</i> (Lour.) Merr.	Juice of tuber is given as cooling agent.	Juice of tuber is given to domestic animals as cooling agent.	Juice of tuber is mixed with other medicinal plants and is given to treat typhoid.	Juice of tuber is given to treat gastritis to both men and animals.	Juice of tuber is given to treat gastritis.
68	<i>Vitex negundo</i> L.					Steam of boiled leaves is taken to treat common cold.
69	<i>Zingiber officinale</i> Rosc.	Juice of rhizome is taken to cure common cold and cough.	Juice of rhizome is taken to cure common cold and cough.	Juice of rhizome is given for recovery of diarrhoea.		
70	<i>Zizyphus mauritiana</i> Lam.	Fruit is edible	Fruit is edible	Fruit is edible	Juice of root is taken to treat fever.	Fruit is edible. Pulp of seed is given to treat measles.

4.3 Variation in ethnomedicinal knowledge among different ethnic/ caste groups

Different ethnic/caste groups have their own way of using plant species as medicinal purposes. The ethnobotanical study carried out showed great variation in the use pattern of medicinal plants among five ethnic /caste groups (Table 1). Out of 70 medicinal plants, 61 species (87.14%) were known to Brahmin, as they had very rich knowledge about medicinal use of plant, followed by Kami having knowledge of 53 (75.5%) medicinal plants. Similarly, Gurung had knowledge of about 45 species (64.3%), Tamang about 42(60%), and Ghale had knowledge of about 41(60%) plant species (Fig. 6).

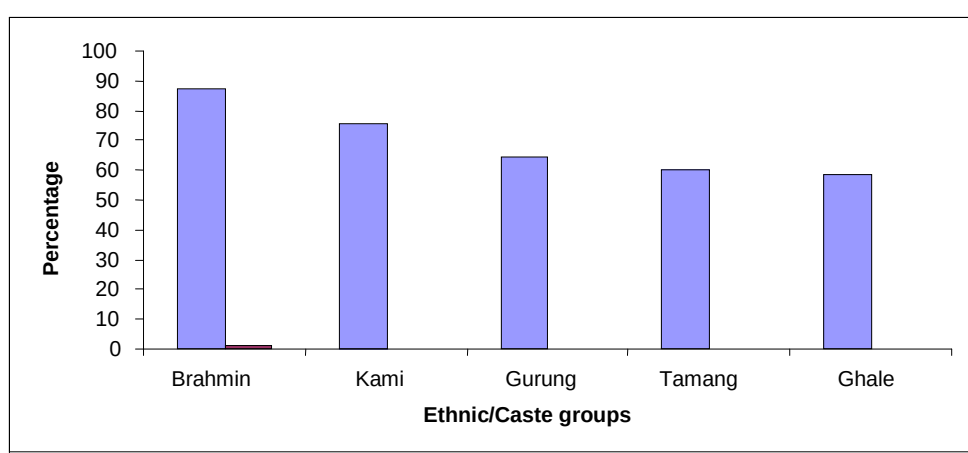


Fig. 6: Variation in ethnomedicinal knowledge among five ethnic /caste groups

Similarly, different parts of plants were used to treat different ailments. The plant parts that were used for medicinal purpose were whole part, root, stem, leaves, shoot apex, flower, fruit, seed, bark, and rhizome, etc. The most frequently utilized plant parts among 70 medicinal plant species recorded from study area were 17.9% (19) leaves, followed by 15% (16) roots, 11.3% (12) barks, 10.3% (11) fruits, 9.4% (10) seeds, 8.5% (9) whole part, 8.5% (9) stems, 7.5% (8) shoot apex, 4.7% (5) flowers, 3.8% (4) rhizomes, 1.9% (2) spines, and 0.9% (1) tubers (Fig.7).

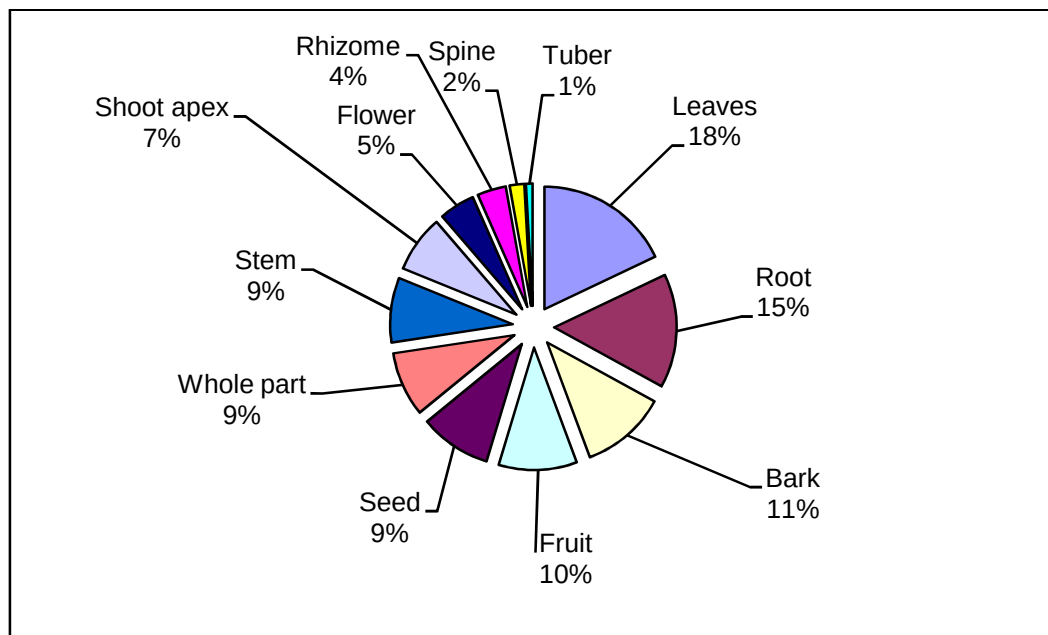


Fig. 7: Percentage of parts used of medicinal plants

4.4 Preference of Medicinal plants

Variation was also observed on the medicinal plants preferred to treat some diseases/disorders. Among 70 medicinal plants, some of the plants were very popular and frequently used by all ethnic /caste groups while some plants were used only by one ethnic /caste group.

Out of total 70 plant species, 20 (28.57%) species of medicinal plants were used by all ethnic/caste groups, 13 (18.7%) species were used by 4 ethnic/caste groups, 15 (21.42%) species were used by 3 ethnic/caste groups, 9 (3.40%) were used by two ethnic/caste groups, and 13(18.75%) species were used by only one ethnic/caste group (Fig. 8, Table 1, Appendix III).

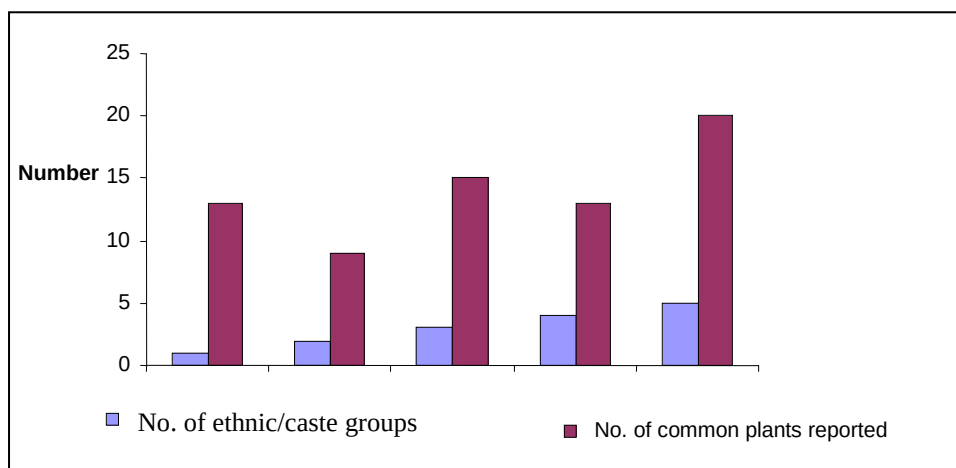


Fig. 8 : Number of common plants used by five ethnics/castes

4.5 Multiple uses of Medicinal plants

Rather than use of plants only for medicinal purposes, indigenous people used plants for multi purposes like food, fodder, fuel wood, furniture, etc. People may use same plant for different purposes based on the knowledge obtained from their ancestors and own experiences. Multiple uses (fodder, edible, fuel wood, ritual, and miscellaneous) of medicinal plants were also documented among five ethnic/caste groups. Although medicinal use knowledge was found to be high in Brahmin and Kami in comparison to Tamang and other ethnic/caste groups, but Tamang had high knowledge about multiple uses of plants as edible, fodder, firewood, ritual, etc. (Fig. 9, Appendix II).

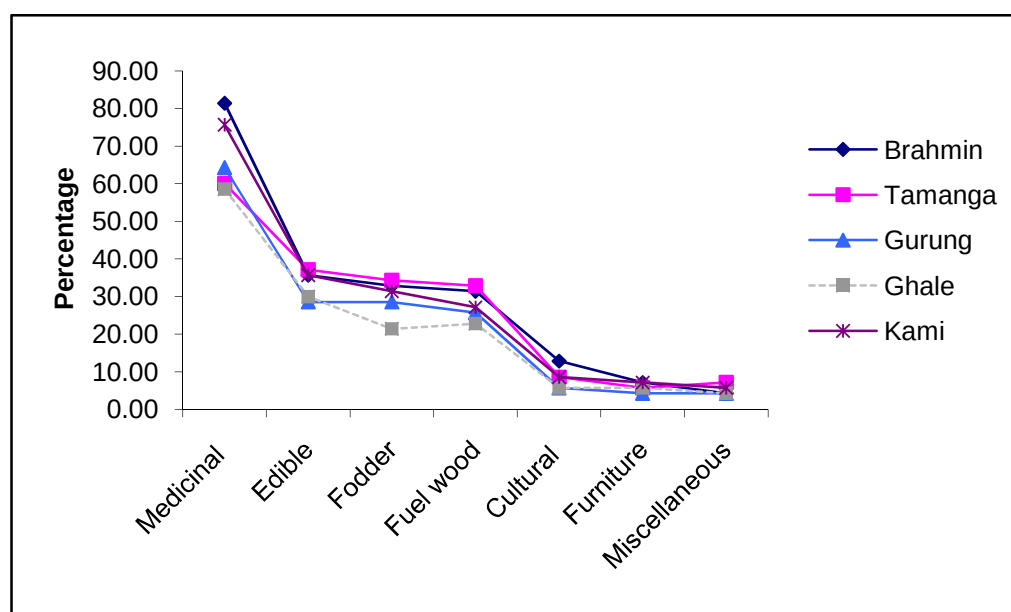


Fig. 9: Multiple uses of medicinal plants among five ethnics/castes

4.6 Common Medicinal plants reported to treat common diseases

Different ethnic/caste groups use the same plant species to treat common diseases/disorders. Plant species which were used by the different groups of indigenous people for common purposes shows the effectiveness of the medicinal value of that species. Out of 70 medicinal plants reported, 5 species of medicinal plants were used by five ethnic/caste groups to treat 9 common diseases/disorders which was followed by 4 species were used by 4 ethnic/caste groups to treat 3 common diseases/disorders, 14 species were used by 3 ethnic/caste groups to treat 10 common diseases/disorders, 29 species were used by 2 ethnic/ caste groups to treat 18 common diseases/ disorders and 62 species were used by only one ethnic/caste groups to treat 53 common diseases/ disorders (Fig. 10, Appendix III).

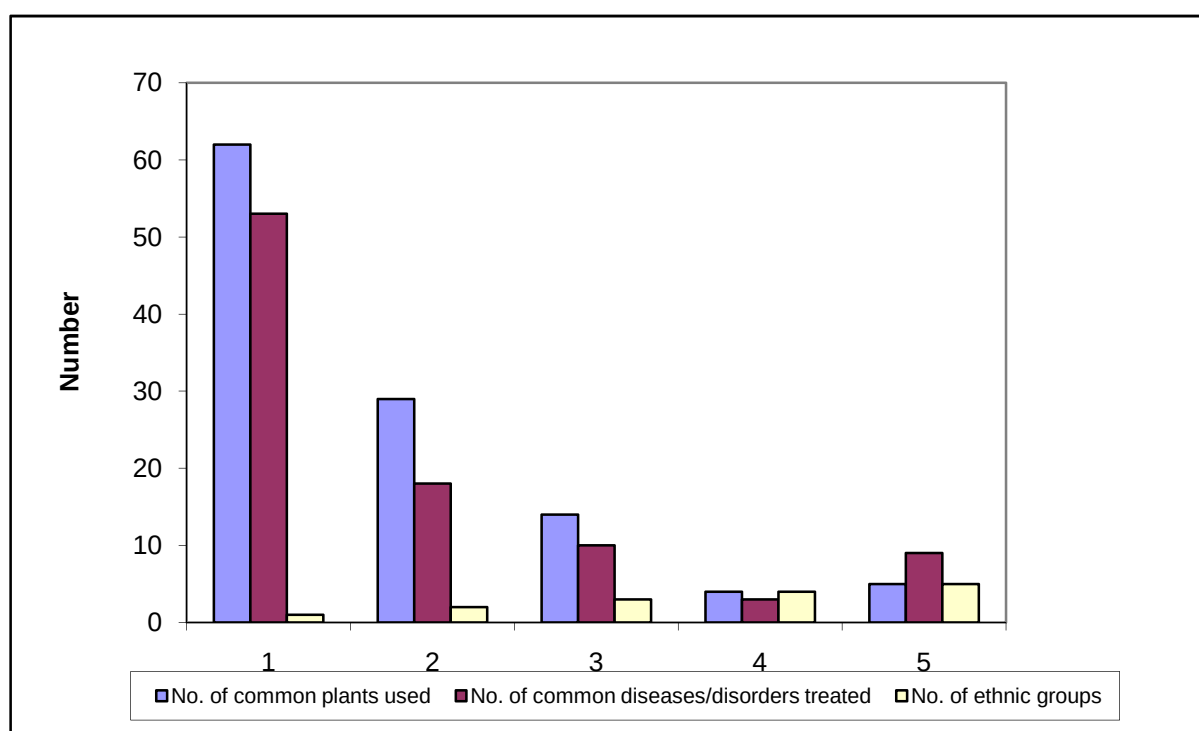


Fig. 10: Number of common plants reported to treat common diseases

4.7 Medicinal plants having high ethnographic validity used for common disease /disorder

Among 70 plant species, the ethnographic validity of 22 medicinal plant species was calculated. Among total medicinal plant species 5 plant species had very high validity score that ranges from 200-320 validity score, 7 plant species had high validity score that ranges from 100-200 validity score and 17 plant species had low validity score that was below 100 ethnographic validity score among which 6 plant species were repeated (Fig. 11).

Among 29 medicinal plant species, 9 plant species were chosen for comparative study with previous use report given by various researchers (Table 2). To select these 9 plant species, cultivated, alien and weed species were excluded and plant species having mean frequency less than 25% were also excluded (Appendix IV).

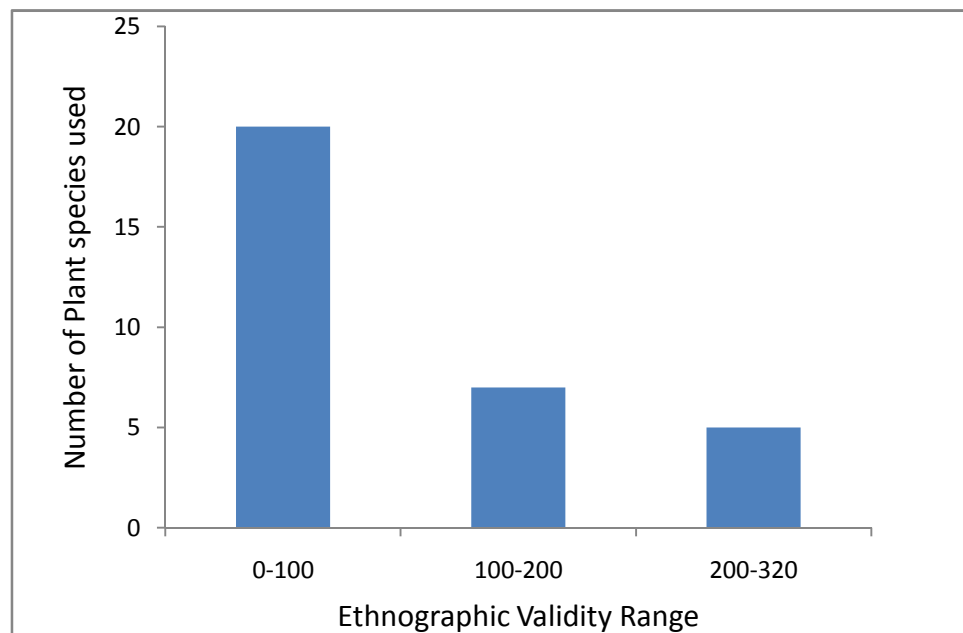


Fig. 11. Relation between ethnographic validity and number of plants used

Table 2. Comparison of medicinal uses of plants between present findings and previous works

S N	Latin Names	parts use	Uses (present findings)	Uses reported previously
1	<i>Artemisia indica</i> Willd.	sa, rt	Fever, scabies, boils, wounds, gastritis, anorexia.	1. Body warm for horses Manandhar,1988) 2. Ringworm (Manandhar,1985)
2	<i>Calotropis gigantea</i> (L.) Dryand	st, fr.	sprain, injuries, headache	1. Boils (Manandhar 1985,1998) 2. Scabies(Bhattarai 1992) 3. Rheumatism and burns, dysentery (Siwakoti & Varma, 1996). 4. Anthelmintic (Bhattarai 1992a) 5. Sinusitis (Bhatara 1993a)
3	<i>Cheilanthes anceps</i> Blanford	lf, rt, wp ,sa.	Gastritis	1. Loose appetite (Bhattarai 1992d)
4	<i>Euphorbia royleana</i> Boiss	st, fr	Anorexia	1. Cuts, burn, stop bleeding due to injury (Siwakoti & Varma 1996) 2.Cataract, muscular swellings (Manandhar 1995) 3. Dandruff (Bhattarai 1991 b) 4. Indigestion (Manandhar 1993 c) 5. Diarrhoea & dysentery (Manandhar 1989a)
5	<i>Phyllanthus emblica</i> L.	fr,	dandruff, gastritis	1. Asthma, bronchitis and biliousness (Siwakoti & Varma 1996) 2. Anthelmintic (Bhattarai 1992 a) 3. Indigestion (Manandhar 1993c)
6	<i>Piper longum</i> L.	fr,rt	fever, cough. Gastritis	1. Stomachache, snake bite, scorpion sting (Siwakoti & Varma 1996) 2. Anthelmintic (Bhattarai 1992 a) 3. Hooping cough (Bhattarai 1993a)
7	<i>Pogostemon benghalensis</i> (Burm.f.) Kuntze	sa, wp	fever, pneumonia, cold, cough, headache	1 Diarrhoea(cattle), Manandhar (1988) 2. Dysentery (cattle), Manandhar (1985) 3.Bleeding, diarrhoea & dysentery (Siwakoti & Varma1996)
8	<i>Terminalia chebula</i> Retz.	se	cough, gastritis	1 Dysentery, skin disease (Joshi and Joshi 2000)

				2. Cough, wound, ulcers (Siwakoti & Varma 1996) 3. Diarrhoea, dysentery, vomiting, urinary disorders (Mahato 1998).
9	<i>Cuscuta reflexa</i> Roxb	st	Jaundice, Typhoid	1. Jaundice (Mandandhar 1993C) 2. Recovery of dislocated parts (Manandhar, 1985) 3. To relieve hooping cough (Bhattarai 1993a) 4. Seeds are anthelmintic, carminative and alterative (Siwakoti and Varma 1996)

Note: st (stem), lf (leaf), rt (root), wp (whole part), sa (shoot apex), fr (fruit), and se (seed).

4.8 Diseases/Ailments treated

The recorded 70 medicinal plant species have been found to be used for the treatment of 55 different ailments/diseases by the different 5 ethnic /caste groups of the study area by using their own indigenous knowledge. Among them 23 plant species were used to treat gastritis, 14 plant species were used to treat fever and headache, and 12 plant species were used as cooling agent, etc. (Table 3).

Table 3. List of diseases/ailments with the plants species used

1	Abortion (Bachha tuhaunu): <i>Alstonia scholaris</i>
2	Anorexia (Bhok nalagne): <i>Artemisia indica</i> , <i>Achyranthes bidentata</i> , <i>Mimosa pudica</i> , <i>Euphorbia royleana</i>
3	Asthma (Dhanki/Dam): <i>Artemisia indica</i>
4	Bites of wasp (Barulale toknu): <i>Colocasia esculenta</i>
5	Body pain (Jiu dukhnu): <i>Mirabilis Jalapa</i>
6	Boils (Pilo/Khatira): <i>Azadirachata indica</i> , <i>Artocarpus lakoocha</i> , <i>Colocasia esculenta</i> , <i>Ficus semicordata</i> , <i>Phyllanthus parvifolius</i> .
7	Breast engorged (Thunilo): <i>Asparagus racemosus</i>
8	Broken part (Bhanchiyeko): <i>Alstonia scholaris</i>
9	Burn (Poleko): <i>Aloe vera</i>
10	Cataract (Motibindu): <i>Euphorbia hirta</i>
11	Child sickness (Ketaketiko betha): <i>Acorus calamus</i>
12	Cojunctivitis (Aankha dukhne): <i>Oxalis corniculata</i>
13	Cold (Sardi lagnu): <i>Aegle marmelos</i> , <i>Acorus calamus</i> , <i>Cannabis sativa</i> , <i>Zingiber officinale</i> , <i>Datura metel</i> , <i>Thallictrum</i> sp., <i>Vitex negundo</i> , <i>Ocimum tenuiflorum</i> , <i>Ocimum basilicum</i> , <i>Pogostemon benghalensis</i> .
14	Cooling agent (Garmiko ausadhi): <i>Asparagus racemosus</i> , <i>Azadirachta indica</i> , <i>Bombax ceiba</i> , <i>Carica papaya</i> , <i>Citrus limon</i> , <i>Mangifera indica</i> , <i>Mentha spicata</i> , <i>Saccharum officinarum</i> , <i>Ananas comusus</i> , <i>Blumea lacera</i> , <i>Centella asiatica</i> , <i>Tinospora sinensis</i> .
15	Sinusitis (Pinas): <i>Cleistocalyx operculatus</i> , <i>Drymaria</i> sp., <i>Nyctanthes arbortristis</i>
16	Cough (Khoki): <i>Acorus calamus</i> , <i>Ocimum tenuiflorum</i> , <i>Pogostemon benghalensis</i> , <i>Piper longum</i> , <i>Justica adhatoda</i> , <i>Terminalia chebula</i> , <i>Zingiber officinale</i> .
17	Cut (Kateko ghau): <i>Calotropis gigantea</i> , <i>Ficus religiosa</i> , <i>Blumea lacera</i> .
18	Dandruff (Chayan): <i>Bombax ceiba</i> , <i>Cissampelos pareira</i> , <i>Phyllanthus emblica</i> .
19	Diarrhoea (Pakhala lagnu): <i>Psidium guajava</i> , <i>Zingiber officinale</i> , <i>Shorea robusta</i> , <i>Rhus javanica</i> , <i>Eclipta prostrata</i> , <i>Cassia fistula</i> , <i>Tectaria coadunata</i> , <i>Mirabilis jalapa</i> .

20	Dog bite (Kukurle toknu): <i>Cannabis sativa</i> , <i>Datura metel</i> .
21	Dysentery (Ragatmasi): <i>Euphorbia hirta</i> , <i>Rubus ellipticus</i> , <i>Bergenia ciliata</i> , <i>Cannabis sativa</i> , <i>Mimosa pudica</i> .
22	Fever (Jyoro aune): <i>Azadirachata indica</i> , <i>Bergenia ciliata</i> , <i>Achyranthes bidentata</i> , <i>Justicia adhatoda</i> , <i>Oxalis corniculata</i> , <i>Ocimum tenuiflorum</i> , <i>Ocimum basilium</i> , <i>Pogostemon benghalensis</i> , <i>Piper longum</i> , <i>Thallictrum</i> sp., <i>Centella asiatica</i> , <i>Tectaria coadunata</i> , <i>Zizyphus mauritiana</i> .
23	Gastritis (Bayugola, Pet dhadinu): <i>Aegle marmelos</i> , <i>Alstonia scholaris</i> , <i>Artemisia indica</i> , <i>Bombax ceiba</i> , <i>Bauhinia variegata</i> , <i>Carica papaya</i> , <i>Cissampelos pareira</i> , <i>Mangifera indica</i> , <i>Mentha spicata</i> , <i>Melia azederach</i> , <i>Mimosa pudica</i> , <i>Ocimum basilium</i> , <i>Phyllanthus emblica</i> , <i>Piper longum</i> , <i>Psidium guajava</i> , <i>Termininalia chebula</i> , <i>Termininalia bellirica</i> , <i>Tinospora sinensis</i> , <i>Rubus ellipticus</i> , <i>Shorea robusta</i> , <i>Cuscuta reflexa</i> , <i>Tectaria coadunata</i> , <i>Cheilanthes anceps</i> .
24	Gonorrhea (Dhatu rog): <i>Amaranthus spinosus</i> , <i>Bombax ceiba</i> .
25	Headache (Tauko dukhnu): <i>Aloe vera</i> , <i>Tectaria coadunata</i> , <i>Azadirachta indica</i> , <i>Centella asiatica</i> , <i>Calotropis gigantea</i> , <i>Celeistocalyx operculatus</i> , <i>Oxalis corniculata</i> , <i>Ocimum basilium</i> , <i>Pogostemon benghalensis</i> , <i>Psidium guajava</i> , <i>Oroxylum indicum</i> , <i>Eryngium foetidum</i> , <i>Thallictrum</i> sp., <i>Cassia fistula</i> .
26	Heart pain (Mutu dhukhnu): <i>Artemisia indica</i>
27	High blood pressure (Pressure badhnu): <i>Azadirachta indica</i>
28	Insecticide (Kitnasak): <i>Nicotiana tabacum</i>
29	Jaundice (Panhele, Kamalpitta): <i>Carica papaya</i> , <i>Saccharum officinarum</i> , <i>Cuscuta reflexa</i> .
30	Joint pain (Jorni dukhnu): <i>Oxalis corniculata</i>
31	Lower abdominal pain (Tallo pet dukhnu): <i>Tectaria coadunata</i>
32	Marasmus (Sukenas): <i>Achyranthes bidentata</i>
33	Measles (Daadura): <i>Zizyphus mauritiana</i>
34	Mumps (Hande): <i>Artocarpus lakoocha</i>
35	Pneumonia (Nimonia): <i>Acorus calamus</i> , <i>Ocimum tenuiflorum</i> , <i>Ocimum basilium</i> , <i>Pogostemon benghalensis</i> , <i>Psidium guajava</i> , <i>Rubus ellipticus</i> .
36	Production of milk/lactation (Dudha badhaune): <i>Asparagus racemosus</i>
37	Retention of urine (Pisab nahune): <i>Amaranthus spinosus</i> , <i>Cassia fistula</i>
38	Expulsion of placenta of domestic animals (Sal najharne): <i>Achyranthes bidentata</i>
39	Rheumatism (Baath): <i>Bergenia ciliate</i>

40	Ringworm (Daad): <i>Cassia fistula</i>
41	Scabies (Luto): <i>Artemisia indica</i> , <i>Schima wallichii</i>
42	Skin allergy (Chhala ko rog): <i>Curcuma amada</i>
43	Soap making/ Detergent (Sabun banaune): <i>Asparagus racemosus</i>
44	Sprain (Markeko, Sarkeko): <i>Amaranthus spinosus</i> , <i>Calotropis gigantea</i> , <i>Oxalis corniculata</i> , <i>Cassia fistula</i>
45	Stomach pain (Pet dukhnu): <i>Asparagus racemosus</i> , <i>Mimosa pudica</i>
46	Sugar (Chini rog, Diabetes): <i>Nyctanthes arbortristis</i>
47	Swelling (Sunninu): <i>Amaranthus spinosus</i> , <i>Calotropis gigantea</i> , <i>Oxalis corniculata</i> , <i>Cassia fistula</i>
48	Throat pain (Ghati dukhnu): <i>Acorus calamus</i> , <i>Alstonia scholaris</i> .
49	Toothache (Dant dukhnu): <i>Artocarpus lakoocha</i> , <i>Carica papaya</i> , <i>Ficus benghalensis</i> , <i>Spilanthes calva</i> .
50	Treat uterus prolapsed of buffalo (Aang khasnu): <i>Nephrolepis auriculata</i>
51	Typhoid (Kukhat): <i>Oroxylum indicum</i> , <i>Cuscuta reflexa</i> , <i>Tinospora sinensis</i> .
52	Waist pain (Kammar dukhne): <i>Mirabilis jalapa</i> , <i>Shorea robusta</i> .
53	Women bleeding (Sutkeri hunda dherai ragat bagnu): <i>Mirabilis jalapa</i> , <i>Nephrolepis auriculata</i> .
54	Worm infection (Churna, juka parnu/mate lagnu): <i>Azadirachata indica</i> .
55	Wounds (Ghau): <i>Artemisia indica</i> , <i>Azadirachata indica</i> , <i>Begonia picta</i> , <i>Citrus limon</i> , <i>Ficus religiosa</i> , <i>Justica adhatoda</i> , <i>Oroxylum indicum</i> , <i>Euphorbia hirta</i> , <i>Phyllanthus parviflorus</i> .

Chapter V - Discussion

5.1 General overview

Plant resources play a vital role in the life of rural people. Among the plant resources, medicinal plants have main role for the local people inhabiting in the remote areas of country. The plant resources are utilizing for various purposes by different ethnic groups for the fulfillment of daily life. Among them, Brahmin, Tamang, Gurung, Ghale and Kami were selected as present study area i.e. Manakamana V.D.C. of Nuwakot district to explore the ethnobotanical knowledge. The study mainly focused on the use of medicinal plant for treating different diseases /disorders. No ethnobotanical work has been previously carried out in this area. This may be a new work for documenting traditional knowledge, among five different ethnic/Caste groups from this area.

The ethnobotanical information presented here are primarily based on the field observation, focusing on medicinal plants species which are used in treating different kinds of diseases as diarrhoea, dysentery, cuts and wounds, fever, bronchitis, sinusitis, etc. The data were taken by interview and group discussion with local people, community leaders, social workers and elderly people from the focused ethnic/caste groups living in the study area. Apart from medicinal knowledge, they also had knowledge about multiple uses of medicinal plants.

5.2 Diversity of Medicinal Plants

The present study revealed 70 medicinal plant species, belonging to 43 families and 63 genera, in which Asteraceae, Euphorbiaceae, Fabaceae, Lamiaceae, and Moraceae were observed as the largest family comprising 4 species each. Out of 70 medicinal plant species, 68 species belong to angiosperm and 2 species belong to pteridophytes. The medicinal plant species were analyzed with respect to frequency of plant family, habit, parts used, mode of use, etc. Based on their habit type, these are grouped as herbs, shrubs, trees and climbers. It was found that herbs were used most commonly as medicinal plants in the study area, which account 35 species (50%) of total used medicinal plants. The high frequency of herbs in the study area may indicate a unique preference of herbaceous species by the traditional healers. Among 70 medicinal

plants studied, 27 species (38.57%) belongs to trees, 4 species (5.71%) belongs to shrubs, and 4 species (5.71%) belongs to climbers.

5.3 Variation in ethnomedicinal knowledge among five ethnic/caste groups

Different ethnic/caste groups had good knowledge on medicinal plants among the five ethnic/caste groups. Brahmin had very good knowledge on medicinal plants. Out of total plant studied, (87.14%) were known by Brahmin. This may be due to the long history of settlements of Brahmin in that area. Comparatively, Ghale people were found to have very less knowledge (58.6%), among the five ethnic/caste groups. This may be because they were recently migrated from another part of country and their population was also very low in the study area. Knowledge transmission from old generation to new generation was not found in Ghale community, because young generations show no more interest on the use of plants.

For the same plant, one uses the root, other use the bark and leaves, and so on to treat same disease. Therefore, the parts use preferred by local inhabitant was categorized into 12 different categories viz. root, stem, leaves, whole parts, shoot apex, flower, spine, fruit, seed, bark, rhizome and tuber. Figure 7 shows the highly used plant parts were leaves (17.9%). This may be due to easy to assess which don't harm the plant. Therefore, people mostly prefer leaves as medicine which was followed by root (15%), bark (11.3%), fruit (10.3%), seeds (9.4%), whole part (8.5%), stem (8.5%), shoot apex (7.5%), flowers (4.7%), rhizomes (3.8%), spine (1.9%) and tubers (0.9%), respectively.

Common medicinal plants reported to treat common diseases. The present findings showed that 20 species of plant were very popular among all ethnic/caste groups. Out of 20 medicinal plants, 5 species were used by all ethnic/caste groups to treat 9 common diseases /disorders, but within one ethnic /caste group there is large number of species used as medicine.

5.4 Multiple uses of Medicinal plants

From the present study can be concluded that the local communities of Manakamana VDC of Nuwakot district have wide Knowledge about the use of plant resources for various purposes such as medicinal, fodder, fuel wood, furniture, etc. There is variation in the knowledge about the multiple uses of plants in the study area (Fig. 9). Among 7

multiple uses of plant species, Tamang were found to have high knowledge about multiple uses of plant as edible, fodder, fuel wood and cultural. This may be because among all ethnic /caste groups, they were most ancient and local inhabitant ethnic group in the study area. More often they collect food materials from the forest. According to total population, Tamang have high population, so the older and younger people of Tamang community have high knowledge about the uses of plant species. Almost in every cultural program they use different plant species.

5.5 Medicinal plants having high ethnographic validity

Out of 70 medicinal plant species studied, 22 plants showed high ethnographic validity. Medicinal uses of only 9 species were selected on the basis of mean frequency greater than 25, and the alien species and cultivated species were excluded (Appendix IV).

The sticky fluid of stem of *Calotropis gigantea* was found to cure sprain, cuts and wound in the present study, but Manandhar (1998) reported use of plant as boils. Similarly Siwakoti and Varma (1996) reported use of plant as rheumatism, burns and dysentery, which is not matching with present study (Table 2).

The leaf, root, whole part and shoot apex of *Cheilanthes anceps* was found to be used to treat gastritis in the present study, where as Bhattarai (1992d) reported similar use for plant to treat loose appetite. The stem of *Euphorbia royleana* was used to treat anorexia in present study. Siwakoti and varma (1996) reported use of plant to treat cut, burn and to stop bleeding, which was not similar with present study. Manandhar (1989a, 1995) reported use of plant to treat cataract, muscular swelling, and diarrhoea and dysentery, which was not similar with the present study. The other uses of plants reported by different researchers have been presented in Table 2.

The fruit of *Phyllanthus emblica* was used to treat dandruff and gastritis in the present study, which was identical with the results of Bhattarai (1992d). Siwakoti and Varma (1996) reported use of plant to treat asthma, bronchitis and biliousness, which was not similar with present study. The use of plant to treat dandruff was not mentioned previously in the reviewed literature. Hence this finding may be new information in ethnomedicine.

The fruits and roots of the *Piper longum* were found to cure fever, cough and gastritis in present study. The use of plant to treat cough is similar with Bhattarai (1993a), however, the use of plants to treat fever and gastritis was not mentioned in previous

literature. The shoot apex and whole part of *Pogostemon benghalensis* was found to treat fever pneumonia, cold, cough headache in the present study, whereas Siwakoti and Varma (1996) and Manandhar (1985, 1988) reported use of plant to treat diarrhoea and dysentery which was not similar with the present findings.

The seed of *Terminalia Chebula* used for curing cough was similar with Siwakoti and Varma (1996). Where as the use of seeds to treat gastritis was not mentioned in previous literature. The other uses of plants reported by different researchers have been presented in Table 2.

Among the medicinal plants taken for comparative study of medicinal use with previous findings, it was found that most of them had new use report. This may because the study was conducted in new area where so far no ethnobotanical work had been carried out before and study had been conducted among five ethnic/caste groups. Another thing is that, the dissimilarity of result for the same plant species is due to different ethnic/caste groups in different place and its use by them in their own style and system of management.

Oli (2001) divided plants into three validity ranks in his study: very high, high and low validity rank. In his study, analysis of ethnographic validity revealed that a total of 9 plants showed high ethnographic validity, plants having validity score greater than 200. Similarly, 12 plants have moderate ethnographic validity, validity score ranges from 100-200, and 29 plants species had low ethnographic validity, validity score below 100.

Similarly, Thapa (2008a) divided plants into four validity rank in her study. i.e. very high, high, medium and low validity rank. In her study, analysis of ethnographic validity revealed that a total of 10 plants species showed very high ethnographic validity score that ranges from 300-420, 25 plants species had high ethnographic validity i.e. validity score ranges form 200-300, followed by 29 plants species with medium validity score, and 3 plants species had low ethnographic validity, i.e. validity score below 100.

But in this study, the ethnographic validity score of medicinal plants were found, similar like Oli (2001). So the plants were divided into 3 validity rank i.e. very high (high), high (moderate) and low. In the present study, 5 plant species had very high (or high) ethnographic validity score that ranges greater than 200. Seven plant species had high (or moderate) ethnographic validity score, that ranges from 100-200 and 20 plant

species had low ethnographic validity score that is below 100 ethnographic validity ranks. *Centella asiatica* has high ethnographic validity score among 5 species having very high ethnographic validity score.

Oli (2001) analyzed the ethnobotanical knowledge among five ethnic/caste groups from Churiya hill of east Nepal by using the ethnographic validity method. Thapa (2008a) analyzed the ethnobotanical knowledge among eight ethnic/ caste groups from western Terai of Nepal. But in the present study, ethnobotanical knowledge among five ethnic/caste groups is analyzed in the Nuwakot district of Central Nepal. The medicinal plants having very high ethnographic validity in treating particular disease/disorder were *Centella asiatica* (cooling agent), *Saccharum officinarum* and *Cuscuta reflexa* (Jaundice), *Cissampelos pareira* (gastritis), and *Aloe vera* (burn).

5.6 Diseases /Ailments with the plant species used

The reported 70 species of medicinal plants have been used for the treatment of 55 different ailments/diseases. Digestive system disorders, infections, respiratory system disorders, injuries were the most frequent ailments or diseases treated with the medicinal plants among the indigenous people of study area by using their indigenous techniques. 64 medicinal plants were used to treat digestive system disorders like gastric, diarrhoea, dysentery stomach pain, heart pain etc.

Similarly, 37 medicinal plant species were used to treat infections like fever, typhoid, jaundice, cooling agent cold, etc. 19 medicinal plant species were used to cure respiratory system disorders (cough, sinusitis, chest pain, asthma, etc.), while 15 plant species were used for injuries (Burn, cuts and wounds) followed by 14 plant species were used for nervous system disorder i.e. headache.

Similarly, 9 plant species for skin cellular tissue disorder (skin allergy, boils, scabies, ringworm, etc.). 6 plant species for genitourinary system disorder (women bleeding, abdominal pain, retention of urine, uterous prolapse, etc.), 5 species for nutritional disorder, (anorexia and marasmus). 4 plant species were used to treat poisoning disorder for animal (dog bite, insecticide, etc.) and also for pregnancy/birth/puerperium disorder (abortion, breast engorged, and expulsion of placenta and production of milk. Similarly, 3 species for B.P. high and throat pain, 2 species for cataract and conjunctivities and only one species each for diabetes and child sickness (Table 3).

Chapter VI - Conclusion

From the above results and discussion, the present study indicates that the inhabitant of the Manakamana VDC have wide knowledge about the use of plant resource for their various purposes such as medicinal values, fodder, wild edible plants, fuel wood, furniture, etc. The study area is also rich in plant resources, particularly in medicinal plant and its traditional knowledge system. The people of the study area have developed unique indigenous practice on the uses of existing plant resource due to constant association with forest and forest products. The healers as “Jhankri”, “Lama”, “Dhami”, and elderly people of the study area found to have rich knowledge on the use of species as medicine. Especially, women have significant knowledge about the identification of medicinal plants.

A total of 70 ethnobotanically important plant species belonging to 63 genera and 43 families were documented in the present study. Most of these species are of wild occurrence, while some of these are being cultivated. Out of 70 medicinal plants, 20 species of medicinal plants are used by all ethnic/caste groups to treat different diseases/disorders which show that these plants are mostly popular in study area. Five ethnic/caste groups use 5 common medicinal plants for 4 common diseases /disorders. It means that each ethnic/caste group use same plants to treat same disease or disorder.

Among five ethnic/caste groups in the study area, Brahmin was found to have comparatively high knowledge on medicinal use of plant species, which was followed by Kami, Gurung, Tamang and Ghale. Brahmin is local inhabitants of that area and they collect the information about plants from other ethnic groups. Similarly, local healer as Jhankri has high knowledge about the use of plant species as medicinal. But, Tamang has high knowledge about the multiple uses of plant species like in fodder, fuel wood, cultural, edible, etc., because they are ancient inhabitants of the study area and having large population and also they use different plant species in ritual functions.

The ethnographical information obtained from the study area was analyzed by taking Ethnographic validity rank, followed by Oli (2001) and Thapa (2008a). The ethnographic validity of medicinal plants used by five ethnic/caste groups showed that 22 plant species have high ethnographic validity among total plant studies.

Among the 22 plant species, five plant species had very high validity, among which *Centella asiatica* had high ethnographic validity for cooling agent (317.15). Similarly, seven plant species had high validity and 20 plant species had low validity in which three plant species were repeated. Among the 22 plant species, 9 plant species having very high validity score were compared with previous use report given in different literature to analyze their medicinal uses. These plants were chosen by excluding cultivated and alien plants species, and plants having use frequency less than 25%. It was found that most plant species have new use report which was not reported in previous literature. It may be due to some reasons like, the present study was conducted in new area where so far no ethno botanical work has been carried out, and also may be due to the information collected among five ethnic /caste groups.

Chapter VII - Recommendation

From this present study, following recommendations are made consideration to sustainable use and manage plant resource to conserve the traditional ethnobotanical knowledge of local people.

1. It is needed to encourage and mobilized the local people to grow and cultivate the useful and valuable medicinal plants.
2. Local people should be trained for sustainable utilization of medicinal plants.
3. Local healers/ doctors should be trained for modern health care system which will enable them to provide more efficient medical services.
4. Participation of young generation should be increased in traditional medicinal practice sharing programs.
5. Create awareness and feeling of ownership regarding the conservation, management and utilization of plant species of medicinal values.
6. The plant species used in folk medicine should be subjected to further biochemical analysis for their efficacy and verification.

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Bauhinia purpurea L.



Ocimum basilium L.



Mentha spicata L.



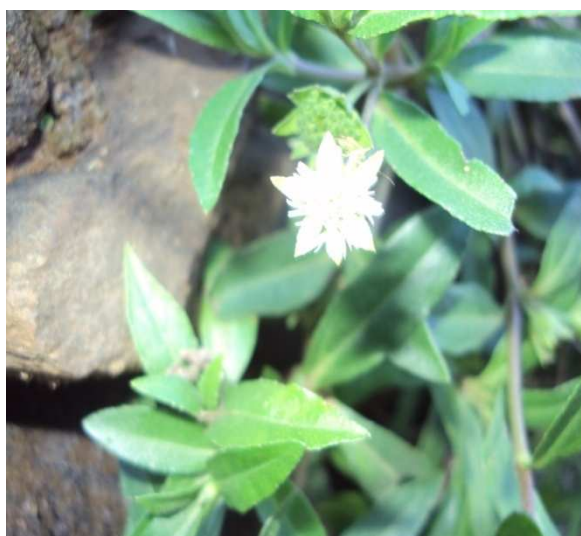
Cissampelos pareira L.



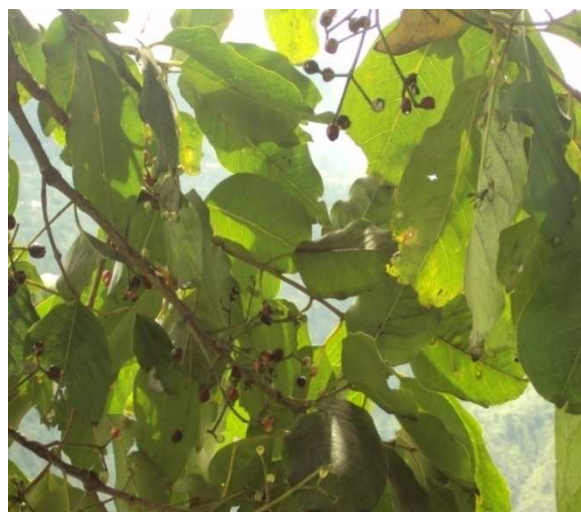
Cheilanthes anceps Blanford



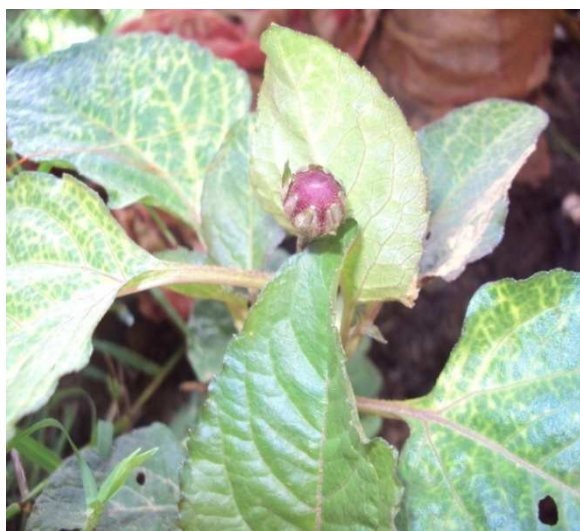
Cuscuta reflexa Roxb.



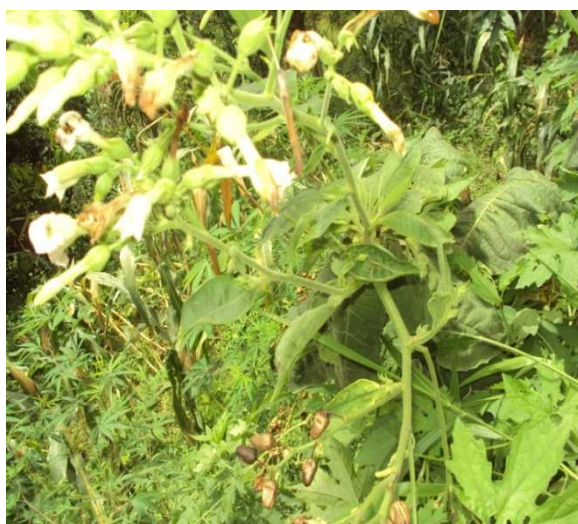
Eclipta prostrata (L.) L.



Cleistocalyx operculata (Roxb.) Merr. and Perry



Spilanthes calva DC.



Nicotiana tabacum L.



Calotropis gigantea (L.) Dyrand.



Mirabilis jalapa L.



Local people collecting plants



***Blumea lacera* (Burm.f.)DC.**



Interview with local people



Interview with local people



way to go to study area crossing Trishuli River



Local people observing the plant

Appendices

Appendix I. Climatic data of Nuwakot

1. Precipitation

Months	2006	2007	2008	2009	2010
Jan	0.0	0.0	3.2	0.0	0.0
Feb	0.0	46.4	0.0	0.0	0.0
March	21.1	31.4	30.6	24.6	0.0
Apr	137.0	34.1	17.2	31.5	0.0
May	133.3	80	112.6	28.7	85.5
Jun	236.4	322.0	382.6	16	161.0
July	296.2	433.2	230.7	257.1	312.5
Aug	332.7	390.8	464.5	413.6	530.7
Sep	77.0	212.0	197.1	67.0	173.7
Oct	0.0	0.0	0.0	41.8	DNA
Nov	0.0	0.0	0.0	0.0	0.0
Dec	20.7	0.0	0.0	1.6	0.0

2. Temperature

Month	T max					T min				
	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
Jan	23.5	22.7	19.5	22.8	22.3	8.1	8.1	8.0	9.5	9.0
Feb	27.0	23.3	22.6	24.1	23.8	12.6	8.4	9.2	10.7	10.8
March	29.7	28.3	27.7	30	29.7	14.8	14.3	14.6	15.9	15.7
Apr	31.5	31.4	31.5	32.9	32.4	17.1	17.1	18.2	19	18.6
May	31.3	31.3	31.8	32.6	32.4	20.2	19.9	18.8	19.9	19.6
Jun	30.7	31.1	31.6	33.4	32	21.8	21.7	21.3	21.7	21.4
July	31.4	30.6	30.8	30.9	30.8	22.2	21.6	22.3	22.1	21.5
Aug	30.9	31	31	30.9	31.1	20	21.9	21.5	21.8	21.3
Sep	30.4	30.4	30.7	30.8	30.7	20.3	20.5	20.5	21	20.5
Oct	27.6	28.1	28.7	28.9	DNA	17.7	17.9	15.4	18.1	DNA
Nov	25.9	25.8	25.9	24.3	24.5	14	14.3	13.7	12.4	12.4
Dec	21.5	21.1	23	22.3	22.1	9.9	9.2	10.1	9.4	8.7

3. Relative Humidity

Month	8:45					17:45				
	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
Jan	87.9	87.9	87.7	84.5	86	71.7	71.8	68.6	61.8	62.9
Feb	87.2	88.9	82.9	88.7	87.4	68.3	67.8	62.7	64	63.9
March	76.8	83.4	85.6	84	83.4	55.9	66.4	62.9	56.7	59.4
Apr	73.4	74.8	84.4	82.9	84	58.6	58.1	66.1	71.1	71.5
May	88.6	88.2	89.8	90.8	89.7	75.4	78.6	84.9	75.5	79.2
Jun	88.4	89.7	90.5	84.4	88.6	77.7	72.8	87.8	70.0	85.8
July	91.7	90.2	93.7	92.7	92.3	88.2	71.2	88.8	87.1	83.7
Aug	89.3	88.9	93.5	91.3	92.7	79.6	79.4	88.5	84.9	83.9
Sep	88.9	89.1	92.5	90.6	92.3	75.2	74.4	87.5	81.2	86.5
Oct	87.8	88.4	88.9	89.7	DNA	78.6	81.3	64.5	83	DNA
Nov	83.5	88.5	92.8	86.6	86.8	73.6	74	87.8	73.7	72.2
Dec	89.4	89.3	88.5	88.5	88.0	68.9	68.7	71.1	68.9	64.5

Appendix II. Total plants used by 5 ethnic/caste groups for different purposes

Ethnic/caste group		Medicinal	Edible	Fodder	Fuelwood	Cultural	Furniture	Miscellaneous
Brahmin	Number	57	25	23	22	9	5	3
	Percentage	81.42	35.71	32.85	31.42	12.85	7.14	4.28
Tamang	Number	42	26	24	23	6	4	5
	Percentage	60	37.14	34.28	32.85	8.57	5.71	7.14
Gurung	Number	45	20	20	18	4	3	3
	Percentage	64.28	28.57	28.57	25.71	5.71	4.28	4.28
Ghale	Number	41	21	15	16	4	4	3
	Percentage	58.57	30	21.42	22.85	5.71	5.71	4.28
Kami	Number	53	25	22	19	6	5	4
	Percentage	75.71	57	31.42	27.14	8.57	7.14	5.71

Appendix III: Medicinal Plant species used for common diseases/disorders among five ethnic/caste groups

S.N.	Latin name	Diseases	Br.	Ta.	Gu.	Gh.	Ka.	E.G.
1	<i>Achyranthes bidentata</i> Blume	Retention of placenta	1	0	0	0	0	1
		Anorexia	0	0	1	0	0	1
		Marasmus	0	0	0	1	0	1
		Fever	0	0	0	0	1	1
2	<i>Acorus calamus</i> L.	Body pain	0	0	1	0	0	1
		Child sickness	0	0	0	1	1	2
		Cold	1	0	0	0	0	1
		Cough	1	0	0	0	0	1
		Pneumonia	0	0	0	1	0	1
		Throat pain	0	0	0	0	1	1
3	<i>Aegle marmelos</i> (L.) corr.	Gastritis	1	0	0	0	0	1
		Cold	0	0	1	1	0	2
		Cooling agent	0	0	0	0	1	1
4	<i>Aloe vera</i> (L.) Burm .f.	Burn	1	1	1	1	1	5
		Cooling agent	1	1	1	0	1	4
		Headache	0	1	1	0	0	2
5	<i>Alstonia scholaris</i> (L) R.Br	Boils	1	0	0	0	0	1
		Gastritis	1	0	0	0	0	1
		Broken part	0	1	0	0	0	1
		Chest Pain	0	0	0	1	0	1
		Abortion	0	0	0	0	1	1
6	<i>Amaranthus spinosus</i> (L) R.Br	Sprain	1	0	0	0	0	1
		Cooling agent	1	0	0	0	1	2
		Swelling	1	0	0	0	0	1
		Retention of urine	0	0	1	0	0	1
		Gonorrhoea	0	0	1	0	0	1
7	<i>Ananas comosus</i> (L.) Merr	Cooling agent	1	0	0	0	1	2
	<i>Artemisia indica</i> Willd.	Fever	1	0	0	0	0	1
8		Scabies	1	0	0	1	0	2
		Gastritis	1	0	1	0	1	3
		Anorexia	1	0	0	0	0	1
		Asthma	0	1	0	0	0	1
		Boils	0	1	0	0	0	1

		Wound	0	1	0	0	0	1
		Heart pain	0	0		1	0	1
		Swelling	1	0	0	0	0	1
9	<i>Artocarpus lakoocha</i> Wall. ex Roxb.	Toothache	1	0	1	1	0	3
		Boils	1	1	1	0	0	3
		Mumps	0	0	0	1	1	1
10	<i>Asparagus racemosus</i> Willd.	Stomach pain	1	0	0	0	0	1
		Productin of milk	0	1	0	0	1	2
		Soap	0	1	0	1	1	3
		Cooling agent	0	0	1	0	0	1
11	<i>Azadirachata indica</i> A. Juss.	High blood pressure	0	0	0	1	1	1
		Fever	1	0	1	1	1	3
		Worm infection	1	0	0	0	0	1
		Cooling agent	1	0	0	0	0	1
		Boils	0	1	0	0	0	1
		Wounds	0	0	0	1	1	2
		Headache	0	0	1	0	0	1
12	<i>Bauhinia purpurea</i> L.	Gastritis	1	0	0	0	0	1
13	<i>Bauhinia variegata</i> L.	Gastritis	1	0	0	1	0	2
		Diarrhoea	0	0	2	0	0	1
14	<i>Begonia picta</i> Sm.	Wound	1	0	0	0	0	1
15	<i>Bergenia ciliata</i> (Haw.) Sternb.	Rheumatism	1	0	0	0	0	1
		Diarrhoea	0	1	0	0	0	1
		Dysentery	0	1	0	0	0	1
		Fever	0	0	0	0	1	1
16	<i>Blumea lacera</i> (Burm.f.) DC.	Cut	1	0	0	0	1	1
		Cooling agent	0	1	0	0	0	1
17	<i>Bombax ceiba</i> L.	Dandroff	0	0	0	1	0	1
		Gastritis	1	1	0	0	1	3
		Cooling agent	1	1	0	0	1	3
		Gonorrhoea	1	1	1	0	0	3
18	<i>Calotropis gigantea</i> (L.) Dryand.	Cut	1	0	0	1	0	2
		Sprain	1	1	1	1	0	4
		Headache	0	0	0	0	1	1
19	<i>Cannabis sativa</i> L.	Dog bite	1	0	0	0	0	1
		Cold	0	1	0	1	0	2

		Stomach swelling	0	0	0	0	1	1
20		Toothache	0	0	0	0	1	1
	<i>Carica papaya</i> L.	Cooling agent	1	0	1	1	0	3
		Jaundice	1	1	1	0	0	3
21		Red urine	1	0	0	0	0	1
		Headache	0	1	0	0	0	1
		Fever	0	1	0	0	0	1
	<i>Centella asiatica</i> (L.) Urban	Cooling agent	1	1	1	1	1	5
22	<i>Cheilanthes anceps</i> Blanford	Gastritis	1	1	1	0	1	4
23		Gastritis	1	1	1	0	1	4
	<i>Cissampelos pareira</i> L.	Dandruff	0	0	0	1	0	1
24		Cooling agent	1	0	0	0	0	1
	<i>Citrus limon</i> (L.) Burm. f.	Wound	0	0	0	0	1	1
25		Coryza	1	0	0	0	1	1
	<i>Cleistocalyx operculata</i> (Roxb.) Merr. & Perry	Headache	1	0	0	0	0	1
26	<i>Colocasia esculenta</i> (L.) Schott	Bites	1	0	0	0	0	1
27	<i>Curcuma amada</i> Roxb.	Skin allergy	1	0	0	0	1	1
28		Jaundice	1	0	0	1	1	3
		Typhoid	0	1	0	0	0	1
	<i>Cuscuta reflexa</i> Roxb.	Gastritis	0	0	1	0	0	1
29		Dog bite	1	1	0	0	0	2
		Snake bite	0	1	0	0	0	1
	<i>Datura metel</i> L.	Cold	0	0	0	0	1	1
30	<i>Drymaria</i> sp.	Coryza	0	0	0	1	0	1
31		Cut	1	0	0	0	0	1
	<i>Eclipta prostrata</i> (L.) L.	Diarrhoea	0	0	0	1	0	1
32	<i>Eryngium foetidum</i> L.	Headache	1	0	1	0	0	2
33		Cataract	1	0	0	0	1	2
		Dysentery	0	1	0	0	0	1
		Burning sensation of chilli	0	0	1	0	0	1
	<i>Euphorbia hirta</i> L.	Wound	0	0	0	1	0	1
34	<i>Euphorbia royleana</i> Boiss	Anorexia	1	1	1	1	1	5
35	<i>Ficus benghalensis</i> L.	Toothache	0	1	1	0	0	1
36	<i>Ficus religiosa</i> L.	Tumor formation	0	0	0	1	0	1
37	<i>Ficus semicordata</i> Buch.-Ham ex Sm.	Boils	0	1	0	0	0	1

38	<i>Justicia adhatoda</i> L.	Fever	0	1	0	0	0	1
		Cough	0	1	0	0	0	1
39	<i>Mangifera indica</i> L.	Gastritis	0	1	0	1	1	1
		Diarrhoea	0	1	0	0	0	1
		Cooling agent	0	0	1	0	0	1
40	<i>Melia azederach</i> L.	Gastritis	1	0	1	0	0	2
		Constipation	1	0	0	0	0	1
41	<i>Mentha spicata</i> L.	Gastritis	0	0	1	1	0	2
		Cooling agent	1	1	0	0	0	2
42	<i>Mimosa pudica</i> L.	Anorexia	1	0	0	0	1	2
		Gastritis	0	1	0	0	0	1
		Stomach pain	0	0	1	0	0	1
		Dysentery	0	0	0	1	0	1
43	<i>Mirabilis jalapa</i> L.	Body pain	1	0	0	0	0	1
		Cooling agent	1	0	0	0	0	1
		Diarrhoea	1	0	0	0	0	1
		Waist pain	0	0	1	0	0	1
		Womem bleeding	0	0	0	1	0	1
44	<i>Nephrolepis auriculata</i> (L.) Trimen	Uterus prolapse	0	1	0	0	0	1
45	<i>Nicotiana tabacum</i> L.	Remove flea	1	0	0	0	0	1
		Remove leeches	0	1	0	0	0	1
		Worm infection	0	0	1	0	0	1
		Insecticide	0	0	0	1	0	1
46	<i>Nyctanthes arbortristis</i> L.	Sugar	1	0	0	0	0	1
		Coryza	0	0	0	1	0	1
		Fever	0	0	0	0	1	1
47	<i>Ocimum basilicum</i> L.	Throat pain	0	0	0	0	1	1
		Headache	0	1	0	0	0	1
		Cooling agent	1	0	0	0	0	1
48	<i>Ocimum tenuiflorum</i> L.	Pneumonia	0	0	0	0	1	1
		Fever	1	0	1	1	1	3
		Cold	0	0	1	1	0	2
		Cough	1	0	1	1	0	3
49	<i>Oroxylum indicum</i> (L.) Kurz	Typhoid	0	0	0	0	1	1
		Headache	0	0	0	0	1	1
		Wound	1	1	1	0	0	3

50	<i>Oxalis corniculata</i> L.	Sprain	0	0	0	0	0	1
		Joint pain	0	0	0	1	0	1
		Headache	0	0	1	0	0	1
		Fever	0	1	0	0	0	1
		Conjunctivites	1	0	0	0	0	1
51	<i>Phyllanthus emblica</i> L.	Gastritis	1	0	1	1	0	3
		Dandruff	1	0	0	0	0	1
52	<i>Phyllanthus parvifolius</i> Buch.-Ham. ex D. Don	Wound	0	1	1	0	0	2
		Boil	0	0	0	1	0	1
53	<i>Piper longum</i> L.	Fever	1	0	0	0	0	1
		Cough		1	1	1	1	5
		Gastritis	0	0	1	0	1	2
54	<i>Pogostemon benghalensis</i> (Burm .f.) Kuntze	Cold	1	1	0	0	1	3
		Cough	1	0	1	0	1	3
		Fever	1	0	0	0	1	2
		Headache	0	0	0	1	0	1
		Pneumonia	1	0	0	0	1	2
55	<i>Psidium guajava</i> L.	Dysentery	0	0	0	0	1	1
		Coryza	0	0	0	0	1	1
		Headache	0	0	0	0	1	1
		Pneumonia	0	0	0	1	0	1
		Diarrhoea	1	1	1	0	1	3
		Gastritis	1	0	0	0	0	1
56	<i>Rhus Javanica</i> L.	Diarrhoea	1	0	1	0	0	1
		Dysentery	0	0	0	0	1	1
57	<i>Rubus ellipticus</i> Sm.	Gastritis	0	0	1	0	1	2
		Dysentery	1	0	0	0	0	1
		Pneumonia	1	0	0	0	0	1
58	<i>Saccharum officinarum</i> L.	Jaundice	1	1	1	1	1	5
		Cooling agent	0	1	0	0	0	1
59	<i>Schima wallichii</i> (DC.) Korth	Scabies	1	0	0	0	0	1
		Burn	1	0	0	0	1	2
60	<i>Shorea robusta</i> Gaertn.	Dysentery	0	1	0	0	0	2
		Diarrhoea	0	1	0	0	1	2
		Gastritis	0	0	1	1	0	2
		Waist pain	1	0	0	0	0	1

61	<i>Spilanthes calva</i> DC.	Toothache	1	0	0	0	0	1
62		Abdominal pain	1	0	0	0	0	1
		Gastritis	0	1	0	1	0	2
		Headache	0	0	1	0	0	1
		Fever	0	0	1	0	0	1
		<i>Tectaria coadunata</i> (Wall. ex J.Sm.) C. Chr.	0	0	0	1	1	2
63	<i>Terminalia alata</i> Heyne ex Roth	Gastritis	1	0	0	0	0	1
64	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Gastritis	1	1	0	0	1	3
65	<i>Terminalia chebula</i> Retz.	Cough	1	0	0	1	1	3
		Gastritis	0	1	1	0	0	2
66	<i>Thallictrum</i> sp.	Cold	0	0	0	1	0	1
		Headache	0	0	0	1	0	1
		Fever	0	0	0	0	1	1
67	<i>Tinospora sinensis</i> (Lour.) Merr.	Typhoid	0	1	0	0	0	1
		Cooling agent	1	0	0	0	1	2
		Gastritis	0	0	1	1	0	2
68	<i>Vitex negundo</i> L.	Headache	0	0	0	1	0	1
		Coryza	0	0	0	0	1	2
69	<i>Zingiber officinale</i> Rosc.	Cold	1	0	0	0	1	2
		Cough	1	0	0	0	1	2
		Diarrhoea	0	1	0	0	0	1
70	<i>Zizyphus mauritiana</i> Lam.	Fever	0	0	1	0	0	1

Br.=Brahmin, Ta.=Tamang, Gu.=Gurung, Gh.=Ghale, Ka.=Kami, E.G.= Ethnic Group.

Appendix IV: Percentage of respondents in each ethnic/caste group using the Medicinal Plants for a common diseases /disorders and score Ethnographic validity for common medicinal use.

S.N.	Latin name	Origin of species	Diseases	Br.	Ta.	Gu.	Gh.	Ka	Mean Frequency	Eg. No	Ethnographic Validity	Ethnographic Validity Rank
1	<i>Aloe vera</i> (L.) Burm. f.	C	Burn	50	33.33	60	40	69.2	50.5	5	252.5	Very high
2	<i>Aloe vera</i> (L.) Burm. f.	C	cooling agent	66.66	40	40	0	61.53	41.63	4	166.52	High
3	<i>Artocarpus lakoocha</i> Wall. ex Roxb.	N	toothache	33.33	0	30	30	0	18.06	3	54.18	Low
4	<i>Artocarpus lakoocha</i> Wall. ex Roxb.	N	boils	25	13.33	20	0	0	11.66	3	34.98	Low
5	<i>Asparagus racemosus</i> Willd.	N	soap	0	26.66	0	50	23.07	19.94	3	59.82	Low
6	<i>Artemisia indica</i> Willd.	N	gastritis	83.33	0	80	0	69.2	47.5	3	142.5	High
7	<i>Azadirachata indica</i> A. Juss	C	fever	41.66	0	40	0	61.59	28.63	3	85.89	Low
8	<i>Bombax ceiba</i> L.	N	gastritis	66.66	13.33	0	0	38.46	23.69	3	71.07	Low
9	<i>Bombax ceiba</i> L.	N	cooling agent	16.66	20	0	0	30.75	13.48	3	40.44	Low
10	<i>Bombax ceiba</i> L.	N	gonorrhoea	33.33	13.33	30	0	0	15.33	3	45.99	Low
11	<i>Calortopis gigantea</i> (L.) Dryand.	N	sprain	75	20	60	0	46.15	40.23	4	160.92	High
12	<i>Carica papaya</i> L.	C	coolig agent	66.66	0	60	0	53.89	36.1	3	108.3	High
13	<i>Carica papaya</i> L.	C	jaundice	50	26.66	50	0	0	25.33	3	75.99	Low
14	<i>Centella asiatica</i> (L.) Urban	C	cooling agent	83.33	40	80	60	53.84	63.43	5	317.15	Very High
15	<i>Cheilanthes anceps</i> Blanford	N	gastritis	75	40	50	0	53.84	43.76	4	175.04	High
16	<i>Cissampelos pareira</i> L.	A	gastritis	83.33	53.33	60	0	69.23	53.17	4	212.68	Very high
17	<i>Cuscuta reflexa</i> Roxb.	N	jaundice	83.33	46.66	60	50	69.2	61.83	5	309.15	Very High
18	<i>Euphorbia royleana</i> Boiss	N	anorexia	33.33	20	30	20	30.76	26.78	5	133.9	High
19	<i>Mangifera indica</i> L.	C	gastritis	0	13.33	0	20	23.07	11.28	3	33.84	Low
20	<i>Ocimum tenuiflorum</i> L.	C	fever	66.66	0	50	30	0	29.33	3	87.99	Low

21	<i>Ocimum tenuiflorum</i> L.	C	cough	66.66	0	50	30	0	29.33	3	87.99	Low
22	<i>Phyllanthus emblica</i> L.	N	gastritis	50	0	40	50	0	28	3	84	Low
23	<i>Piper longum</i> L.	N	cough	58.33	20	30	60	23.07	38.28	5	191.4	High
24	<i>Pogostemon benghalensis</i> (Burm. f.)	N	cold	33.33	33.3	0	0	38.46	21.02	3	63.06	Low
25	<i>Pogostemon benghalensis</i> (Burm. f.)	N	cough	25	0	30	0	30.76	17.15	3	51.45	Low
26	<i>Psidium guajava</i> L.	C	diarrhoea	66.66	33.33	40	0	0	23.99	3	83.97	Low
27	<i>Saccharum officinarum</i> L.	C	jaundice	75	46.66	60	50	61.53	58.63	5	293.15	Very High
28	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	N	gastritis	58.33	26.66	0	0	38.46	24.69	3	74.07	Low
29	<i>Terminalia chebula</i> Retz.	N	cough	50	0	0	30	53.84	26.76	3	80.28	Low

Appendix V. Detail information on Medicinal plants of Manakamana VDC.

SN	Family	Scientific name	Local Name	community Name	English	Habit	Voucher no.	Category	Flowering	Fruiting	Distribution in world	Distribution in Nepal
1	Acanthaceae	<i>Justicia adhatoda</i> L.	Asuro		Vasaka	S		D	Dec-May	Jan-May	Subtropical Himalaya, India, Indo -China	WCE Tropical-subtropical
2	Amaranthaceae	<i>Achyranthes bidentata</i> Blume	Datiwan	Mlan mra (Ta.)	Prickly chaff flower	H	78	D	Jul-Nov	Sep-Dec	Tropical Africa, India, China, Malaysia	CE, Tropical Temperate
3	Amaranthaceae	<i>Amaranthus spinosus</i> L.	Banlunde		Spiny amaranth	H	85	D	Evergreen	Evergreen	Pantropical	WCE Tropical-subtropical
4	Anacardiaceae	<i>Mangifera indica</i> L.	Aanp		X Mango	T		D	Feb-March	June	Tropical Himalaya, Myanmar, Indonesia. Cultivated in Tropic.	WCE, Tropical

5	Anacardiaceae	<i>Rhus javanica</i> L.	Bhakke amilo	Tipru		T	62	D				
6	Apiaceae	<i>Eryngium foetidum</i> L.	Kandedhaniya			H		D			widespread in Tropics of old and new world	CE, Tropical-subtropical
7	Apocynaceae	<i>Alstonia scholaris</i> (L.) R. Br.	Chhatiban		Dita bark	T		D	Aug-Oct		Tropical Asia, Myanmar, Malaysia, Australia, Philippines, Africa.	WCE, Tropical
8	Araceae	<i>Acorus calamus</i> L.	Bojho		Calamus, Sweet flag	H		M	Mar-Jun	Jun-Sep	Temperate, North Hemisphere	CE, Tropical Temperate
9	Araceae	<i>Colocasia esculenta</i> (L.) Schott	Karkalo		Co-coyam, Torio	H		D			India, Srilanka; cultivated in hot countries	WCE Tropical-subtropical
10	Asclepiadaceae	<i>Calotropis gigantea</i> (L.) Dryand.	Aank		Giant milk weed	S	86	D	Feb-Jan	Apr-Jul	Bhutan, India, China, Malaysia	WCE, Tropical
11	Begoniaceae	<i>Begonia picta</i> Sm.	Magarkanchi			H		D	Sep	Sep		
12	Begoniaceae	<i>Oroxylum indicum</i> (L.) Kurz	Tatelo		English trumpet flower	T		D	Jul-Oct	Jul-Nov	Tropical Himalaya, India to west China, Malaysia, W and S China.	WCE Tropical-subtropical
13	Bombacaceae	<i>Bombax ceiba</i> L.	Simal		Silk cotton tree	T		D	Dec-Mar	Mar-Jun	Tropical Himalaya, India to W. China, Malaysia.	WCE, Tropical
14	Bromeliaceae	<i>Ananas comosus</i> (L.) Merr.	Bhuikatar		Pineapple	H		M			A native of Tropical America	WCE Tropical-

												subtropical
15	Cannabaceae	<i>Cannabis sativa</i> L.	Ganja	Sima (Ta.)	Indian hemp, Hemp	H	87	D	Jun- Oct	Jun-Nov	Probably native of C. Asia, cultivated in Tropical and Temperate area of world.	WCE, Tropical – Temperate
16	Caricaceae	<i>Carica papaya</i> L.	Mewa		Papaya	T		D			Cultivated through the Tropic	WCE Tropical-subtropical
17	Caryophyllaceae	<i>Drymaria</i> sp.	Abijalo			H	61	D				
18	Combretaceae	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Barro		Bastard myrobaln	T		D	Mar-July	Jul-Dec	Nepal, India, Srilanka, Myanmar, Thailand, Indo China, Malaysia	WCE Tropical-subtropical
19	Combretaceae	<i>Terminalia chebula</i> Retz.	Harro	Araba (Ta.)	Chebula myrobaln	T		D	Mar-July	Jul-Oct	Himalaya (Uttar Pradash to Nepal) India, Srilanka, Myanmar	WCE Tropical-subtropical
20	Compositae	<i>Artemisia Indica</i> Willd.	Titepati	Chende (Ta.)	Mug-wort	H		D	Dec- Feb	Dec- Feb	Himalaya, India, Myanmar, Thailand, S. China	CE, Tropical – Temperate
21	Compositae	<i>Blumea lacera</i> (Burm.f.) DC.	Kurkure Ghans		Blumea	H	67	D	Jun		Africa, Asia, Pakistan, Nepal and China, Japan, Australia	CE, Tropical
22	Compositae	<i>Eclipta prostrata</i> (L.) L.	Bhairaj	Dambbi (Ta.)	False daisy	H	69	D	Sep		Tropical America	WCE Tropical-

												subtropical
23	Compositae	<i>Spilanthes calva</i> DC.	Marati	Gorakh pani (Ta.)		H	75	D	Jun		Himalaya, India, Myanmar, Malaysia	CE Tropical-subtropical
24	Convolvulaceae	<i>Cuscuta reflexa</i> Roxb.	Aakashbeli		Dodder	C	54	D	Oct		Afghanistan, N. India, Srilanka, Thailand, Malaysia	WCE Tropical-subtropical
25	Dipterocarpaceae	<i>Shorea robusta</i> Gaertn.	Sal	Jhising (Ta.)	Common sal	T		D	Feb-Apr	Apr-Jun	Subtropical Himalaya (Uttar Pradesh to Assam), India	WCE Tropical-subtropical
26	Dryopteridaceae	<i>Tectaria coadunata</i> (Wall. ex J.Sm.) C.Chr.	Kaloneuro	Haigani(Ta.)		H		D			India, Bhutan	WCE Tropical-subtropical
27	Euphorbiaceae	<i>Euphorbia hirta</i> L.	Dudejhar		Australian asthma herb	H	70	D	Most part of the year	Most part of the year	Pantropical	WCE Tropical-subtropical
28	Euphorbiaceae	<i>Euphorbia royleana</i> Boiss.	Siudi		Cactus spurze	S		D	Feb-Jan		Himalaya (Uttar Pradesh to Nepal)	WCE, Tropical – Temperate
29	Euphorbiaceae	<i>Phyllanthus emblica</i> L.	Amala	Ambale (Ta.)	Gooseberry	T		D	Mar-Jun	Sep-Feb	Himalaya (U.P. to Bhutan) NE China, N. Myanmar, Malaysia	WCE Tropical-subtropical
30	Euphorbiaceae	<i>Phyllanthus parvifolius</i> Buch. – Ham. ex D. Don	Khareto			H	82	D				

31	Fabaceae	<i>Bauhinia purpurea</i> L.	Tanki		Bauhinia, Ebony	T	63	D	Aug- Dec	Dec- Apr	Tropical Himalaya (Kashmir to Bhutan), India, SE Asia, S. & W China	WCE Tropical-subtropical
32	Fabaceae	<i>Bauhinia variegata</i> L.	Koiralo		Mountain ebony	T		D	Feb-Apr	Mar-Jun	Himalaya (Kashmir to Bhutan), India, Myanmar, China	WCE Tropical-subtropical
33	Fabaceae	<i>Cassia fistula</i> L.	Rajbrikshya		Casiapod	T		D	Mar-Jun		Widely cultivated in Africa, W. Asia. Himalaya, India, SE Asia.	WCE Tropical-subtropical
34	Fabaceae	<i>Mimosa pudica</i> L.	Lazzawati		Sensitive plant	H		D	May-Sep	Jul-Oct	Pantropical, native of tropical America	WCE Tropical-subtropical
35	Gramineae	<i>Saccharum officinarum</i> L.	Ukhu		Sugarcane	H		M			Widely cultivated thorough the Tropical countries	WCE Tropical-subtropical
36	Lamiaceae	<i>Mentha spicata</i> L.	Pudina		Mint, spearmint	H	88	D	May-Sep	Oct-Feb	Europe, Afghanistan, Himalaya (Kashmir to Nepal), China, widely cultivated	CE, Tropical – Temperate
37	Lamiaceae	<i>Ocimum basilium</i> L.	Babari		Sweet basil	H	73	D	Jun		Throughout the warmer parts of Asia, Africa, America, widely cultivated herb	WCE Tropical-subtropical

38	Lamiaceae	<i>Ocimum tenuiflorum</i> L.	Tulsi	Koshemra (Ta.)	Basil, sacred bush	H	65	D	Sep-Oct	Nov- Dec	SW Asia, Himalaya (Nepal), Bangladesh, India, Srilanka, China, often cultivated	WCE Tropical-subtropical
39	Lamiaceae	<i>Pogostemon benghalensis</i> (Burm.f.) Kuntze	Rudilo			H	58	D			Himalaya (Uttar Pradesh to Nepal), India	WCE Tropical-subtropical
40	Liliaceae	<i>Aloe vera</i> (L.) Burm. f.	Ghiukumari		Curacao aloe	H		M			Mediterranean and canary island, West indies, C. America and Asia	WCE Tropical-subtropical
41	Liliaceae (Asparagaceae)	<i>Asparagus racemosus</i> Willd.	Kurilo		Asparagus	H		D	May-Sep	Nov-Oct	Himalaya, Australia, Malaysia, Africa	WCE Tropical-subtropical
42	Meliaceae	<i>Azadirachta indica</i> A. Juss.	Neem		Neem margosa	T		D	Feb-Jul	Apr-Sep	Himalaya, India, widely cultivated	WCE, Tropical
43	Meliaceae	<i>Melia azedarach</i> L.	Bakaino		China-berry, Bead tree	T		D	Feb-May	Jun-Dec	Pantropical	WCE Tropical-subtropical
44	Menispermaceae	<i>Cissampelos pareira</i> L.	Batulpate		Velvet-leaf	C		D	Sep		Pantropical	WCE, Tropical – Temperate
45	Menispermaceae	<i>Tinospora sinensis</i> (Lour.) Merr.	Gujargano		Gulancharinospora	C		D	Apr- May	Jul-Oct	NE India, S India, Srilanka, Myanmar, Thailand, Vietnam, Malaya	WCE, Tropical

46	Moraceae	<i>Artocarpus lakoocha</i> Wall. ex Roxb.	Badahar		Monkey jack	T		D			Himalaya (U.P. to Bhutan), India, Srilanka, Myanmar, Malaysia	WCE Tropical-subtropical
47	Moraceae	<i>Ficus benghalensis</i> L.	Bar		Banyan tree	T		D			Pakistan, India, widely cultivated	WCE Tropical-subtropical
48	Moraceae	<i>Ficus religiosa</i> L.	Pipal		Peepal tree	T		D			Widely cultivated in India and S. Asia	WCE Tropical-subtropical
49	Moraceae	<i>Ficus semicordata</i> Buch.-Ham.ex Sm.	Khanayo		Fodder fig.	T		D			Himalaya (Nepal-Arunachal Pradesh), Indo-China, Malaysia	WCE Tropical-subtropical
50	Myrtaceae	<i>Cleistocalyx operculatus</i> (Roxb.) Merr. & Perry	Kyamuno	Lecheke (Ta.)		T	51	D		Jun	Subtropical Himalaya, NE India, Srilanka, Malaysia.	WCE Tropical-subtropical
51	Myrtaceae	<i>Psidium guajava</i> L.	Ambba		Guava	T		D	Mar-May	Oct-Feb	Tropical America, widely planted and naturalised in Tropical Asia	WCE Tropical-subtropical
52	Nephrolepidaceae	<i>Nephrolepis auriculata</i> (L.) Trimen	Paniamala	Ambale (Ta.)	Sword fern	H	56	P			Tropic and Sub-tropic of the world, India	WCE Tropical-subtropical
53	Nyctaginaceae	<i>Mirabilis jalapa</i> L.	Lankasani			H		D				WCE Tropical-subtropical

54	Oleaceae	<i>Nyctanthes arbortristis</i> L.	Parijat		Coral jasmine	T	89	D	Aug- Dec	Aug-Dec	Subtropical Himalaya, India, often cultivated.	WCE Tropical-subtropical
55	Oxalidaceae	<i>Oxalis corniculata</i> L.	Chariamilo		Indian sorrel	H	60	D	Evergreen	Evergreen	Almost cosmopolitan	WCE, Tropical – Temperate
56	Piperaceae	<i>Piper longum</i> L.	Pipla		Long pepper, piper	C	57	D	Jun-Oct	Sep-Jan	Himalaya (Nepal to Bhutan), India, Srilanka, Malaysia, Indonesia	WCE, Tropical
57	Pteridaceae	<i>Cheilanthes anceps</i> Blanford	Ranisinka	Pramji (Ta.)		H	50	P			India, Bhutan	WCE, Subtropical
58	Ranunculaceae	<i>Thalictrum</i> sp.	Dampate			H	71	D				
59	Rhamnaceae	<i>Zizyphus mauritiana</i> Lam.	Rukh bayar		Indian cherry plum	T	84	D	Jun-Sep	Aug-Jan	Tropical Asia, Australia, widely cultivated	WCE Tropical-subtropical
60	Rosaceae	<i>Rubus ellipticus</i> Sm.	Ainselu	Polang (Ta.)	Golden evergreen raspberry	S		D	Jan-May	Feb-Jun	Himalaya (Swat to Bhutan), NE India, Srilanka, Phillippines	WCE, Subtropical – Temperate
61	Rutaceae	<i>Aegle marmelos</i> (L.) Correa	Bel		Bael tree	T		D	Feb-Jun	Apr- Jul	Himalaya(Kashmir to Nepal), India, Myanmar, Malaysia	WCE Tropical-subtropical
62	Rutaceae	<i>Citrus limon</i> (L.) Burm.f.	Nibuwa		Lemon	T		D			India, China, Cultivated throughout the subtropic	WCE Tropical-subtropical

63	Saxifragaceae	<i>Bergenia ciliata</i> (Haw.) Sternb.	Pakhanved			H		D	Feb- Apr	May-Jun	Afghanistan, Himalaya (Kashmir to Bhutan), China, NE India	WC, Subtropical-Temperate
64	Solanaceae	<i>Datura metel</i> L.	Dhatura		Thorn apple	H	90	D	May-Jun	Jun- Sep	Tropical America, widely cultivated and naturalized elsewhere	WCE Tropical-subtropical
65	Solanaceae	<i>Nicotiana tabacum</i> L.	Surti		Tobacco	H	55	D	Jul	Jul	Tropical America, widely cultivated and naturalized elsewhere	WCE Tropical-subtropical
66	Theaceae	<i>Shima wallichii</i> (DC.) Korth.	Chilaune			T	92	D	Feb-Apr	Apr-Jun	Subtropical Himalaya (Uttar Pradesh to Assam), India	WCE, Tropical – Temperate
67	Umbelliferae	<i>Centella asiatica</i> (L.) Urb.	Ghodtapre		Water panny wort	H		D	Jan-Apr	Mar-Aug	widespread in Tropical and Subtropical regions.	WCE, Tropical – Temperate
68	Verbenaceae	<i>Vitex negundo</i> L.	Simali		Five leaved chaste tree	T	91	D	Mar- Oct		Himalaya (Nepal to Bhutan), Srilanka, China	WCE Tropical-subtropical
69	Zingiberaceae	<i>Curcuma amada</i> Roxb.	Besar			H		M				WCE Tropical-subtropical
70	Zingiberaceae	<i>Zingiber officinale</i> Rosc.	Aduwa			H		M	Aug-Nov	Sep-Nov		WCE Tropical-subtropical

Appendix VI:

A. Questionnaire

1. Name
2. Gender
3. Age
4. Locality
5. Literacy
6. Education
7. Occupation
8. Family members
9. Do you believe on traditional medicinal practice?
10. Do you use medicinal plants to cure illness?
11. Which parts of the plants are mostly used?
12. What are the diseases that you cure for?
13. How do you treat your patients?
14. Which plants do you use for treating each disease?
15. Can you please give the detail information on the preparation of traditional medicine by using different plants?

For the preparation of traditional medicine

- a. Name of diseases
- b. Symptoms of diseases
- c. Name of medicinal plants
- d. Detail on preparation of traditional medicine
 - Quantity of plant parts used
 - Condition of plant parts(e.g. whether fresh, dried)
 - Amount and name of other ingredients used
 - Mode of preparation
 - Forms of medication
(Decoction,powder,paste,juice,steam,liquid)
- e. Treatment Procedures
 - External use
 - Internal use

- Quantity of dose given
- Any special instruction (e.g. taken with milk, water etc.)
- Precaution during treatment (e.g. not to take oily/ spicy food etc.)
- Any side effects

16. Do you collect medicinal plants yourself?

17. Do you grow these plants?

18. What are the major localities of the medicinal plants?

19. What medicinal plants have you cultivated?

20. What are the highly traded medicinal plants from your area?

21. Do you use the medicinal plants for other purposes?

22. Do you conserve the plants?

B: Medicinal Use of Plants

Name:			Age:	Sex:	Ethnic/Caste Group:		Place:		Ward No.:	Date:		
S.N.	Scientific Name	Local Name		Use	Parts Use	Mode of Use	Habit	Place of collection	CollNo.	Altitude	Fl./Fr	Remarks
		Nepali	Vernacular									

C: Multiple uses of Medicinal Plants

Name			Age:	Sex:	Ethnic/Caste Group		place:		Ward No:		Date
S.N.	Scientific Name	Cultural	Medicinal	Edible	Fodder	Oil Extracts	Furniture	Handicraft	Firewood	Miscellaneous	

Appendix VII: Local equivalent of medical terms

S. N.	Medicinal terms	Local equivalent terms
1	Abortion	Bachha tuhaunu
2	Anorexia	Bhok nalagnu
3	Asthma	Dam badnu
4	B.P. High	Pressure badhnu
5	Bleeding (woman)	Sutkeri hunda dherai ragat bagnu
6	Body pain	Jiu dukhnu
7	Boils	pilo
8	Breast engorged	Thunilo
9	Broken part	Bhanchiyko bhag
10	Burns	Polnu
11	Cataract	Aakhama phulo parnu
12	Child sickness	Ketaketi byatha (Jwaro, Pakhala)
13	Cold	Sardi lagnu
14	Conjunctivitis	Ankha pakne
15	Cooling agent	Garmiko ausadhi
16	Coryza	Pinas
17	Cough	Khoki
18	Cuts	Katnu
19	Dandruff	Chaya
20	Diarrhoea	Pakhala lagnu
21	Dog bite	Kukurle toknu
22	Dysentery	Ragatmasi
23	Fever	Jawro
24	Fracture	Bhachinu
25	Gastritis	Ganu, Bayugola, Pet dhadinu
26	Gonorrhoea	Dhatu rog
27	Headache	Tauko dukhnu
28	Heart pain	Mutu dukhnu
29	Insecticide	Kira marnu

30	Jaundice	Pyale (Kamal pitta)
31	Joint pain	Jorni dhukhne
32	Lower abdominal pain	Tallo pet dukhne
33	Marasmus	Sukenas
34	Measles	Dadura
35	Mumps	Galphulo
36	Pneumonia	Pneumonia
37	Production of milk	Dudha badhaune
38	Retention of placenta	Sal najharne
39	Retention of urine	Pishab nahune
40	Rheumatism	Bath rog
41	Ring worm	Daad
42	Scabies	Luto
43	Skin allergy	Chhala chilaune
44	Soap making	Sabun banune
45	Sprain	Markeko
46	Stomach pain	Pet dukhnu
47	Sugar	Chini rog
48	Swelling	Suninu
49	Throat pain	Ghanti dukhnu
50	Toothache	Daant dukhnu
51	Typhoid	Gadeko jwaro, Kukhat
52	Uterus prolapse	Aang khasnu
53	Waist pain	Kammar dukhnu
54	Worm infection	Churna, juka parnu, mate
55	Wound	Ghau, Khatira

Appendix VIII: Conceptual framework of study

