Original Article

Ethnobotanical Exploration of Wild Plants for The Treatment of Fever in Hamirpur District, Himachal Pradesh, India

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Abstract

An ethno-botanical survey was conducted to identify the medicinal plants in Hamirpur District, Himachal Pradesh, concerned the treatment of fever. The informants of rural area were intervened through semi-structured questionnaire. 1366 citations were made for 73 plant species belonging to 31 families for the treatment of fever including malaria, typhoid, Dengue, Chikungunya and cold fever. Among them most of the plants were herbs (46%) followed by shrubs (29%), trees (20%), climbers (5%). In the study, families with maximum number of species used in the treatment of fever comprises, Lamiaceae (12 Species), Malvaceae (6species), Fabaceae, Solanaceae and Acanthaceae (5 species), Amaranthaceae, Asteraceae (4species), Menispermaceae, Rutaceae (3 species), Anacardiaceae, Capparaceae, Meliaceae, and Oxalidaceae (2 species). The most common mode of administration is Decoction followed by Powder and others. On the basis of Use reports (citations) and Citation Frequency, most important and frequently used species are *Tinospora cordifolia*, *Swertia chirayata*, *Viola serpense*, *Withania somnifera*, *Adhatoda vasica*, *Azadirachta indica*, *Achyranthes aspera*, *Asparagus racemosus*, *Achyranthes bidentata*, *Murraya koenigii*, *Solanum nigrum*, *Aegle marmelos*, *Artemisia scoparia*, *Colebrookea oppositifolia*, *Pogostemon benghalensis*, *Ocimum basilicum*, *Acorus calamus*, *Fumaria indica*, *Aerva sanguinolenta*.

Keywords: Ethno-botanical, Fever, Informants, Citation, Medicinal

INTRODUCTION

Fever has been one of the most common problems facing by mankind in developing as well the developed countries. Fever is defined as an increase in body temperature above the normal range, which can be caused by a wide range of conditions, including microbial infection, where pyrogens released by the microorganism (bacteria or virus) act directly on the organum vasculosum laminae terminalis (OVLT) of the anterior hypothalamus, which provoke the body temperature (Walter et al., 2016). However, the endogenous release of pyrogens substance occurs in response to pathogenic protozoa life forms that use mosquitoes as their vectors. In India and other developing countries, the most common forms of fever are caused by the transmission of mosquito-borne vectors, particularly dengue fever and malaria (Bhatti et al., 2017; Saleh and Kamisah, 2020). According to World Health Organization (WHO), infectious diseases remain sixth largestest causes of deaths globally. Infectious disease is a persistent threat to human population (WHO,2021; Saleh and Kamisah, 2020). The recent global pandemic of COVID-19 has stimulated and renewed interest in discovering new therapies that act against fevers and fever-causing agents. WHO is working with research institution to screen the traditional medicine for the treatment of COVID-19 and continue its support to countries for the exploration of herbal drugs (WHO, 2020; Phumthum et al., 2021). Seeking curative drugs from plants is considered a rational approach for the development's synthetic derivatives of alkaloids from Cinchona, possibly contributing to patient recovery (Bhatti et al., 2017; Saleh and Kamisah, 2020). Whereas, the true function of fever recovery is unknown, it is expected that fever is part of an infection-fighting mechanism where the host's core body temperature increases to stress the pathogenic microbe (Walter et al.,2016). While fever is not itself regarded as life-threatening, it creates enough discomfort to become an obstruction to normal activities in society, leading to absences from places of work or study. Recently, data convey that societies spend a lot of money on doctors and at health centers, paying for prescribed treatments of fever caused by dengue, chikungunya, malarial, covid-19 fever in the last two or three years (Saleh and Kamisah, 2020).

Most of the indigenous people include tribal communities depend on medicinal flora for curing various diseases (Chand et al., 2017; Aziz et al., 2018) Traditional medicines have been playing a significant role in health care management since long especially in remote area (Bhardwaj and Seth, 2017; Nand and Naithani, 2018; Kumar et al.,2022). The utilization

continues today in rural population of developing countries totally depend for primary health care (Kant and Pandey 2022). In urban areas, plant-based drugs are still being used as an optional alternative to allopathic drugs (Bhatti et al., 2017). Preserving the knowledge of these alternative therapies is necessary because history demonstrates that modern medicines can be developed from plants. For example, the discovery of artemisinin aided in the recovery of millions of people from around the world infected with *Plasmodium falciparum* for which Tu You, was awarded half of the Nobel Prize in 2015 (Su and Miller, 2015).

The present study was conducted to explore ethno-botanical diversity and importance of local plants harnessing for medicinal purposes by the local people residing in the remote area or villages where modern facilities are poorly developed. These people are mainly depending upon plants to combat their daily needs (Bhatti et al., 2016, 2017; Kumar et al., 2022). According to World Health Organization more than 80% of world's population or 4.3 billion people of developing countries mainly rely upon the plant based medicines for curing different diseases (Bhatti et al., 2016; Kant and Pandey, 2022; Abhishek et al.,2020).

The main objective of this study is to collect information for curing different ailments utilized by local people and ethnic community especially, the Gujjar, inhabited in the Hamirpur district, Himachal Pradesh. These people therefore have a lot of traditional knowledge on the medicine of that particular area. Primary purpose of this study was to document and analyses traditional information associated with the medicinal plants that are used in managing fever problems by the indigenous or tribal people (Mostly Gujjar) and preserves this knowledge for the future generations. Moreover, because of the importance of medicinal plant use and lack of practical and scientific information regarding the plant's care, there is need to document the ethno-botanical and socio-ecological linkages before the traditional knowledge going to completely lost.

MATERIALS AND METHODS

Description of Site

The present work was undertaken at Hamirpur district Himachal Pradesh. The study area comprised of several villages of the district located at the south western part of Himachal Pradesh. It lies between 76°17'50" to 76°43'42" east longitudes and 31°24'48" to 31°53'35" north latitudes. It is covered by lower Himalayas; the elevation varies from 400 to 1100 meters. The district covers an area of 1118 km^2 of total geographical region of the state and it is bounded in the north by river Beas which separates from Kangra district and in the east, Bakar and Seer Khads separates from Mandi district, whereas in the south, it is bounded by Bilaspur district and in the west by Una district. It is the smallest district of Himachal Pradesh. It is also known as "Martyr's Land" (Veer Bhumi). Extensive field surveys were carried out in sub-divisions Nadaun, Barsar, Hamirpur, Bhoranj and Sujanpur Tira in Himachal for the collection of ethno-botanical information.

Socio-demographic characters of the informants

A total of 1720 informants were face to face interviewed, of which 1069 were males and 651 were females.1366 citations were made regarding the plant species use in fever treatment. Data collected from these resources were employed to analyze different indices to validate our research work. For example, Citation Frequency and Use reports (Citation) respectively.

RESULT AND DISCUSSION

It was revealed from the collected information that there were numerous plants species used by the locals to cure fever diseases. Data were firstly screened for the use of plants in the treatment of different types of fever including malarial fever, typhoid and dengue, respectively (Table 1). The informants reported 73 plant species belonging to 31 families, maximum species belonged to family Lamiaceae (12 Species) followed by Malvaceae (6 species each), Fabaceae, Solanaceae and Acanthaceae (5 species each), Amaranthaceae and Asteraceae (4 species each), Menispermaceae, and Rutaceae (3 species each) and Anacardiaceae, Capparaceae, Meliaceae, and Oxalidaceae (2 species) (Figure 1). Among them most of the plants were herbs (46%) followed by shrubs (29%), trees (20%), and climbers (5%) (Figure 2). These plant species were cited about 1366 times by different informants. It means that each species has been cited 18.71 for the treatment of fever.

Table 1 Plant species used for various types of fever by the local people.

Sr. No.	Name of plant species	Family	Part used	Mode of Administration
1.	*Abelmoschous crinitus* Wall.	Malvaceae	Root & Leaf	Root and leaves are boiled in water till 1/4 left, 20-30 ml orally taken two times a day till recovery.
2.	*Abutilon indicum* (L.) Sweet	Malvaceae	WP	Leaves or whole plant extract is taken 1/4 cup given two times daily
3.	*Achyranthus aspera* L.	Amaranthaceae	WP	Boiled in sufficient amount of water, 20-25 ml is taken two times daily for 4-5 days. Root crushed boiled in water and taken orally.
4.	*Achyranthus bidentata* Bl.	Acanthaceae	WP	Boiled in sufficient amount of water, then it about 20-25 ml is taken two times daily for 4-5 days. Root crushed then boiled in water and taken orally.
5.	*Aconitum heterophyllum* Wall	Ranunculaceae	Root	Root powder 5-10 g twice a daily till recovery

6.	*Acorus calamus* L.	Acoraceae	Rhizome	Rhizoid in decoction or powder form about 20-25 ml or 5-10 g mixed small amount of jaggery in case of child, given orally two times till recovery. Massage the dried powder with Sesame oil in black fever or fever in ladies after delivery.
7.	*Adhatodam vasica* L.	Acanthaceae	Leaf, Root	Leaves decoction about 25-30 ml. mixed 2-3 black pepper powder, given orally two or three times. Root powder 5-10 g may be taken for relief in fever. Root crushed kept in water overnight and filtrate is taken empty stomach in morning.
8.	*Adina cordifolia* Benth & Hook	Rubiaceae	Bark	Decoction of bark about 30-40 ml is given twice a day orally for 3-4 days or till recovery.
9.	*Aegle marmelos* Correa	Rutaceae	Leaf & Bark	Leaf and bark decoction or fruit shake (Sharbat) is administered in fever.
10.	*Aerva sanguinolenta* L.	Amaranthaceae	Flowers	Flowers decoction 20-25 ml is taken orally.
11.	*Ajuga bracteosa* Wall	Lamiaceae	WP	Whole plant extract is given directly in all type of fever.
12.	*Ajuga parviflora* Benth.	Lamiaceae	WP	Whole plant extract is given directly in all type of fevers.
13.	*Alternanthera sessilis* (L.) R.Br. Ex DC	Amaranthaceae	WP	Decoction 20-25 ml two times a day in fever.
14.	*Andrographis paniculata* (Burn f.) Wall.	Acanthaceae	Leaf	Leaves of *Andrographis panniculata* along with leaves of *Ocimum sanctum*, *Adhatoda vasica* are boiled under low flame till 1/4 left. This decoction about 20-25 ml is taken twice daily for three to four days.
15.	*Artemisia scoparia* Waldst. & Kit.	Asteraceae	WAP	Powder of aerial parts like inflorescences, leaves is used for massaging the whole body to lower down the fever, Decoction is also taken orally
16.	*Asparagus racemosus* Willd	Asparagaceae	Root & Leaf	Root powder 5-10 gm. with water or milk is taken twice daily for 4-5 days or till recovery.
17.	*Azadirachta indica* A. Juss	Meliaceae	Leaf	Fresh leaves 4-5 in numbers along with 3-4 seeds of black pepper is taken with water in empty stomach in morning.
18.	*Barleria cristata* L.	Acanthaceae	WP	Roots and leaves are used to treat fever.
19.	*Barleria prionitis* L.	Acanthaceae	WP	Whole plant is boiled in sufficient amount of water till it becomes 1/4 , added Black pepper powder, then taken 20-25 ml two times daily till recovery.
20.	*Bauhinia racemosa* Lam.	Fabaceae	Bark, Leaf	Bark or leaf decoction 20-25 ml is taken two times for 4-5 days after meal.
21.	*Berberis aristata* D.C.	Berberidaceae	Root and stem,	Rasaut is taken, Bark and root in small pieces, crushed, kept in water overnight and taken in empty stomach in morning.
22.	*Boerhavia diffusa* L.	Nyctaginaceae	WP	Fresh aerial parts are used in the form of decoction, mixed small amount of black pepper and then taken 25 ml twice daily for 4-5 days.
23.	*Caesalpinia bonduc* (L.) Roxb.	Fabaceae	Leaf,	Leaves decoction 20-25 ml, two times daily.
24.	*Caesalpinia sapiaria* Roxb.	Fabaceae	Seed	Seed powder 5-10 g. two times daily.
25.	*Cedrela toona* Roxb ex. Willd.	Meliaceae	Bark & Leaf	Bark or leaf boiled in water till 1/4 left and it is taken two to three times daily till recovery.
26.	*Cleome viscosa* L.	Capparaceae	WP (Hulhul)	Powder or decoction of whole plant taken 2 to 3 times daily.
27.	*Clerodendron infortunatum* Gaertn.	Lamiaceae	Leaf	Leaf extract or juice 1/2 cup is taken two times daily for three to four days.
28.	*Clerodendron phlomidis* L.f.	Lamiaceae	Leaf	Leaf extract or juice 1/2 cup is taken two times daily for three to four days.
29.	*Cocculus pendulus* (Forsk) Diels	Menispermaceae	Root	Root powder 5-10 g with water, taken two times daily for 4-5 days or till recovery.
30.	*Colebrookea oppositifolia* Smith	Lamiaceae	Leaf	Leaves of *Colebrookea*, *Adhatoda*, *Murraya*, *Vitex negundo* boiled in water till 1/4 left and then added sufficient amount of jaggery and taken two times daily till recovery.
31.	*Crataeva religiosa* Hook.	Capparaceae	Leaf & Bark	Leaves and bark decoction is used orally.
32.	*Cynodon dactylon* (L.) Pers.	Poaceae	WP	Whole plant is boiled in sufficient amount of water under low flame till it becomes 1/4 of its volume, then added few amounts of Black pepper powder and taken 20-25 ml twice a day daily.
33.	*Datura innoxia* Mill	Solanaceae	WP	Roots of Dhatura bound on the left wrist of man and right wrist of female with threads on vein for any kind of fever especially in typhoid.
34.	*Datura stramonium* L.	Solanaceae	Root	Roots of Dhatura bound on the left wrist of man and right wrist of female with threads on vein for any kind of fever especially in typhoid.
35.	*Desmodium gangeticum* (L.) DC.	Fabaceae	Root	Decoction of root is given orally.

36.	*Digera muricata* Mart.	Amaranthaceae	Leaf &Young shoot	Leaves extract or juice, one cup taken two times daily.
37.	*Evolvulus alsinoides* L.	Convolvulaceae	WP	Fresh juice extract of whole plant is taken two times.
38.	*Ficus palmata* Forssk.	Moraceae	Fruit	Fruit boiled in sufficient amount of water till it becomes 1/4 of its volume and taken empty stomach till recovery.
39.	*Fumeria indica* (Haussk) Pugsley.	Fumariaceae	WP	Whole plant of *Fumeria*, rhizome of *Swertia Chirayata* + tuber of *Cyprus rotundus*+, *Abelmoschus monihot*, 15 g of each with 10 g bhindi boiled in water till it becomes 1/4 of its volume, then taken 15-20 ml two times daily for 4-5 days.
40.	*Holarrhina antidysentrica* (L.) Wall	Apocynaceae	Bark & Seed	Powder or decoction of bark and seed taken orally twice a day.
41.	*Hyptis suaveolens* (L.) Poit	Lamiaceae	WP	Whole plant powder and decoction preparation is given orally.
42.	*Leucas aspera*	Lamiaceae	WP	Whole plant powder and decoction preparation is given orally.
43.	*Malvestrum coromandelianum* (Linn.) Garcke	Malvaceae	Leaf	Leaf decoction or powder.
44.	*Mangifera indica* L	Anacardiaceae	Fruit	Seed powder 5-10 g taken orally.
45.	*Murraya koenigii* Spreng.	Rutaceae	Leaf	Leaves of *Murraya, Vitis negundo, Adhatodavasica, Coolibrookia* boiled in sufficient amount of water till it becomes one fourth, then added few amounts (one pinch) of black pepper and taken orally till recovery.
46.	*Nepeta elliptica* Royle ex Benth	Lamiaceae	WP	Whole plant powder as well as decoction given orally.
47.	*Nepeta ruderalis* Buch Ham	Lamiaceae	WP	Whole plant powder and decoction preparation is given orally.
48.	*Nyctanthes arbor-tristris* L.	Oleaceae	Leaf	Leaves boiled in water till 1/4 left, added jaggery and then taken orally.
49.	*Ocimum basilicum* L.	Lamiaceae	WP	Leaves of *Ocimumbasilicum, O. sanctum* boiled and added small amount of pepper powder and jaggery in it and taken two times daily till recovery.
50.	*Origanum vulgare* L.	Lamiaceae	Leaf	Leaves of *Origanum vulgare*, O. *sanctum* boiled and added small amount of pepper powder and jaggery in it and taken two times daily till recovery.
51.	*Oxalis corniculata* L.	Oxalidaceae	WP	Decoction of WP about 25-30 ml is taken orally two times daily.
52.	*Oxalis latifolia* Kunth.	Oxalidaceae	WP	Decoction of WP about 25-30 ml is taken orally two times daily.
53.	*Physalis minima* L.	Solanaceae	WAP	Whole aerial plant is boiled in sufficient amount of water till 1/4 left added black pepper *(Piper nigrum)* powder and honey in it and then it is taken orally for 3-5 days.
54.	*Pistacia integerrima* Stewart.	Anacardiaceae	Gall	Decoction or powder of the gall is used to cure fever.
55.	*Pogostemon benghalensis* (Burm.f.) Kuntz.	Lamiaceae	Leaf & Root	Leaves and elaichi powder 5-10 g are taken with water orally. Root decoction along with powder of Black pepper *(Piper nigrum)* 20-25 ml taken two to three times daily till recovery for black fever.
56.	*Polygonum plebeium* R.Br.	Polygonaceae	WP	Whole plant decoction 20-25 ml is taken two times daily till recovery.
57.	*Putranjiva roxburghii* Wall.	Euphorbiaceae	Fruit &Bark	Powder of bark and fruit 5-10 g is taken two times daily orally with water.
58.	*Randia dumetorum* (Retz.) Poir	Rutaceae	Fruit	Fruit boiled in sufficient amount of water till it remained one fourth of its volume and then taken empty stomach (without meal) till recovery.
59.	*Rhynchostylis retusa* Blume	Orchidaceae	Leaf	Leaves are boiled in water till 1/4 left, added small amount of *Piper nigrum* and then it is taken two to three times daily till recovery.
60.	*Sida cordifolia* L.	Malvaceae	Root	Root powder or decoction is used in various types of fever.
61.	*Sida acuta* Burm.f.	Malvaceae	WP	Whole plant as decoction or in powdered form taken twice times daily till recovery.
62.	*Sidar hombifolia* L.	Malvaceae	WP	A decoction of whole plant of 20-25 ml taken orally for two to three times daily for 3-4 days.
63.	*Solanum erianthum* D. Don.	Solanaceae	Bark &Leaf	Leaf or bark decoction 20-25 ml and small amount of black pepper are added in it and then it taken two times daily.
64.	*Solanum nigrum* L.	Solanaceae	WAP	WAP decoction used to cure chronic fever.
65.	*Sonchus oleraceus* L.	Asteraceae	Leaf, Root	Leaf and root boiled in sufficient amount of water till it becomes 1/4 of its volume and then added jaggery in it and taken orally (20-25 ml) two or three times daily till recovery.
66.	*Sonchus arvensis* L.	Asteraceae	WP	Decoction of whole plant.

67.	*Sonchus asper* (L.) Hill.	Asteraceae	WP	Whole plant extract given directly for any kind of fever.
68.	*Stephania glabra* (Roxb.) Miers.	Menispermaceae	Tuber	Small pieces of tuber are freshly taken with water.
69.	*Swertia chirayata* Wall.	Gemlinaceae	Rhizoid	Decoction or powder form of rhizoids is given in various kind of fever.
70.	*Syzygium cumini* (L.) Skeels.	Myrtaceae	Bark, Leaf	Bark or leaves powder or decoction is taken two to three times daily till recovery.
71.	*Tamarindus indica* L.	Fabaceae	Bark,	Bark decoction 20-25 ml two to three times taken daily.
72.	*Terminalia arjuna* (Roxb.ex Dc.) Wight &Arn.	Combretaceae	Bark	Decoction or powder of bark about 20-25 ml or 5-10 g taken two to three times daily. Added 2-3 seed powder of pepper *(Piper nigrum)* and jaggery.
73.	*Tinospora cordifolia* (Wild.) Hook.f. &Thomson.	Menispermaceae	Stem & Leaf	Decoction or powder form of stem is given in various types of fever, Fresh stem crushed, kept in water overnight and then taken filtrate in empty stomach in morning daily till recovery.

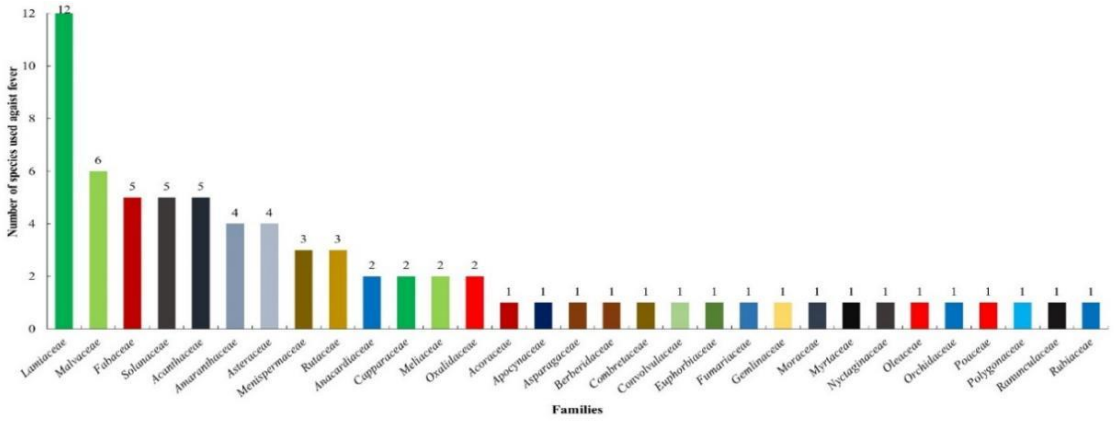

Figure 1. Family-wise number of Plant Species reported for the treatment of fever

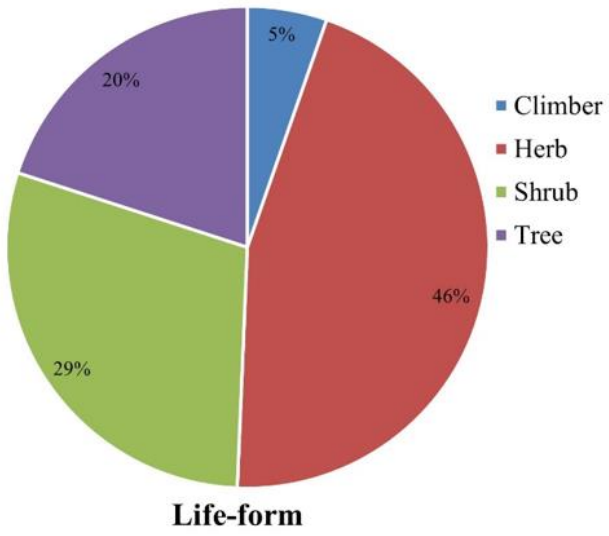

Figure 2. Various life forms of the recorded plant species

Based upon the citations (use reports) and Citations frequency estimation, *Tinospora cordifolia (48),* was found the most preferential species to cure fever followed by *Swertia chirayata (45), Vitex negundo (43), Viola serpense (45) Withania somnifera (38) Adhatoda vasica (38), Azadirachta indica (37), Achyranthes aspera (35) Asparagus racemosus (33) Achyranthes bidentata (33) Murraya koenigii (28), Solanum nigrum (28), Aegle marmelos (28), Artemisia scoparia (27) Colebrookea oppositifolia (27) Pogostemon benghalensis (27), Ocimum basilicum (26), Acorus calamus (23)* respectively and the lowest citations were made to *Nepeta ruderalis* (4) and *Tamarindus indica* (4) (Figure 3).The citation frequency of plant species for the treatment of fever by the local has also been mentioned (Figure 4). Our results are validated much more in agreement with several other reports (Saba Hasan,2014; Astuti et al., 2017; Bhatti et al., 2017, Sneha and Kant, 2022).

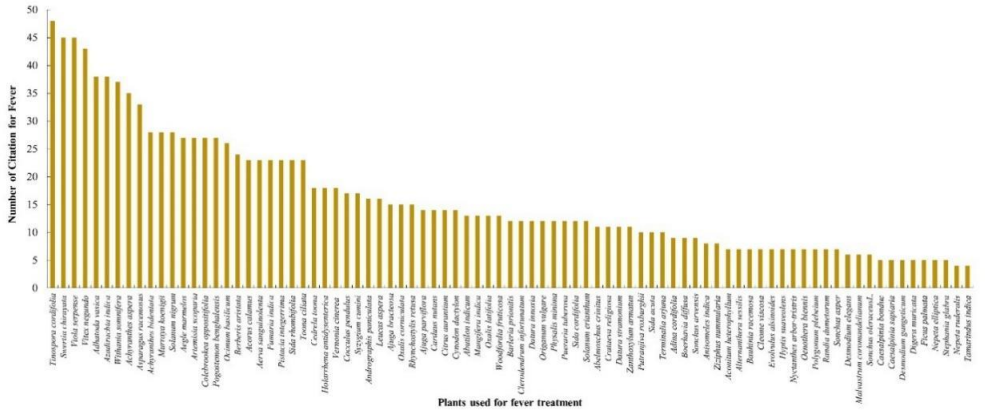

Figure 3 Number of citations made by the informants for plant species used to cure fever

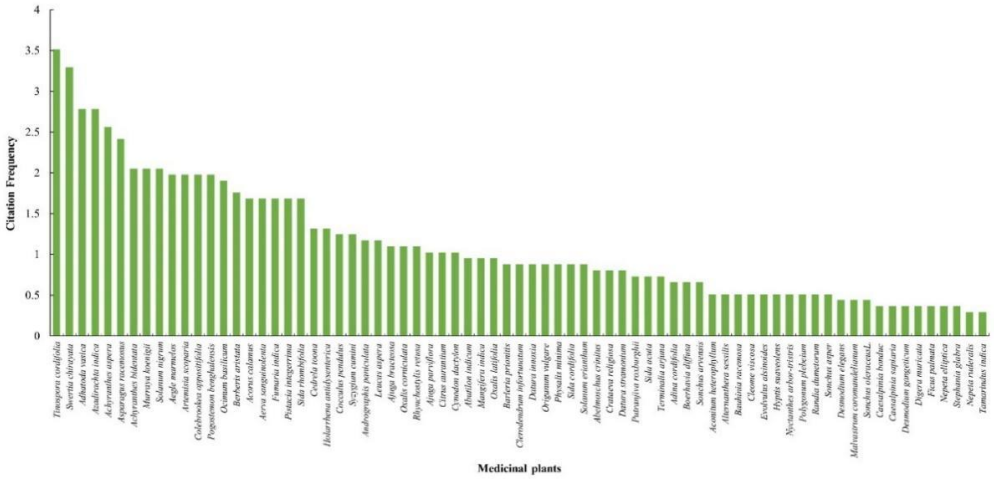

Figure 4. Citation Frequency of various plants species for fever treatment

FINDINGS

In the present study, some new uses of plant species for medicinal purposes have been recorded which were not reported yet. Root paste of *Carissa spinarum* is used in fever; leaves and flowers of *Calendula officinalis* used for the treatment of fever and Jaundice. Single plant species or in combination with others either in decoction or in powdered form are generally applied to cure ailments by the local people as well as provided by herbal healer(s)In most cases, the constituents of single plant is also used to cure multiple diseases (Ijinu et al.,2011; Bhatti et al.,2017; Chand et al., 2016), for example, *Achyranthes aspera* plant species is used cure fever, cold, cough, respiratory problems, heart problem, and tooth pain. (Gupta et al.,2010; Bhatti et al., 2017). Similarly, *Tinospora cordifolia* is used to cure fever, blood pressure, diabetes, tumor or cancer. *Andrographis paniculata* is used to cure malarial, typhoid and general fever (Chand et al., 2017).

In our study, we found that some local informants agreed that they use some particular plants in combination for treatment of a specific ailment. In general, there are many evidences given in the earlier literature as well as from scientific documents that combined form of a plant species can be a better and effective remedy for incurable ailments. Plants in combination of two or more plants are used to cure specific disease and they might be used to cure several diseases. On the other hand, many informants reported that two or more plants are used to cure same or specific disease, leaves of *Vitex negundo*, *Adhatoda vasica* and *Acorus calamus* are used in combination to cure diseases like fever, stomach problems, (Jeeva et al.,2007; Bhatti et al., 2017). These three plants are highlighted with full support by the local people who believe that nobody can die in the presence of these plants.

Preparation and formulation of medicines

In our study, it was observed that a major part of medicine preparation in India is plant based; therefore, substantial amount of plant sources has been utilized in pure form used as decoction, extract, powder, juice, ash, small pieces and raw. It was further observed that some plants products are commonly used with the preparation of drug of other plants for specific use such as *Piper nigrum* (black pepper powder), *Elettaria cardamomum*, *Trachyspermum ammi*, *Piper longa* were added for base and good application (Shah et al., 2015; Chand et al., 2016; Jima et al., 2018). For example, rhizome powder of *Acorus calamus* mixed with powder of *Artemisia scoparia* in *Brassica campestris* (mustard) or *Sesamum indicum* (sesame) oil is used for massage in case of fever, joint pain and arthritis.

In the study area, majority of the remedies were prepared from fresh parts of medicinal plants followed by dried form and some plant parts are used either in fresh or dried from. Most used part for the preparation of medicine is leaf followed by whole plant, bark, root and other parts (Figure 5). The dependency of people on fresh materials is due to more effectiveness of medicinal plants to cure specific disease in the treatment as contents are not lost before drying.

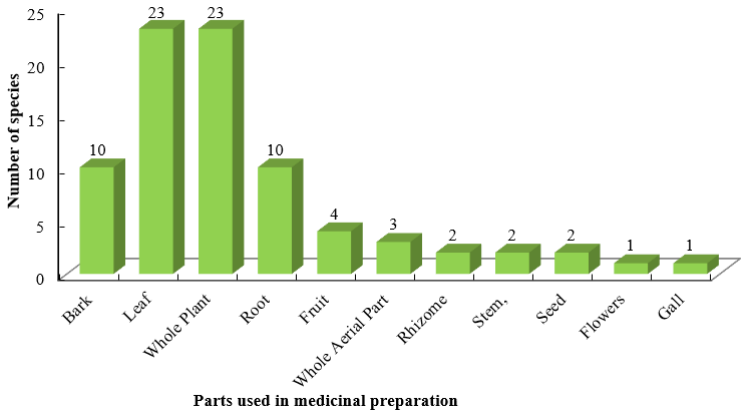

Figure 5. Contribution of plants parts in the preparation of fever medicine.

The various methods of preparations were adopted by the local communities as it is also based upon the different type of diseases. The principal methods of remedy preparations were 51% plants used in form of decoction followed by powder (42%) and other form fresh extract, and juice (7%) given for the treatment of fevers (Figure 6), rest with other forms. Jima and Megersa (2018), conducted study on ethnomedicinal aspects in Berbere District, Bale Zone of Oromia Regional State, South East Ethiopia, where in they found that crushing accounted for (38.5%) followed by pounding (18.8%), powdering (14.6%), squeezing (10.4%) and others.

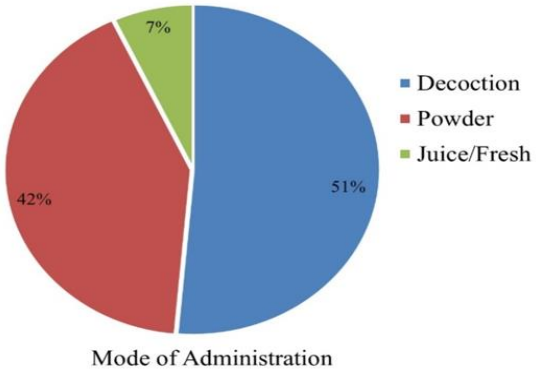

Figure 6. Various modes of Administration used orally for curing fever

5 CONCLUSIONS

In this study, we found that selected sites at Hamirpur district are rich in wild flora having vast diversity of ethno-medicinal plants. The meeting with the local people or villagers revealed that the uses of plants are in hands of limited peoples who keep the knowledge of the plants on secrets. Even they do not disclose this information to his/her whole family members, but they pass it to the selected members of the family and other also. So, the information pertaining to the uses and applications for different ailments are in the hand of some Sianas or old peoples (those people must be head of the family or group). However, young generation is not well aware about the utilization of these plants and also not willing to accept or keep such information for future generation. Hence the information of their uses is not uniformly distributed among the peoples.

In conclusion, we collected total 73 plants belonging to 31 families, most of them were wild in nature but useful for several purposes including fever. For examples, *Tinospora cordifolia, Swertia chirayata, Viola serpense, Withania somnifera, Adhatoda vasica,* and *Azadirachta indica* are being used to general disability, fever, pneumonia, malarial fever, typhoid fever and dengue fever.

Present study may provide an array and new hope to screen suitable medicinal plant species having with medicinal properties to synthesize new drugs for curing diseases. Furthermore, conducting such study is urgently needed to document all those species existing in the remote areas have not been explored and documented yet. Moreover, this study could be act as backbone information to understand people- plants relationships with respect to its local climate under socio-ecological dimension.

Author's Contribution

RCB, and H.B., have written the original draft of the research paper, S.K., S.H., reviewed and edited it. A.N.S. and C.N., have assessed the data and validated it finalize it for publication.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationship that could have appeared to influence the work reported in this paper.

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