

An analytical ethnobotanical survey-study and its contribution to ‘Amchi System’ of Spiti valley, India

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This review paper provides an updated overview on the importance of the traditional healthcare system in tribal communities of the Spiti Valley (Himachal Pradesh) in the cold deserts of the Western Himalayas. Existing studies have justified a strong connection of tribals with nature as their livelihood depends on the resources from wild. In Spiti valley, the local health practitioners, known as ‘Amchi’, utilize native flora with therapeutic potential to treat a variety of ailments. The traditional repository of ancestral knowledge and practices as well as exploitation of Himalayan resources by emerging industrial sectors has been extensively documented. Consequently, the disappearance of wild flora has led to a decline in Amchi profession. This has drawn the global attention towards preserving and conserving indigenous communities’ knowledge *i.e.*, ITK. Hence, this review aims to compile the ethnobotanical vernacular database on the existing health-care system through a survey to present an updated overview of the current status of the Amchi system in Spiti Valley. The study also presents a comprehensive analysis of ethnobotanical approaches, including descriptive and qualitative databases, that serve as a foundation for further quantitative analysis, and it highlights awareness on the status and conservation of indigenous traditional knowledge (ITK) emphasizing its critical role in sustaining Himalayan health-care practices.

Keywords: Amchi, Cold desert, Healthcare system, Herbs, Medicinal and aromatic plants (MAPs)

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Himachal Pradesh, a state in the north of the Indian subcontinent, encompasses about 17% of the Western Himalayan region. Its cold desert biome represents its vital biodiversity as a hotspot¹ in terms of unique flora and fauna covers approximately 11,000 km square area² and varies in terms of climate zones ranging from 3000 to 5000 m above mean sea level (amsl), with cold-temperate to alpine-temperate to glacial temperate zone³. Previous articles have documented approximately 18000 floral species⁴, with characteristics of sparse habitat, dwarf in growth, though floristically rich in diversity and distinctiveness. The Spiti valley lies between the Kunzom-La range in the northwest to Khab-Sangam in the southeast, where Spiti river merge with Satluj. The valley has received the UNESCO recognition of India’s first ever ‘Cold Desert Biosphere Reserve’ in September, 2025 at 37th MAB-ICC meeting in Hangzhou, China and become 13th Biosphere Reserve of Nation-India. The region is blessed with rare

medicinal and fragrant flowering plants; about 1,750 plant species have been documented⁵, having medicinal properties. Traditionally, 1600 Himalayan plant species were used to cure various ailments⁶ while aromatic/fragrant plants as an important part of pooja rituals. Amchi, the local doctor or *vaid*, has harnessed the therapeutic potential of Himalayan herbs, by successive refinement of knowledge inherited from their ancestors.

Through an ethnobotanical survey, researchers collect information on the traditional uses and cultural significance of plants to the local community. The resultant study encourages researchers to continue searching for herbal remedies explored and practiced by indigenous communities. Development in pharmaceutical sector, as well as accessibility to the Himalayan region has amplified the risk of illegal extraction and biopiracy by outsiders. The decline in the practice of Amchi medicine as a profession in the Himalayas can be attributed to various factors such as emergence of Western lifestyles, instant accessibility as well as results of allopathic medicines and the

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growing apathy of younger generations to tradition⁷. The preservation and documentation of information regarding this valuable traditional knowledge is crucial to prevent its irreplaceable loss⁸. Literature surveyed by various pioneer researchers presents a diversity of ethnomedicinal information on status of cold desert trans-Himalayan flora⁹⁻²¹ with respect to their vernacular usages with different formulations.

Methodology

The floristic status changes over time under the influence of various factors such as climate or weather variations, ecological succession, modernization, developmental activities, and tourism. This dynamic scenario cannot be fully captured at a single point, as it continues to evolve. Therefore, ethnobotanists and other interested researchers must consistently update the status and further share these changes to carry out pivotal action for preservation or conservation strategies that suit prevailing conditions. To explore the current situation of the Himalayan medicine tradition, knowledgeable local respondents across the valley have been included.

Study area

First, the biogeographical features of the study area were examined, including the locations of both clustered as well as scattered communities. In Spiti valley, folk practitioners- 'Amchi', still exist, serving patients where village population ranges from 50 to 800 inhabitants. The scarce population is due to harsh climatic condition of valley where winter temperature touches below -30°C during January and February. To obtain unfabricated information on the status and ethnomedical usage of medicinal and aromatic plants (MAPs), a field survey was conducted over a period of two consecutive years across 15 different scattered villages of Spiti Valley. About 12 professionals Amchi were identified out of a total of 45 respondents from Gue, Hurling, Poh, Tabo, Khurik, Chicham, Kibber, Demul, Sagnam and Mudh villages from Pin Valley, Rangrik, Kee, Losar, Hansa Rama-Lalung with altitude ranges from 3000 to 4200 m above mean sea level (amsl). This information about existing practitioners of above-named villages has been compiled in this survey for the first time. For the survey, structured questionnaires, interviews and participatory reviews were employed, including ethnobotanical as well as socioeconomic aspects, as per Martin (2010)²².

First phase of ethnobotanical survey

In 2023, preliminary survey meetings were conducted with fourteen tribal informants which included six practitioners belonging to the 'Bhoti' ethnic group along with eight other village members. The raw data were compiled and discussed with local *jadi-booti* experts (herbalists); and educated-farmers for clarification and simplification. Literature relevant to assigned objectives was mined from various sources; previous studies based on the cold desert region were categorized and critically cross-checked. Nonetheless, ethnobotanical survey data were compiled based on conversational interviews. The local herbs were identified, specified and studied for their vernacular identity and usage. Furthermore, classification/botanical description of cold desert flora was explored using taxonomical protocols. The prepared semi-structured questionnaire was refined in response to the collective input during visits and finalized for the next phase of the survey, aimed at obtaining more precise information.

Second phase of ethnobotanical survey

The second-year survey was resumed in the first week of April 2024, when 90% of the Spitians had returned after winter migration from both within and outside the state. A total of 45 respondents were interviewed, including the previous six consulted Amchi practitioners (during the second meeting). The follow-up ethnobotanical survey was facilitated by an assistant-a local linguist who acted as a mediator to help understand the Bhoti dialect and fill the gaps identified during first-year conversations. Information was gathered through general discussions; village-wise data was compiled in sequence for further analysis, and ambiguous responses were cross-checked as certain sayings and interpretations varied among different respondents. During winter, collected information was reviewed and verified by comparing statements across multiple sources, and was documented to develop an authentic and reliable database.

Sources used

In the present study, verbal information/facts were noted down; images/videos were captured using phone recording devices. Additional written information derived from the texts were kept by Amchi with themselves. The folk-medicine products, specimens and remedial plant parts procured from them as generous faith gift. Plant samples

were dried pressed on herbarium sheet without disturbing phyllotaxis. Same were identified through monographs, photograph source and taxonomic description available online on internet *i.e.*, Plants of world online-Kew, World Flora Online (website: <http://www.worldfloraonline.org>), eFlora of India-<https://efloraofindia.com/>, GBIF-Global Biodiversity Information Facility <https://www.gbif.org/> were sited. Book named 'Tibetan Medicinal Plants' (Tsewang, 1994) helped to explore the Tibetan Medicine system and linkage with 'Spiti Amchi System'. The extracted taxonomical identifications were confirmed from BSI, Dr. Y S Parmar, UHF Nauni Solan (HP). Identified as well as verified plant samples along remedial part were kept at RHRSS & KVK Tabo (Lahaul & Spiti) for record and exhibitions.

Data analysis

Quantitative ethnobotanical indices, such as the Informant Consensus Factor (ICF), Relative Frequency of Citation (RFC), Use Value (UV), Diversity of Uses -Shannon index (H'), Shannon Equitability Index (E_H) & Diversity Index were calculated using formulas (given below) on Microsoft excel based as per responses from 45 informants as well as ailment categories (Table 1 & Table 2).

Informant Consensus Factor (ICF)^{23,24}

The ICF indicates the degree of agreement among respondents regarding plant use for various ailments. Calculations were performed for 12 primary ailments commonly treated with ethnomedicinal herbs.

The formula is:

$$ICF = (NSU - NPU) / (NSU - 1)$$

Where:

- NSU = Total number of use reports for each ailment category
- NPU = Number of plant species used for the category

The ICF values ranges from (0-1), when ICF values are near zero (0) or low which depicts that the plants have been chosen randomly or if there is no exchange of information about their use among informants. Another, if ICF score approaches one (1), this depicts that information has been exchanged between informants or there is high agreement between them²⁵.

Relative frequency of citation (RFC)

$$NPU / \text{Total no. of respondents/informants (R)}$$

Use value (UV)

$$\text{No. of different plant uses (NU) / Total no. of respondents/informants (R)}$$

Diversity of uses

Shannon index to ailment categories- It is applied to disease categories to measure the diversity and evenness of diagnoses within a population/dataset. Evenness is a measure of species abundance or the proportion that each species comprises of the whole. It ranges from zero to no theoretical limit, though ranges 1.5 and 3.5 in ecological studies; higher number indicates a larger diversity of species and a more even distribution among categories.

The formula for the Shannon index (H') is:

$$H' = - \sum_{i=1}^R p_i \ln(p_i)$$

Shannon Equitability Index (E_H)

$$\text{Shannon index (H')} \times \text{No. of total species (s)}$$

Table 1 — ICF (Informant consensus factor) and Relative Frequency of Citation (RFC) values based on agreement on different Ailments using local plant species mentioned above

S. No.	Ailments category (Illness name in Bhoti)	Number of Reports for Same Use (NSU)	Number of Reports for Same Plant (NPU)	Informant Consensus Factor (ICF)	Relative Frequency of Citation (RFC)
1	Fever (<i>Niphachi</i>)	15	12	0.21	0.26
2	Nausea/vomiting (<i>Khimchil</i>)	10	9	0.11	0.20
3	Respiratory Problems (<i>Uhtuk</i>)	8	6	0.29	0.13
4	Gastrointestinal diseases (<i>Sh-hmer</i>)	15	9	0.43	0.20
5	Reproductive	18	8	0.59	0.17
6	Itching/infections (<i>See-tuk</i>)	13	7	0.50	0.15
7	Skin/Hair diseases (<i>Shah-situk</i>)	10	6	0.44	0.13
8	Cold, dry/old cough (<i>Naasham/Lutpa</i>)	18	15	0.18	0.33
9	Different body aches (<i>Sukshar</i>)	16	10	0.40	0.22
10	Awakening consciousness	8	4	0.57	0.08
11	Sensitivity/Allergy	11	6	0.50	0.13
12	Medico religious	8	8	0.00	0.17

Shannon Equitability Index (E_H)

$$1.06 \times \log(43) = 1.73$$

Principal component analysis (PCA)

PCA analysis has been carried out for calculating covariance between Number of different plants uses (NU) and the Index of Agreement on local Species (IAS) using online Principal Component Analysis

Table 2 — IAS (Index of Agreement on Species) value based on respondents' familiarity with various plant uses and their use value (UV) in Spiti valley

SN	Plants mentioned by Amchi (in Bhoti)	No. of different plant uses (NU)	Index of Agreement on local Plant Species (IAS)	Use Value (UV) = (NU/R)
1	Angpolakpa	8	0.86	0.178
2	Ban-kakdi	4	0.73	0.089
3	Ban-karela	4	0.63	0.089
4	Brahm-kamal	5	0.79	0.111
5	Burse	6	0.76	0.133
6	Changma	6	0.88	0.133
7	Charma/Tirku	8	0.92	0.178
8	Chaumpa	5	0.82	0.111
9	Chaura/Sapal	8	0.76	0.178
10	Dhup/Shukpa	5	0.90	0.111
11	Yerr/Bathu	7	0.79	0.156
12	Gatikpa	7	0.75	0.156
13	Gyman	5	0.93	0.111
14	Heypommo	7	0.84	0.156
15	Himalayan Chirayata	5	0.64	0.111
16	Himalayan Geranium	5	0.69	0.111
17	Himalayan Jatamansi	6	0.83	0.133
18	Hoppus	5	0.87	0.111
19	Jangli Pudhina	8	0.84	0.178
20	Karru	7	0.86	0.156
21	Kichu	5	0.64	0.111
22	Kuth	6	0.83	0.133
23	Kutki	7	0.87	0.156
24	Leechu	9	0.82	0.200
25	Manu	7	0.68	0.156
26	Pashakha	4	0.67	0.089
27	Patish	8	0.67	0.178
28	Pheelu	3	0.82	0.067
29	Pognok	8	0.81	0.178
30	Ratanjot	6	0.89	0.133
31	Ruchua	3	0.78	0.067
32	Rutokpa	8	0.84	0.178
33	Shatag-sha/cheepchi	4	0.84	0.089
34	Shiamindu	6	0.83	0.133
35	Shirshe-menthok	7	0.68	0.156
36	Shurr	4	0.79	0.089
37	Somlata/Chhe	8	0.89	0.178
38	Themma	4	0.87	0.089
39	Thuklung	6	0.89	0.133
40	Tikta	8	0.79	0.178
41	Wild Garlic/Chause	8	0.91	0.178
42	Wild Jeera/Mao	8	0.79	0.178
43	Yange	5	0.86	0.111

Calculator Scree plot. The same have been used for PCA analysis for dependent patients and seasonal visit to Amchi.

Results**Demographic characteristics of respondents**

The respondents were interviewed using the questionnaire (Fig. 1), and their details as well as authenticity have been verified by the village authorities -Pardhan/Lambardhar/Panchayat Secretary of Spiti villages. Among the 45 respondents, 12 were village Amchi, 5 were assistant traditional healers or family members, 4 were herbalists and the remaining were elderly indigenous people. The majority of interviewees were male, except three elder women belonging to Amchi family. Twelve practicing this health-care practice as professionals, along with Poojan/Lama/Pundit, were between 50 and 80 years of age (Supplementary Table S1). Most of them responded in a low tone using the ethnic dialect - 'Bhoti.' To accurately interpret and collect ethnobotanical information, a translator with a strong understanding of the subject and the respective dialect assisted in this survey. Popular professional healers were from Pin Valley, Gue, Hurling, Poh, Khurik, Chicham, Kibber, Hansa, and they received regular visits from community members seeking treatment. Out of the 12 Amchi, only five members of next generation were interested in continuing the family profession, while others showed inclination toward formal education, business and jobs indicating a noticeable decline in the practice of Amchi profession. Their livelihoods and household family earnings primarily depend on the preparation of local medicines. Potential seasonal herbs are being identified and collected from wild (hilltops-dongharies) during June to October. Collected herbal parts are key sources of medicines used in treatments against various illnesses and cure²⁶ in the traditional system.

Collection time frequency

The optimum time for herbs collection/extraction from wild, pronounced by respondents is between June to September month. The best collection month is August with highest value (0.68), when whole plant starts blooming and reaches maturity stage. It is recommended that targeted parts of herbs must be extracted in autumn season when vegetative phase shifts to dormancy. For collection of herbaceous part, Amchi preferred June and July when bloom stage is at peak and can be identified easily by new healers.



Fig 2 — (a) A natural patch Himalayan/local gyamn/laot – *Allium carolinianum* Redouté. at Demul village, (b) Traditional boiled cuisine, (c) Ethnobotanical survey visit, (d) Mixture of raw herbs, (e) Planto-religious belief

jaundice, asthma, awakening consciousness, joint pain/muscular spasm, skin/hair problems/infection etc. are treated with ethnomedicines. Local practitioners, prepare medicines formulations in the forms of powder (chooran), tablets, decoction, tincture (external purposes), paste etc. Earlier formulations were kept in *bhedu-Khal* (fine sanded sheep skin). However, due to shrinkage with time, Amchi prefer to kept in plastic durable boxes. For patients, folk medicines are served in *puddiya* (crushed medicine folded in white paper) or in small vials, recommending advices for administration like doses/timing/combinations, etc over it (hardly seen in printed newspapers, possible to avoid contamination).

In this study, no phyto-chemical analysis was done on above mentioned plants and uses. Most of the aged Amchi interacted in their local dialect and described prominent plants such as Tikta or Karru which are bitter in taste, Zima which are thorny and woody while ponkhar/bonker was described as a white flower herb with two extended roots. They usually recognized plant species with same genera and referred them with single vernacular name due to

similar general appearance, only differentiating by flower colour or different familiar medicinal uses they know. Amchi compared the flowers of ‘Tikta’ and ‘Karru’ as white-blue hue as the sky, botanically as *Gentiana algida* Pall. and *Gentiana kurroo* Royle., respectively. Both Tikta (Spangan mentok in Bhoti) and ‘Karru’ are of the same genera ‘*Gentiana*’ of Gentian family having medicinal properties in their bitter roots. They also mentioned *Tikta-Skandha* & *Dravya* (by Charaka Samhita) and their role in the treatment of bones mentioned in Science of Life- ‘*Ayurveda*’.

Data analytical tables and graphical representations

The ICF with values above 0.40 depicts frequent consultation for ailments such as unconsciousness with epilepsy, gastrointestinal diseases, body aches like elderly bone and joint pains, skin diseases/allergies/body itching, respiratory problems in elders and reproductive problems, etc. Among all ailment categories, Reproductive (0.59), Awakening consciousness (0.57), Allergy/Itching (0.50) are most agreed/consensus with their respective herbs. ICF with the least value like cold, dry/old cough, fever,

nausea/vomiting etc are treated easily by tribal community with household remedies using local herbs having diverse uses and among them species selection has greater variation. Overall, the mean ICF is 0.35, which defines that there is moderate consensus among overall informants/respondents (45) during the ethnobotanical survey of Spiti valley. The higher RFC value indicates that plant used for respective ailments are widely recognized, such as for fever, vomiting, gastrointestinal diseases, different body aches etc and low RFC value have less frequent citation among informants.

The value for the Index of Agreement on Species (IAS), have been quantified from respondents familiar in using the local medicinal plants in their health-care system. The highest value represents the common daily use and familiarity with local species. Plants like Tirku, Chause, Shukpa (a medicinal and aromatic tree for incense purpose) having IAS score more than 90 (> 90) have been usually found to sold locally within community due to high demand among locals.

Additionally, mean Use Value (UV) observed is 0.136, the plants with higher the UV above >0.170 such as Angpolakpa, Charma/Tirku, Chaura/Sapal, Jangli Pudhina, Leechu, Patish, Pognok, Rutokpa, Somlata/Chhe, Tikta, Wild Garlic/Chause, Wild Jeera/Mao have significance in their varietal local ethnomedicine uses. The poisonous plants which are not preferred by animals or unpalatable have toxicity effects, such as Locoweed (*Oxytropis* spp.), Thuklang (*Hyocymus niger* L.), Somlata (*Ephedra* spp.), Patish (*Aconitum* spp.), Losaan (*Delphinium* spp.) etc. should be use cautiously under the strict guidance or supervision of professional only.

Principle component analysis (PCA) between number of different plants uses (NU) and the index of agreement on local species (IAS)

On analysing PCA plotting graph (Fig. 3.) significant variation with negligible clustering of different medicinal plants shows the difference in their traditional way of usage/consumption. The variation in PC-1 and PC-2 was 59.5% and 40.5%,

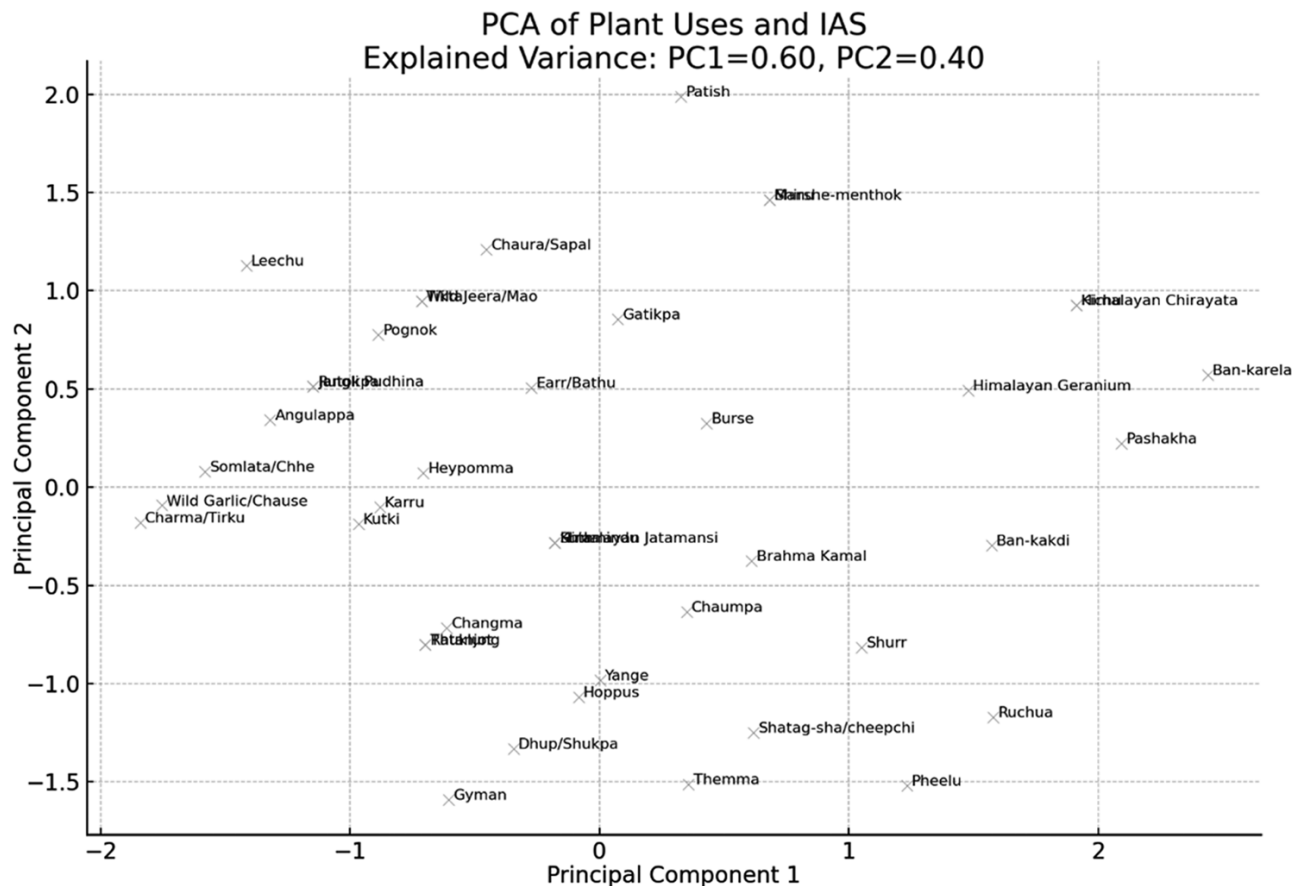


Fig. 3 — Principal Component Analysis (PCA) graph

respectively, after reducing the dimensional representation by differentiating the plants/herbs in a 2-D graphical analysis according to the combination of IAS with their consumption/use count. This shows valley has vast knowledge on ethnobotany and within the valley, there is no unified traditional practice that varies among the Amchi of different villages of Spiti Valley. Plants like Changma, Chharma, Gyman, Shukpa, Karru, Kutki are enormously popular with the community in respect to daily usage for different purposes. In the graph, these plants have acquired a negative value, indicating an inverse relationship with the principal components, with variations of 59.5% and 40.5% around the respective components.

Diversity index

Shannon index to ailment categories

After the analysis, the Shannon index (H') observed is 1.06 (Supplementary Table S2) which is moderated, for the diversity of medicinal plant uses based on the frequency of use reports per ailment category. This depicts the moderate diversity of medicinal plant across the mentioned ailments in categories. Though Amchi are specialised in their respective practices, their combinations and distribution of plant use is uneven.

Shannon Equitability Index (E_H): $1.06 \times \log(43) = 1.73$, (E_H) shows the evenness in plant knowledge distribution in Amchi system, indicating that knowledge distribution is fair but not evenly distributed among the practitioners across the Valley. Amchi have compiled knowledge through old Tibetan texts/literatures they had kept with themselves as an important source or instructional guide received from their mentor. During the survey, it was found that different Amchi have different mentor as 'Guru' and their learning/practices varies.

The compound formulations prepared by Amchi are preferred over raw form as they are considered safe. Their formulation methods, preparation, mixings are varied, unscientific and not unified over the valley as it varies due to verbal transfer of method by different instructors. However, some of the drug combinations mentioned by one Amchi may be opposed by others. For instance, one suggests dried roots of Angpolakpa (*Dactylorhiza hatagirea* (D. Don) Soo) as a rich source of vitamins and nutrition, whereas other recommended it to enhance overall body immunity. Similarly, a *chooran* - powdery form of medicine, contains ground powder ingredient of

mixed herbs for the treatment of various ailments (not mentioned specifically) such *Akar-soma/Songha* where 'Akar' means wood (significant amount of dried/fragrant wood) and 'songha' means thirty-fives (35), another is *Tikta-yarnga** is combination of 25 herbs where bitter Tikta (*Gentiana spp.*) is the main ingredient with highest quantity among other 24 herbs part. Similarly 'Chauru-yarnga' where *chauru* mean Amla (Indian-gooseberry) as main among 25 combined herbs recommended to patient to balance the high blood pressure. Some herbs are more effective when used in combination²⁷ and synergetic effect for multipurpose ailments are achieved by formulation of raw forms of herbs (Table 3).

**Tikta-yarnga* includes the below mentioned herbs, their Tibetan names have been described by professional Amchi belongs to the village Hurling, Spiti (L&S).

Tikta+Sirmae+Chirshun+Thunhunay+Chiche+Kiche+Ponkhar+Aaru+Yati+Ruta+Gundhum+Chungam+Shimer+Attang+Khurkum+Takshwin+Pashakha+Lishi+Honglen+Sandup+ Sugmel/Pibling+Kakala+Shukshur+Karru+Chhini (sugar) – for balancing the human blood pressure.

A mixture of eight herbs including roots, leaves, flower, wood- *Gaiyang + Saldan larbo (wood)+ Gurkum + Dhuwang* (Yellow-white flower colored plant) + *Honglen + Bobha-karwo* (root part) + blue coloured *Tikta* flower (*Gentiana spp.*) + *Vanapsa (Viola odorata L.)* – as an energy booster to enhance body immunity by using it with milk. Another respondent describes formulation utility during jaundice, dry cough, and to treat cold infection. Some of the unidentified herbs mentioned in Bhoti or Tibetan language were *Mantok-takga, Loma, Baltheek, Ta-sse, Gitika, Cheerakpa, Pognok* of white flower, *Gympe-mendok, Pherna*, green algae-*Chhubel* used by their ancestors, having medicinal potential.

PCA analysis for dependent patients and seasonal visit to Amchi (in Percentage) (Fig. 4)

Mudh & Sagnam (Pin-Valley), Losar, Kibber, Rama-Lalung villages have more dependent patients in the active season, and their Amchis' have plant-resource allocation and medicines for patients during winters when valley roads are closed. They have different kinds of health-care dependency for visiting patients, but accessibility within the same village or panchayat. The above-mentioned villages still have belief in the traditional practices of their

health-care system. These villages are far-extreme sides situated in valley and are more scattered in the fragile cold desert.

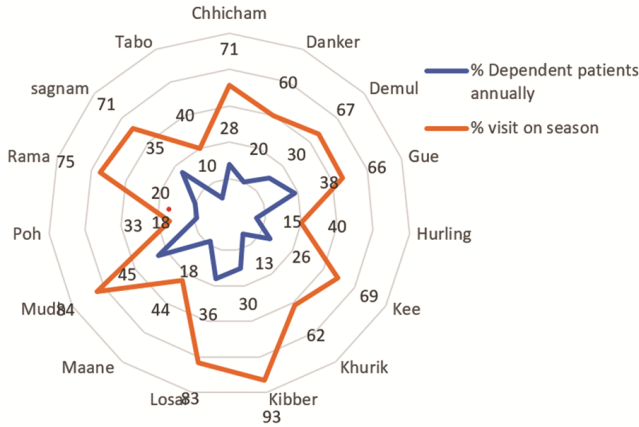


Fig. 4 — Graphical representation of the percentage consultation in different villages

Current scenario of Amchi system of Spiti Valley

The legacy of the Indigenous medicine system with herbal usage is on wane, and is surviving with the grandparent generation. It has become apparent during the survey that only the elderly and cannot afford hospitals, have no access to health-care facilities, and tried allopathic treatment without any success, come to see the local healers. Earlier, this tradition of preparing and using herbal medicines was passed down to next²⁸ kin or passionate students. In the rapidly evolving field of modern medicine, most people use synthetics-preferably OTC tablets, for instant relief. Nevertheless, because herbal medicines are safe, economical and have a natural aroma/flavor²⁹ people are returning to traditional drugs and increasingly prefer them for their fewer side effects. MAPs species diversity status is dwindling in wild and this truth is very concerning as well as alarming

Table 3 — Some of combinations specific to investigated area-Spiti valley, mentioned by respondents during survey visits

Combinations	Application for the described treatment
Kuth roots oil + Manu roots powder (<i>Saussurea costus</i> (Falc.) Lipsch. & <i>Inula racemosa</i>)	To treat deep wounds/bruises and reduce the chances of infection, Hot mixed oil massage to treat backache due to kapha dosha during winters
Kuth root oil + Chool/Chulli oil (<i>Saussurea costus</i> (Falc.) Lipsch. & <i>Prunus armeniaca</i> L. wild Apricot)	Relief from bone and joint pain/ Apricot kernel oil mixed with various oil to strengthen the body and treat skin diseases and infections
Chool/Chuli oil + Rutokpa seed oil (<i>Prunus armeniaca</i> L. + <i>Capparis spinosa</i> L.)	To treat muscular discomfort and reduce old bone and joint pain/ Mixture is considered to maintain the Vitamin-D and calcium requirement for bones/joints
Kuth oil + Jaiphal powder (nutmeg) (<i>Saussurea costus</i> (Falc.) Lipsch. & <i>Myristica fragrans</i>)	Treat skin infection and itching, treat joint pain in winters
Kuth oil + Seed of Singujeera (<i>Saussurea costus</i> (Falc.) Lipsch. + <i>Carum carvi</i> L.,)	Paste prepared from ground Singujeera seeds in warm Kuth oil to cure ear-ache.
Salampanja root powder + Shehadh/Dhoodh (<i>Dactylorhiza hatagirea</i> (D. Don) Soo & Honey/Milk)	Mixture called as <i>Mol-chaukpa</i> as immunity booster for new mothers as well as weak men to treat impotency
Tikta- <i>Gentiana</i> spp & curd	Bitter decoction of Tikta plant is mixed in curd to cure jaundice
Roots of <i>Aconitum heterophyllum</i> and <i>Withania somnifera</i> along with Champa-sa seed (<i>Malva verticillata</i> L.)	To get relief from kidney problems
Sapal+ Gurr (<i>Angelica glauca</i> Edgew + <i>Jaggery</i>)	To treat fever, cold/cough in winters
Ratanjot mixed in mustard oil/Chuli oil (<i>Arnebia euchroma</i> Royle ex Benth. & <i>Brassica juncea</i> L.)	Red dye of Ratanjot helps in maintaining black and long hairs
Somlata root/needles + Arjun Bark powder (<i>Ephedra gerardiana</i> Wall. ex Klotzsch & Garcke. & <i>Terminalia arjuna</i> Roxb. Ex DC.Wight & Arn.)	Treat cardiac and urinary muscles problems
Somlata root/needles powder + Shehadh (<i>Ephedra gerardiana</i> Wall. ex Klotzsch & Garcke & Honey)	To treat dry cough and breathing problems.
Phuntha + Honey+ water (Leaves of <i>Aster/Erigeron</i> spp - wild)	Old aged people used to sniff its burning powder through nostrils.
Hyssop or Shim-thingli + Themma (<i>Hyssopus officinalis</i> L. or <i>Dracocephalum officinale</i> & <i>Iris</i> spp.)	Antimicrobial activity to treat urine infection and if blood during urtication, Essential oil of leaves for flavouring local food
Raldhup + Shukpa leaves - Resin of <i>Canarium strictum</i> Roxb. & <i>Juniperus communis</i> L.) along with flowers of <i>Elaeagnus angustifolia</i> L.	Root paste to cure skin disease
Ealdang/Phurmong + Warm mustard oil (<i>Artemisia scoparia</i> Waldst. & Kit)	Incense mixture considered as powerful dhuni to make positive environment with cleansing surrounding air with aroma
	The oil is applied to cure ear and toothache

for the Himalayan ecosystem and indigenous tribals whose most of livelihood depends upon plant resources are undoubtedly insecure. Hence 70% inherited families are abandoning this traditional profession. This situation calls for immediate action to protect this profession based upon traditional knowledge for conserving invaluable natural resources. Participatory community awareness on Rapid Vulnerability Assessment (RVA) on biodiversity and indigenous traditional knowledge (ITK) training programs can foster heritage linkage among tribal communities to preserve nature-blessed cultural values on precious herbs. Follow-up activities can ignite young minds to sustain inherited practices under technological influence in changing climate scenario. Hence, documentation is important to address apprehensions with sincerity.

Conclusion

The over-all analysis of survey and indices highlights that valley has a rich repository of biocultural knowledge and traditional usage, the moderate evenness with Shannon–Wiener diversity index, displays the ecological adaptation of higher altitude disease with respect to ethno-medicinal diversity based on cultural significance and different frequency of occurrence of medicinal plants. Collectively, this shows the dynamic nature of healthcare-system with continuous knowledge transmission of local esoteric knowledge that must be contextualized in a scientific way with reported pieces of evidence to make it easier for everyone. It should not be based on philosophical and mythical beliefs as herbal formulations prepared by Amchis are important for survival and must be validated through clinical researches/studies. Hence, pharmacological methods have to be incorporated which could reveal the potential compounds as well as explore the efficacy of cocotions mentioned by local healers.

Supplementary Data

Supplementary data associated with this article is available in the electronic form at [https://nopr.niscpr.res.in/jinfo/ijtk/IJTK_24\(11\)\(2025\)1164-1174_SupplData.pdf](https://nopr.niscpr.res.in/jinfo/ijtk/IJTK_24(11)(2025)1164-1174_SupplData.pdf)

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Conflict of Interest

Authors declare that there is no conflict of interest.

Author Contributions

BD has role in survey studies, information compilation and writing the original draft, RSS has conceptualized the draft, IA for data analysis and pictorial representation, ID and RSC have reviewed the final script.

Disclaimer - Artificial Intelligence

The authors hereby declare that no generative AI (artificial intelligence) technology, like text-to-image generators and Large Language Models (ChatGPT, COPILOT, etc), was used in the writing or editing of papers.

Consent and Ethical Approval

The authors have fully observed ethical issues such as plagiarism, double publication and data manipulation.

Data Availability

The supporting data are available from the corresponding author upon reasonable request.

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