Ethnobotanical study of indigenous knowledge on medicinal plants used by the tribal communities in tehsil "Karnah" of District Kupwara (Jammu and Kashmir) India

Mohammad Asif, Shiekh Marifatul Haq, Umer Yaqoob, Musheerul Hassan and Hammad Ahmad Jan

Research

Abstract

Background: A fair amount of ethnobotanical knowledge of wild plant species is still held by the native people of the Himalayan mountainous region. The present study quantified the ethnobotanical usage of plants in a remote tehsil (Karnah) of district Kupwara, Jammu and Kashmir, evaluating the traditional medicinal plants use against various diseases.

Methods: This study was conducted in 2019 and 2020 to collect information regarding different ethnomedicinal uses of plant species growing in the region through questionnaires and semi-structured interviews. Multivariate ecological community analysis was used to find the relationship between ethnobotanical usage and plant species.

Results: Floristically, a total of 29 plant species belonging to 25 genera were used as medicine. Asteraceae was the largest family with 14% species. The results of preference analysis showed a significant difference in plant part usage (χ^2=70.587, df=9, p<0.001). The highest priority of local people was for leaves (38%). The most frequently usage was against stomach problems (20%). The dendrogram generated five distinctly separate clusters based on the usage of wild plant as traditional medicines against various diseases. A majority of the local people (81.33%) used traditional medicines and 49.23% regarded traditional medicines as always effective.

Conclusions: This study provides a useful self-care tool for the native people of the Kashmir Himalayas and other similar Himalayan mountainous region. Further, this study will help in developing scientifically-informed strategies for conservation of medicinal resources and sustainable use of plant diversity in this part of Himalayan region.

Keywords: Ethno-botanical usage; medicinal plants; *Hakeems*; Kashmir Himalayas

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خلاصہ

پس منظر: جنگلی پودوں کی پرجاتیوں کے نسلی علم کی کافی مقدار ابھی بھی ہمالیہ پہاڑی علاقے کے مقامی لوگوں کے ساتھ برقرار ہے۔ موجودہ مطالعے نے جموں وکشمیر کے ضلع کپواڑہ کی دور دراز تحصیل (کرناہ) میں پودوں کے نسلی استعمال کو متناسب قرار دیا ، اور مختلف بیماریوں کے خلاف روایتی دواؤں کے استعمال کی جانچ کی۔

طریقے: یہ مطالعہ 2019-2020 میں سوالنامے اور انٹرویوز کے ذریعہ خطے میں بڑھتی ہوئی پودوں کی نسل کے مختلف نسلی استعمال کے بارے میں معلومات اکٹھا کرنے کے لئے کیا گیا تھا۔ کثیر الثقافتی ماحولیاتی تجزیہ کا استعمال نسلی نباتاتی استعمال اور پودوں کی انواع کے درمیان رشتہ تلاش کرنے کے لئے کیا گیا تھا۔

نتائج: فلوریسٹکلی طور پر ، مجموعی طور پر 29 پودوں کی 25 نسلوں سے تعلق رکھنے والی انواع کی تحقیقات کی گئیں جو بطور دوا استعمال کی گئیں۔ ایسٹریسی 14 فیصد پرجاتیوں والا سب سے بڑا کنبہ تھا۔ ترجیحی تجزیہ کے نتائج نے پودوں کے حصے کے استعمال (=2 = 70.587، df = 9 ،0.001> p) میں نمایاں فرق ظاہر کیا۔ مقامی لوگوں کی سب سے زیادہ ترجیح پتیوں (38٪) کے لئے تھی۔ سب سے زیادہ استعمال پیٹ کے مسائل (20٪) کے خلاف تھا۔ ڈینڈرگرام نے مختلف بیماریوں کے خلاف روایتی دوائیوں کے طور پر جنگلی پودوں کے استعمال پر مبنی پانچ الگ الگ کلسٹر تیار کیے۔ مقامی لوگوں کی اکثریت (81.33٪) روایتی دوائیں استعمال کرتی ہے اور یہ بھی پتہ چلا ہے کہ (49.23٪) لوگ روایتی دوائیں ہمیشہ موثر ہوتے ہیں۔

نتیجہ: یہ مطالعہ کشمیری ہمالیہ اور اسی طرح کے ہمالیہ پہاڑی علاقے کے مقامی لوگوں کے نفیس نگہداشت کا ایک مفید آلہ فراہم کرتا ہے۔ مزید یہ کہ اس مطالعے سے ہمالیائی خطے کے اس حصے میں دواؤں کے وسائل کے تحفظ اور پودوں کی تنوع کے پائیدار استعمال کے لئے سائنسی طریقے سے باخبر حکمت عملی تیار کرنے میں مدد ملے گی۔

Background

Forests and wild plants are known to play an important role in meeting the health and nutritional necessities of people all over the world (Setalaphruk and Price 2007; Singh 2004). Wild herbs are found to play a significant role in the livelihood of tribal people (Jadhav *et al.* 2011). India, being world's second most populous country is characterized by having more than 75% of the population living in rural areas (https://censusindia.gov.in/2011census/population_enumeration.html) and a large chunk of these people depend on wild edibles and medicinal plants to meet their needs of food as well as medicines (Rashid *et al.* 2008). It is estimated that in India about 800 plant species are consumed as food and medicinal plants, chiefly by the tribal inhabitants (Med 2017).

Since prehistoric times, mankind all over the world have studied and practiced the utilization of plants growing in their surroundings for curing various diseases (Yuan *et al.* 2016; Sewell 2014). From ancient times, the Indians have been using local medicinal plants growing in their surrounding as indigenous drugs and have played a pioneering role in the evolution of modern medicinal allopathic and traditional systems (Kala *et al.* 2006). Ethno-medical practices are the basis of medicinal systems such as Siddha, Unani, Sowa-Rigpa, Ayurveda and even used in the allopathic system (Roy 2020). It is estimated by WHO that about four-fifth of people present in the developing regions are depending on plant derived medicines (World Health Organization 2003) and large populations of third world countries use these traditional due to their presence in their close vicinity (Allkin 2017). Manyost of the drugs utilized in the allopathic system originated from plant compounds (Aziz *et al.* 2017).

Ethnobotanical studies have depicted the vital association between the use of plants and tribal communities (Pieroni *et al.* 2002; Turner and Tjørve, 2005; Verpoorte *et al.* 2005; Singh and Lal 2008; Mahmood *et al.* 2011). Traditional knowledge is still passed from generation to generation, but cultural contact, accelerating land degradation, developmental activities and deforestation have resulted in migration of tribal populations from their homelands, and knowledge is slowly lost. The conservation of this treasured primordial information requires immediately documentation. Ethnobotanical surveys investigate how these plants resources are utilized as medicine, fuel wood, food, shelter, agriculture, timber, furniture, fodder and religious ceremonies (Khan *et al.* 2003).

This study represents the first quantitative ethnobotanical survey from this part of Himalayan region. It will help in developing scientifically-informed strategies for the conservation of natural resources and sustainable use of plant diversity in this part of Himalayan region.

Materials and Methods

Study area

The Himalayan Region of India is considered as one of the largest biodiversity hotspots of the world and occupies about 40% of the land area of India (Kumar *et al.* 2011). Karnah is a tehsil in Kupwara district of Jammu and Kashmir, India. Karnah is 180 km towards the north of Srinagar and about 80 km from district headquarters Kupwara, which lies at 34.39' N latitude and 73.86' E longitude (Fig.- 1). The altitude of the area ranges between 1380 to 3300 masl. Karnah has a population of 60129 as per census 2011. Languages spoken are Pahari, Gojjari and Kashmiri. About 70% of the population speaks Pahari, the rest speaks Gojjari and only two villages speak Kashmiri (Hajinar and Baghballa). Most of population of the area is Muslim except for one village (Terbondhiyan) which is Sikh. The average literacy rate of the area is 63.65% as per census 2011.

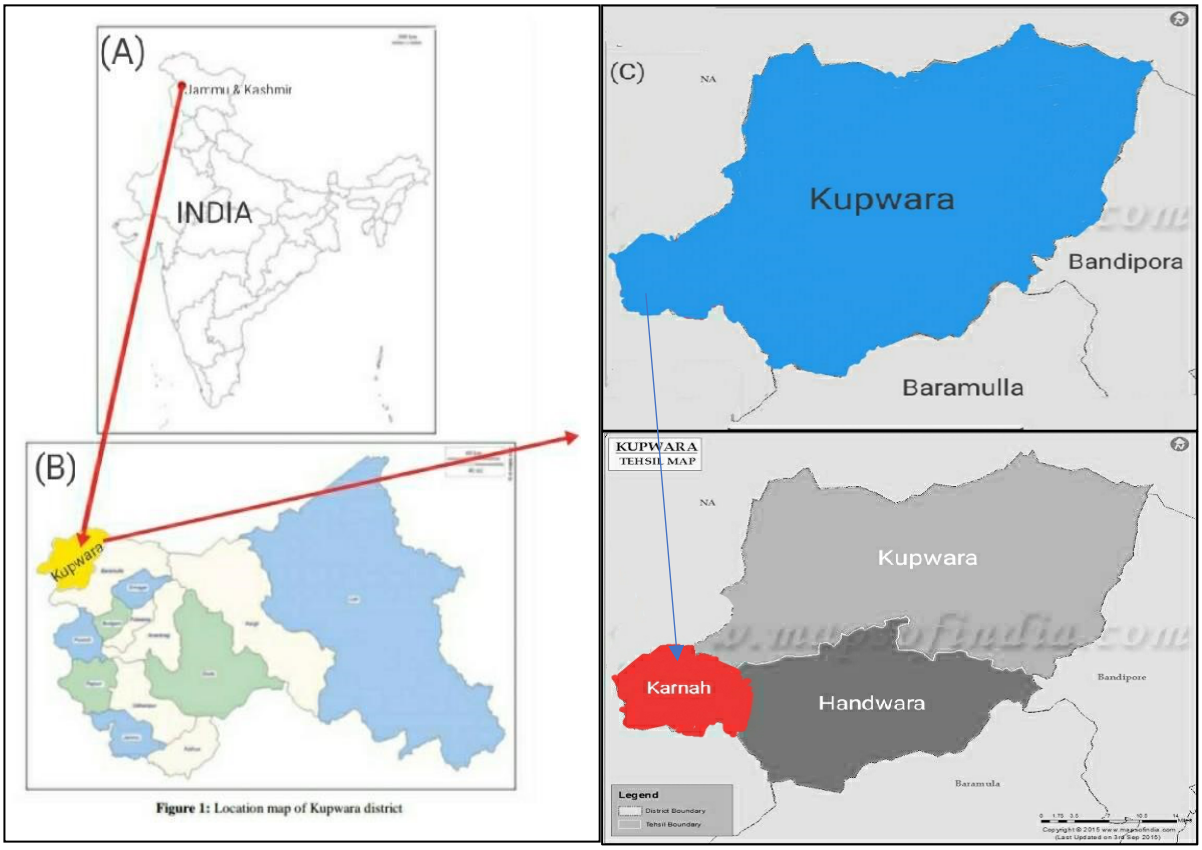

Fig. 1. Map of the study area

The region is located in the lap of Shamasbari and Kranu mountains of the lesser Himalayas. The climate in district Kupwara including tehsil Karnah is warm and humid. Kupwara has considerable precipitation throughout the year and is considered as Cfa (Humid subtropical climates or mild temperate climates) by Koppen and Geiger. In Kupwara the average annual temperature is 14.1˚C. Precipitation here average 843 mm (https://en.climate-data.org/asia/india/jammu-and-kashmir-751/) with well-defined four seasons in a year. It experiences pleasant weather from April to October with scanty rainfall and is thickly forested in the region. The region is rich in various economically important medicinal and aromatic plants like *Aconitum heterophyllum* Wall. ex Royle, *Bergenia ciliata* (Haw.) Sternb, *Aucklandia costus* Falc., and *Taxus wallichiana* Zucc.

Methodology

The present study is based on a carefully planned field survey. Representative villages (N=3) were visited during the year 2019 and 2020. The methodology was based on interviews using semi-structured and closed ended questionnaires and group discussions to document the local ethnobotanical knowledge on uses of plant resources (Khan *et al.* 2011; Abbas *et al.* 2017). The information was collected from diverse groups of the area, i.e. *Hakeems* (traditional doctors), hunters, herders and other common citizens like cultivators/agricultural laborers, skilled/semi-skilled workers, daily wage laborers, housewives, shopkeepers, Govt. employees and students. All interviews were conducted only after obtaining prior informed consent of the village heads, tribal leaders and individual informants, by explaining clearly the objectives of the study. The most important ethnic groups are the *Hakeems*, Gujjar/Barkawals and herders who are directly dependent on wild plant products for their livelihood. (Table 1). A local community member of these tribes who knew the norms and traditions of that indigenous society was taken as a guide. Informants were asked about the conventional uses of wild flora species, methods of preparation of ethnomedicinal recipes, performance of ethnomedicine against the disease. Informants were further asked about parts of flora used e.g., leaves, roots, bark, fruits, and flowers, etc. The field study was carried out in diverse age-sex groups (young, old and middle). Field-based personal observations, information from local informers and both formal and informal discussions were carried out for additional information.

Table 1. Demographic status of the respondents from the study area.

DEMOGRAPHIC FEATURES	NUMBER OF PEOPLE	PERCENTAGE
Bio-geographic areas	**610**	
Budwan	100	16.39
Baghballa	251	41.14
Nachiyian	259	42.45
Education		
Illiterate	372	60.98
Primary education	153	25.08
Secondary education	67	10.98
Higher education	18	2.95
Age range (Years)		
30-40	141	23.11
41-50	161	26.39
51-60	213	34.91
61-70	56	9.18
>70	39	6.39
Profession		
Cultivators/ Agricultural labourers	169	27.70
Daily wage laborers	115	18.85
Skilled/semi-skilled workers	78	12.78
Housewives	122	20.00
Shopkeepers	42	6.88
Students	31	5.08
Herders	35	5.73
Govt. employees	11	1.80
Hakeem's	7	1.14
Gender		
Male	413	67.70
Female	197	32.29

The Plant List and POWO 2019 (www.theplantlist.org; http://www.plantsoftheworldonline.org/) were used for the updated nomenclature of recorded species from study area. From each selected site, plant specimens were collected for the authentication and herbarium preparation. Plant specimens were identified using relevant taxonomic literature and with the help of taxonomists at Centre of Biodiversity and Taxonomy, University of Kashmir, Srinagar (J&K). Later the doubtful plants specimens were verified by deposited herbarium specimens at the Kashmir University Herbarium (KASH herbarium). After, incorporation of field data on herbarium sheets, the vouchers were deposited at KASH Herbarium.

Data analysis

Plant data were statistically analyzed to elucidate the relationship between ethnobotanical usage and plant species. The presence/absence (1/0) data were subjected to the classification of different ethnomedicinal differences and similarities among the diverse plant medicinal usage via PAST software (Hammer *et al.* 2001; Greig-Smith, 2010). Using this method, more similar groups come close to each other and dissimilar groups are shown as distant in the cluster from each other. Sørensen's (Bray-Curtis) distance was used to identify significant differences among the different ethnobotanical usage similarities (Sorensen, 1948; Dalirsefat *et al.* 2009). Principal Component Analysis (PCA) was done to visualize

the provisioning services and plant parts associations between plants using PAST software.

Results

Profile of respondents

We conducted interviews of 610 informants, of which 100 were from Budwan village, 297 from Baghballa and 313 from Nachiyian village of tehsil Karnah in Kupwara district. Out of the total informants interviewed, 413 (68%) were men and 197 (32%) were women . During our study, the respondents interviewed included cultivators/agricultural laborers (28%), housewives (20%), daily wage laborers (19%), skilled/semi-skilled workers (13%), shopkeepers (7%), herders (5%), students (5%), Govt. employees (2%) and Hakeems (1%). The age of the respondents ranged between 20 to 70 years. Most of the respondents belonged to age group 51-60 (34.91) followed by 31-40 (29%) 41-50 (27%), 61-70 (9.18) and lowest age respondents (7%) belong to 70 or above age group in the regions. More than half of the respondents were without formal education (45%), while most of those with education had merely primary (25%) followed by (11%) having education up to 10^{th} and least (3%) having higher education.

Vegetation composition and distribution

A total of 29 plant species belonging to 25 families were reported in the course of the study as shown in Table 2. The useful flora of the region can be classified into trees (7%), shrubs (17%), and herbs (76%). The species distribution across the 25 families was unequal; half of the species belonged to just 11 families while as the remaining half belonged to 14 families. A large number of families (22) were found to be represented by only one species, (Table 2). The dominant plant families included Asteraceae with 14% of the total species followed by Ranunculaceae (10%) of species. The details of reported plant species are given in Table 2 and Fig 2.

Plant part used

The results of preference analysis showed a significant difference in plant part usage (χ^2=70.587, df=9, p<0.001). The highest priority of local people was for leaves (37%) followed by roots (24%) and others having less than 10% of preference in show in Fig. 3. This fact is also supported by principal components analysis (PCA) analyses showed three distinct groups based on the variations in the preference levels of plant part usage. PC1 and PC2 explained 5.9% of similarity of plant parts in the biplot (Fig.4), in which specific groups of plant parts were more related to specific provisioning services than others. Roots and leaves were distinctly separated from each other, while other parts formd separate group (Fig.4).

Traditional medicines against various diseases

The most frequently cited usage of plants was against stomach problems (20%) followed by bone and joints (17%), cough, cold and fever (15% each) (Fig.5). Maximum (83%) of medicinal plants (*Aconitum heterophyllum* Wall. ex Royle*, Adiantum capillus-veneris* L, *Bergenia ciliate* (Haw.) Sternb. *Aucklandia costus* Falc., and *Taxus wallichiana* Zucc.) were used to cure single diseases, followed by (17%) of plants (e.g. *Anemone tschernjaewii* Regel, *Artemisia absinthium* L*, Rheum webbianum* Royle, *Rhododendron campanulatum* D. Don) used to cure more than one disease.

The dendrogram generated five distinctly separate clusters based on the usage of wild plant as traditional medicines against various diseases (Fig.6). The clusters that grouped in one limb are more similar in plant usage to cure these diseases. However, the cluster limb one and five displayed maximum dissimilarity with their neighbor clusters. Moreover, the similarity in usage decreased with increasing distance between groups (cluster). The dendrogram generated five (5) distinctly separate clusters based on plant usage for disease cure: cluster one- abdominal problems and obesity; cluster two - kidney problems; asthma, healing and cancer; cluster three-fever and cold & cough; The stomach problems and bone and joints form 4^{th} and 5^{th} cluster of the dendrogram. The Two-Way Cluster Analyses of both the ethnobotanical usage and plant species resulted in 5 major clusters (Fig 6).

Efficacy of traditional medicines

A majority of the local people (81.33%) used traditional medicines for medication while rest (18.67) did not prefer to uses traditional medicines. A total of 83.80% of the local inhabitants prepared their own traditional remedies and 16.19% obtain it from Hakeems. We found that a majority (49.23%) of the people indicated that traditional medicines were always effective followed by 45% who believed that these are sometimes effective and only 5.77% responded that they were never effective.

Table 2. Plant species, family, local name, habitat, part used and method of preparation and application of plant in the study area.

Botanical name	Family	Local Name	Habitat	Specimen number	Part Used	Method of Preparation and Application
Sambucus wightiana Wall. ex Wight & Arn.	Adoxaceae	Ganullo	Shrub	SHM-KH-256	Leaves, roots	Edible roots are eaten in small amount to treat asthma. Dried and ground leaves are applied for wound healing mostly in cattle.
Amaranthus viridis L.	Amaranthaceae	Kanhaar	Herb	SHM-KH-235	Seeds	Dried seeds of the plant are boiled for a day and decoction is either drunk to cure sneezing or rhinorrhoea or corn flour is added to the decoction along with ghee and relished as “Kher” to relieve back pain.
Angelica glauca Edgew.	Apiaceae	Choro	Herb	SHM-KH-238	Leaves	A recipe made with the combination of leaves of the plant and kidney bean curry is taken to treat obesity.
Achillea millefolium L.	Asteraceae	Dandjadi	Herb	SHM-KH-231	Root, leaves	Is proved to be most effective to relieve toothache if a tuft of its leaves is grasped in tooth for a while.
Artemisia absinthium L	Asteraceae	Chaoow	Herb	SHM-KH-240	Shoot sap	Juice of the grinded leaves drunk to treat diabetes and abdominal pain.
Aucklandia costus Falc.	Asteraceae	Kuth	Herb	SHM-KH-257	Roots	Dried roots are ground into a fine powder and mixed with boiling water or milk or cooked with rice and are taken as tonic for the treatment of joint pain, rheumatism and cough.
Taraxacum officinale (L.) Weber ex F.H. Wigg.	Asteraceae	Hannd	Herb	SHM-KH-258	Leaves	Leaves are consumed as vegetables and are especially served to women as a tonic who has recently delivered a baby.
Berberis asiatica Roxb. ex DC.	Berberidaceae	Sumloo	Shrub	SHM-KH-241	Roots	Roots are grinded into a fine powder along with water and a paste is prepared and the paste is then applied to treat bone fracture.
Arnebia benthamii (Wall. ex G. Don) I.M. Johnst.	Boraginaceae	Gazbaan	Herb	SHM-KH-239	Roots and rhizome	Decoction of rhizome in sugary water is sipped to alleviate common cold, cough, and fever.
Cannabis sativa L.	Cannabaceae	Bhang	Shrub	SHM-KH-243	Leaves	Fresh or dried leaves along with sugar are ground together and one cup of water is added into it. This mixture is then filtered with a piece of cloth and drunk against loss of appetite.
Equisetum arvense L.	Equisetaceae	Deelo	Herb	SHM-KH-246	whole plant	Whole plant is ground on a hard stone with water and put into a jug thereby making juice by pouring water and the juice so obtained is drunk to treat kidney problems.
Rhododendron campanulatum D. Don	Ericaceae	Ingo	Shrub	SHM-KH-253	Flowers	Dried crushed flowers are smoked in cigarette to treat rhinorrhoea, sneezing, cough and headache.
Indigofera heterantha Brandis	Fabaceae	Kanthi	Shrub	SHM-KH-247	Leaves	Partially chewed leaves are applied on wounds to stop bleeding as a coagulant/ clotting factor.
Mentha arvensis L.	Lamiaceae	Pudino	Herb	SHM-KH-248	Leaves	Leaves of the plant along with ground nuts and milk are grinded and made into a sauce which is
Plantago lanceolata L.	Plantaginaceae	Chamchi-Patar	Herb	SHM-KH-251	Seeds	Seeds of the plant are boiled and taken to treat typhoid fever.

Cynodon dactylon (L.) Pers.	Poaceae	Khabbal	Herb	SHM-KH-244	Roots	Drinking the juice of its roots with empty stomach in the morning is good in normalizing sugar level (hyperglycemia).
Rheum webbianum Royle	Polygonaceae	Chatiyaal	Herb	SHM-KH-252	Fruit,roots, leaves	Powdered fruits of the plant and Berberis mixed with small amount of water to make a paste which is applied on a fractured bone twice or thrice in a week proved to be best for fracture healing.
Anagallis arvensis L.	Primulaceae	Kanain	Herb	SHM-KH-236	Leaves	Leaves of the plant are poured in hot or boiling water to make tea and are taken to treat stomach problems and high fever.
Adiantum capillus-veneris L.	Pteridaceae	Kakwaa	Herb	SHM-KH-234	Leaves	The dried powered fronds are mixed with milk and given as a remedy for fever to infants. Leaves of the plants are mixed with Cardomom and boiled in water and given to cure cough, cold and fever in infants.
Aconitum heterophyllum Wall. ex Royle	Ranunculaceae	Ptrees	Herb	SHM-KH-232	Roots	Dried powdered roots are taken and sometimes dried roots are chewed for treatment of abdominal pain and also as anthelmintic.
Aconitum violaceum Jacquem. ex Stapf	Ranunculaceae	Ptrees	Herb	SHM-KH-233	Flowers, roots	Flowers are collected, dried and powdered during summer season and then applied during winters to treat common cold and sneezing.
Anemone tschernjaewii Regel	Ranunculaceae	Rattanjogh	Herb	SHM-KH-237	Rhizome	Dried rhizome is ground into fine pieces and mixed with boiling water or milk followed by sieving. Then sieved liquid extract is taken
Rubus ellipticus Sm.	Rosaceae	Kranchhi	Herb	SHM-KH-254	Roots	Roots of the plant are ground and soaked in water overnight and four or five tea spoon of decoction so obtained is mixed in a glass of water and drunken empty stomach in the morning to treat the jaundice.
Salix alba L.	Salicaceae.	Beenso	Tree	SHM-KH-255	Twigs	A brush made of twig is rubbed gently around the teeth and gums to relieve toothache and also for tooth cleaning. Sometimes leaves of the plant are putted around the head and fasten tightly with a scarf to relieve headache.
Bergenia ciliata (Haw.) Sternb.	Saxifragaceae	Batpeva	Herb	SHM-KH-242	Rhizome, leaves	The rhizome is cleaned and ground into a coarse powder. The powder is mixed with boiling milk and taken as tea which is a good medicine for diarrhoea and other gastrointestinal infections.
Datura stramonium L.	Solanaceae	Taturo	Herb	SHM-KH-245	Seeds	Two or three pair of black coloured seeds is eaten to treat prolonged cough, cold and sneezing.
Taxus wallichiana Zucc.	Taxaceae	Paronghi	Tree	SHM-KH-259	Bark	Outer bark of the plant is taken in tea as anticancer.
Pilea microphylla (L.) Liebm.	Urticaceae	Cheekal	Herb	SHM-KH-250	Stem, leaves	Stem part of the plant are grinded into a course powder is mixed with two or three eggs thereby making oblate and the oblate is then taken with tea to treat the acidity (Goola).
Orychophragmus violaceus (L.) O. E. Schulz.	Violaceae	Gurnash	Herb	SHM-KH-249	Leaves, stem	Infusion obtained from the grinded leaves of the plant is taken to treat constipation and diarrhoea.

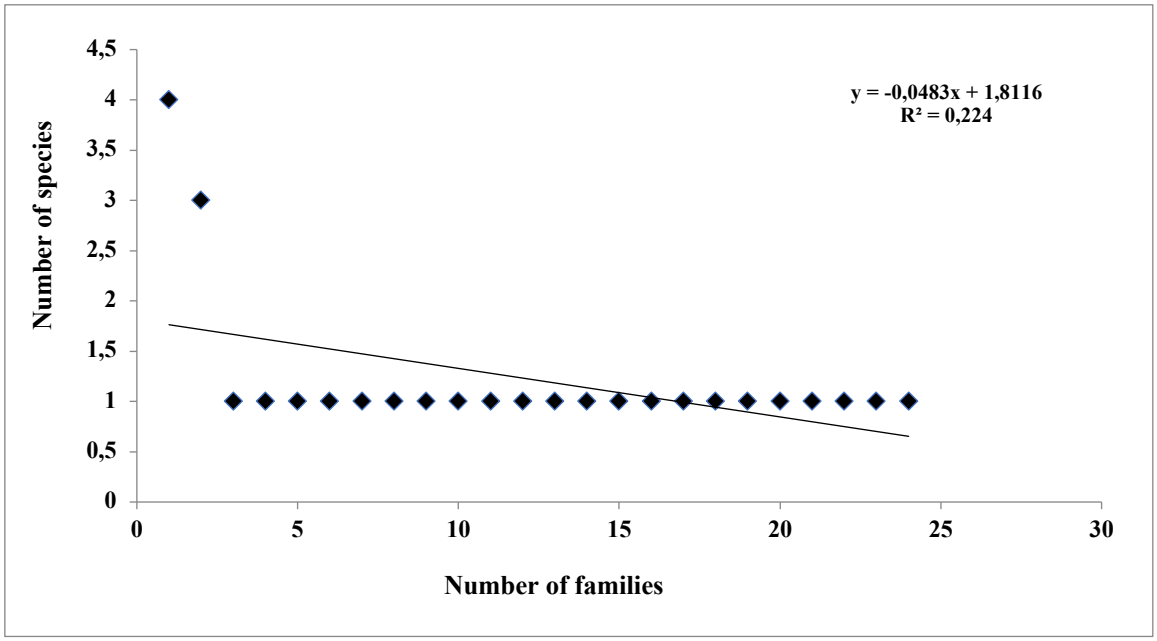

Fig. 2. Species-family relationship of flora.

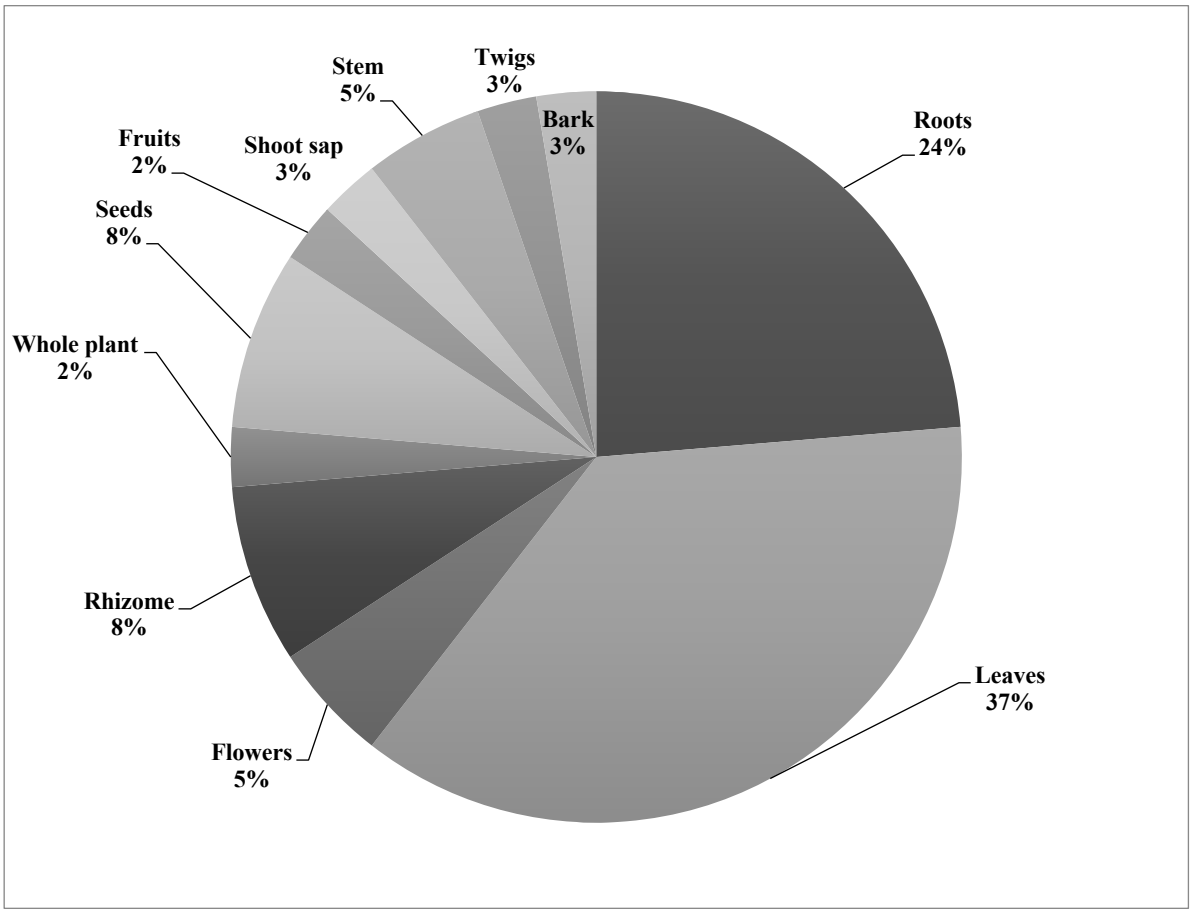

Fig. 3. Percentage of plant parts usage by the local communities in the study area

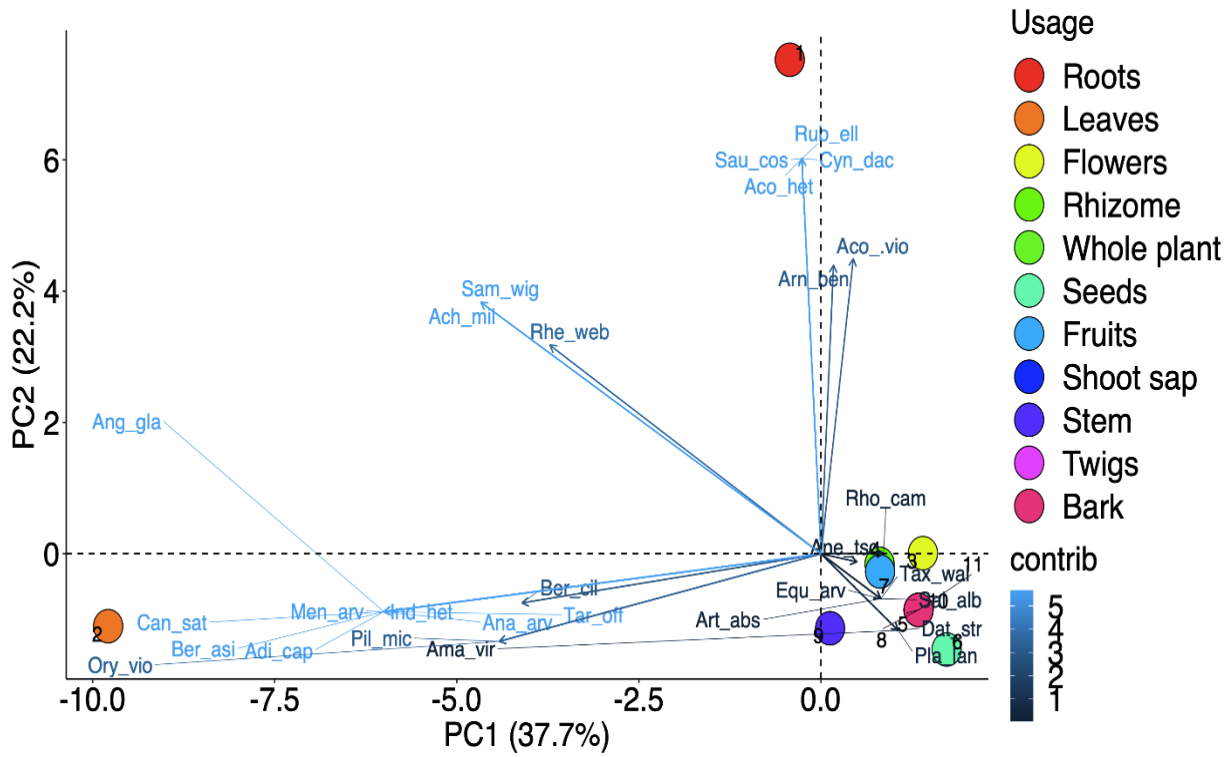

Fig. 4. Principal Component Analyses (PCA) biplot of different provisioning services investigated in the study area

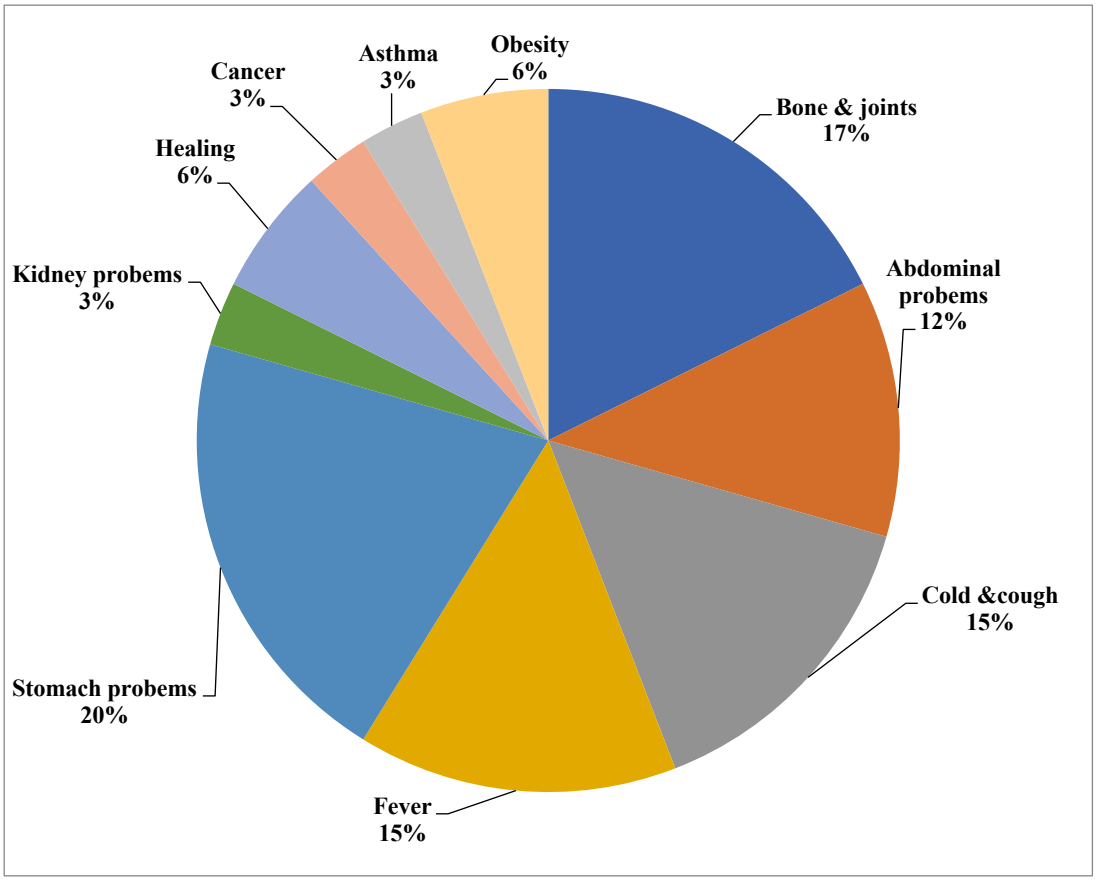

Fig. 5. Percentage of disease cured by traditional use of medicine

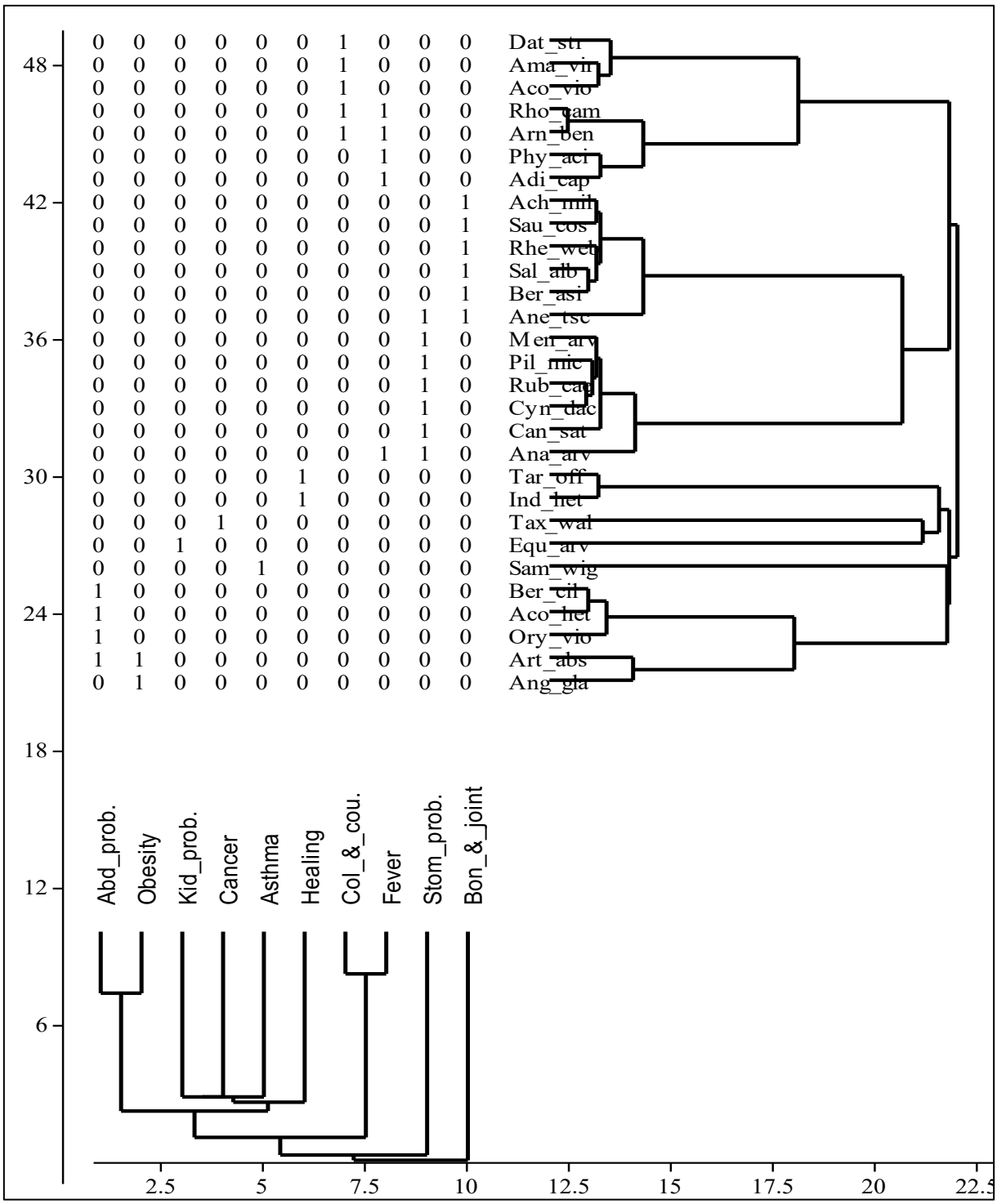

Fig. 6. Two Way Cluster Analysis based on Sorenson's similarity index of plant species and diseases cure

Discussion

The tribal people of Karnah depend upon forests for their food, shelter, medicine, fodder, fuel and other necessities of life. Identification and documentation of wild edible plants from ethnobotanical studies is important for enhancing the understanding of indigenous knowledge systems (Kunwar *et al.* 2008). Our present study has documented 29 plant species from 25 families in the selected study area. Documented richness of species was similar to various other studies from different areas of the Himalaya, e.g. 38 species were reported by Ajaib *et al.* (2010) from district Kotli, Pakistan, Mahmood *et al.* (2011) described a total of 29 plant species from district Mirpur, Pakistan. Sharma *et al.* (2012) reported 40 plant species from Sub-Himalayan region of Uttarakhand. Hamid and Raina, (2014) reported a total of 30 plant species from Kanji Wildlife Sanctuary, North-West Himalaya. Muhammad *et al.*

(2016) reported 20 plant species from Sadda Lower Kurram Agency, Pakistan (Ajaib *et al.* 2012; Shaheen *et al. 2014*).

The floristic distribution patterns of this study revealed that the results were comparable with the investigations carried out in other parts of Himalayan region where families such as Asteraceae and Ranunculaceae were the most dominant representative families. Various research studies have described Asteraceae as the dominant family from several ethnobotanical surveys (Ajaib *et al.* 2014; Hamid *et al.* 2014; Muhammad *et al.* 2016; Haq et al., 2020b). Owing to widespread ecological amplitude, the members of family Asteraceae acclimatize easily and adapt to arid dry habitats rapidly (Badshah *et al.* 2013). Further, Kayani *et al.* (2015) described Ranunculaceae as the most dominant family from the Alpines of Pakistan. This floristic study reported the skewed distribution of species across families and 22 families were found to be represented by only one species. These results are similar to the earlier observed findings from other parts of Himalaya (Rahman *et al.* 2018; Haq *et al.* 2019, 2020a).

Medicinal plants are often less expensive, and are perceived to have lesser side effects and toxicity and are easily available (Gurib-Fakim, 2006; Angmo *et al.* 2012; Aziz *et al.* 2018). Many ethnobotanical studies have been conducted on the traditional uses of medicinal plants in Himalayan region (Shinwari and Gilani 2003; Singh *et al.* 2009; Ishtiaq *et al.* 2012). According to our results the most frequently usage was against stomach problems followed by bone and joints cough & cold and fever. Similar results were reported by Muhammad *et al.* (2016) were the most commonly treated ailments with medicinal plants from Pakistan. Singh and Lal (2008) from Lahaul-Spiti in the western Himalaya. Frequently used parts were leaves then roots followed by flowers. Due to the presence of secondary constituents leaves and flowers are often used in traditional medicine. Roots were also known to contains good concentration of bioactive compounds (Srithi and Balslev, 2009; Begum *et al.* 2014), and local healers (Hakeems) used the root extractions for treating various health malefactions. Different previous studies from different regions of Himalaya are in accordance with our present study (Kala *et al.* 2006; Singh *et al.* 2009; Ahmad *et al.* 2014; Bano *et al.* 2014; Abbas *et al.* 2017; Haq et al., 2020b).

Many important medicinal plants such as *Aconitum heterophyllum* Wall. ex Royle, *Bergenia ciliata* (Haw.) Sternb*, Rheum webbianum* Royle*, Aucklandia costus* Falc*.,* and *Taxus wallichiana* Zucc. were also reported their medicinal usage in other parts of Himalaya (Khan *et al.* 2013; Kayani *et al*. 2015; Haq *et al*. 2020b). Majority of the local people uses traditional medicines to overcome health problems. Topographical inaccessibility and relative accessibility of medicinal herbs play a vital role in making the traditional medicine a first choice of treatment against modern medicine (Verma *et al.* 2019). Due to ease of access and close proximity to the forest area and also having good knowledge of ethnomedicinal plants the local people prefered the use of traditional medicines for medication. Similar results were reported by Haq et al. (2020b) from North-Western Himalaya, India, thus supporting our findings.

Conclusions

The aim of the present study was to document the plants with medicinal attribution used by the people in Karnah (study area). Investigations support that rich information (ethno-medicinal) is mostly held by elderly people, hence documentation is essential. A total of 29 plant species belonging to 25 genera were used as medicine. Asteraceae was the largest family with 14% species. The results of preference analysis showed a significant difference in plant part usage (χ^2=70.587, df=9, p<0.001). The highest priority of local people was for leaves (38%). A majority of the local people (81.33%) used traditional medicines and 49.23% regarded traditional medicines as always effective. The study emphasizes the importance of ethnomedicinal use of wild medicinal plant. Our present investigations will help to make young generations aware about the traditional knowledge related to plant, along this present study describes a useful self-care tool for the native people of the Kashmir Himalayas and other similar Himalayan mountainous region.

Declarations

Ethics approval and consent to participate: All the participants provided prior informed consent before the interviews.

Availability of data and materials: Data are available from the first author.

Competing interests: The authors declare that they have no competing interests.

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Author contributions: SMH carried out the field study. SMH and UY wrote the manuscript. SMH contributed in specimen identification. MUH and HAJ thoroughly revised the manuscript. All authors read and approved the final manuscript.

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