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A Study on Ethnomedicinal plants used to cure Respiratory Disorders in Top Northern Himalayan Regions of India

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ABSTRACT

The present paper compiled and analyzed traditional ethnomedicinal knowledge used to treat various respiratory disorder by different communities of three northern most regions of India. Ethnobotanical studies carried out were searched from books, journals, from scientific databases like JSTOR, Scifinder, Scopus, Science direct, google scholar, Pub med and web of science. A total of 178 plant species belonging to the 138 genera of 51 families were found to be used by different communities to treat respiratory disorders. Some of the mostly used plant species include *Aconitum Heterophyllum, Ephedra gerardiana, Inula racemosa* and *Ocimum sanctum*. The maximum plant species used in the study area belonged to Asteraceae (28 species), followed by Lamiaceae (15 species) and so on. Mostly the plant parts like leaves, root, stem, flower fruit and whole plant were found to treat Asthma, Bronchitis, Cough etc. In addition, scientific research is needed to validate the usage of these medicinal plants and to prove the claimed Ethnobotanical activity of these medicinal plants.

INTRODUCTION

The respiratory system or pulmonary system includes the organs involved in breathing –exchange of oxygen and carbon dioxide. Breathing is vital for survival and for the proper functioning of all other organs. Respiratory system includes Nose, nasal cavity, mouth, throat, larynx, trachea, diaphragm, lungs, bronchial tubes, bronchioles and alveoli. The respiratory organ works in a coordinated manner to perform the function of gaseous exchange. Respiration includes external and internal processes. External respiration refers to the exchange of CO2 and O2 between the environment and interstitial fluid, while internal respiration refers to chemical processes within the cell leading to absorption of O2 and release of CO2. The lung is the vital organ most susceptible to injury and infection from the environment because of repeated exposure to chemicals, infectious organisms and particles in the air. Any abnormality in the respiratory system that effects the functioning of these organs is known as respiratory disorder. It includes allergies, infections and diseases related to tissues and organs of the respiratory system. Both natural and anthropogenic factors are responsible for respiratory diseases. Respiratory disease may be classified into:

1.Vascular like pulmonary edema and pulmonary hypertension.
2. Restrictive condition like pulmonary fibrosis, sarcoidosis, and hypersensitivity pneumonitis.
3. Obstructive conditions like asthma, bronchitis, COPD.
4. Infection and environmental disorders like TB, Influenza, Para influenza, corona virus.

Asthma is an inflammatory disease of the lower respiratory track and is one of the most chronic diseases. It is characterized by four symptoms like sneezing, rhinorrhea, nasal congestion and nasal itching. Asthma is the second most prevalent respiratory disorder worldwide [1] Around 334 million people have Asthma which mostly affects 14 % of children worldwide. The numbers are increasing [2]. Around 210 million people suffer from moderate to severe chronic obstructive pulmonary disease (COPD), out of which 3 million of them die every year resulting it as third leading death globally [3,4].

Globally around 4 million deaths are caused due to lower respiratory tract infection worldwide among children under the age of 5 years old. Mostly the infection is caused by influenza [5-7]. Tuberculosis is a lung disease caused by Mycobacterium tuberculosis leading to severe fever, chest pain and coughing. Around 10.4 million people suffer from TB, out of which 10% of them die [8].

Another lethal lung disorder in the world is lung cancer which kills around 1.6 million people every year [9-12]. Acute respiratory infections mainly influenza and pneumonia are also widely common and is one of the causes of death worldwide. WHO defines Traditional Knowledge as “the knowledge, skills, and practices used in the maintenance of health and in the prevention, diagnosis, improvement or treatment of physical and mental illness”. Traditional medicine always served societies in controlling diseases throughout the world. We find the use of medicinal plants to treat disease and in primarily maintaining public health. Natural products obtained from plants play a vital role in new drug discovery and in the treatment of many new and deadly diseases.

Recent studies have shown a very good result from the usage of medicinal plants in the treatment and prevention of a huge number of respiratory disorders. World Health Organization(WHO) estimated that around 80% of the global population are relying on medicinal plants to cure various diseases [13-15].

Indian TransHimalaya encompass cold arid land of entire Tibetan plateau and its marginal mountain covering an area of 25 million sq km. Indian trans Himalaya is the northern most area in the country falls in the state of Himachal Pradesh, Jammu Kashmir and Ladakh Union Territory as shown in Fig.1. The geographical and topographical position of Indian TransHimalaya makes the region bestowed with diversity of Medicinal plants and a rich ethnobotanical knowledge. Most of the population in this region lives in rural areas with sole income source form agriculture. Poor economic condition and remoteness forced them to rely on ethnobotanical knowledge, mainly of medicinal Plants. At the same time people are apprised of about the side effects of artificial synthetic drugs and are realizing the importance of medicinal herbs in treating diseases.

The tribal population of the study area is mostly relying upon medicinal herbs to meet the primary health care needs. The common tribes found in the study area includes Gaddis, Gujjars, Kinnauras, Lahulas and Pangwals of Himachal Pradesh; Gujjar, Bakkarwal, Paharis of Jammu Kashmir and Chanpas, Brokpa, Balti and Purigpa of Ladakh region.

MATERIALS AND METHODS

Thorough literature study published in books, journals and reports was carried out to get an overview about medicinal plants used against respiratory disorders from Jammu Kashmir, Himachal Pradesh and Ladakh. Various databases like Scopus, Web of science, Google scholar, Elsevier, Pub med, science direct, Google scholar, JSTOR, Springer, Taylor and Francis, Wiley Online Library and Sci finder were searched. The key words like respiratory disorder, ethnobotany, medicinal plants and respiratory problems, plant extract, asthma, ethnomedicinal survey, ethnobotanical study and survey of plants used in respiratory disorder has been used to search for authentic and relevant articles, book chapters and even books related to the topic[17-20].

Review of the available literature and collected data on explored regions (All district of state of Himachal Pradesh and UT of Jammu Kashmir and Ladakh) has been done. The data has been compiled and analyzed [21-26].

RESULTS AND DISCUSSIONS

A total of 178 plants belonging to 138 genera and 51 families were found to be used to treat respiratory diseases shown in Table 1. The local communities include Amchis, Gujjar, Purigpa, Bakkarwal, Guddies, Paharis and other ethno communities. As shown in the figure2. Maximum number of plant species of Asteraceae (28 species) was used followed by family Lamiaceae (15 species), Solanaceae (8 species), Rosaceae (6 species) and so on. It has been found that Plant species of Asteraceae finds highest uses in the treatment of various ailments. Also, the plant species of Asteraceae contains wide variety of phytoconstituents of economic importance like Alkaloids, essential oils, tannins, terpenes which impart them valuable in the treatment of various diseases. As mentioned in Fig. 3 leaves (50 species) were used by different communities across three regions. In comparison root and whole plant of 39 species and 36 species respectively were used followed by flower (27 species) and fruit (26 species) used to treat different respiratory disorders.

STUDY AREA

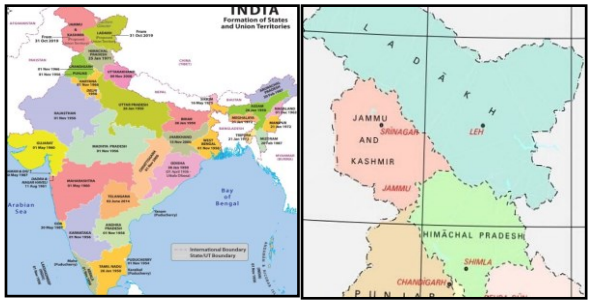

Fig1: Map showing the UT of Jammu Kashmir, Ladakh and state of Himachal Pradesh. (Source: Google Map)

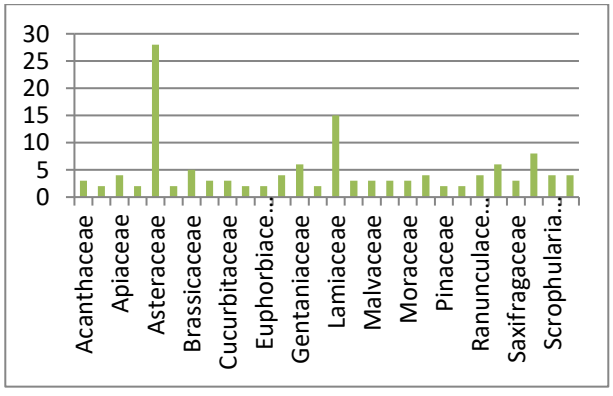

Fig 2: Frequently used families for managing various respiratory disorders by indigenous communities of J&K, HP and Ladakh

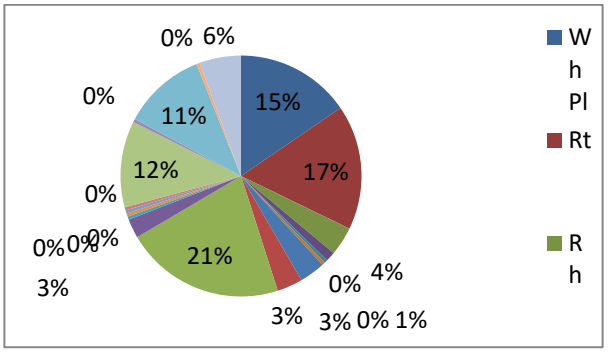

Fig 3: Numbers of plant parts used in the formulations to manage various respiratory disorders by indigenous communities of J&K, HP and Ladakh .

Table 1:Plant parts and their uses

S.No	Botanical Name	Edible Part	Indigenous uses
1	*Abies pindrow* Royle	Rt, Bk	Bark powder is used to treat cough and asthma. Root decoction is used to treat cough and bronchitis. Leaves are used as expectorant.
2	*Abutilon indicum* (L.) Sw.	LF, St, Rt Bk	Leaf decoction is used to treat bronchitis. Seeds and fruit is used to treat cough. Bark of the stem is used to treat pulmonary disorder.
3	*Arnebia benthami* (Wall. Ex. G. Don) Johnston.	Rt	Root powder along with honey is given in fever, cough and cold. The roots are added to tea given to people having pneumonia.
4	*Arnebia guttata* Bunge	Rt	Root yields a dye and is also used as cough medicine.
5	*Betula utilis* D. Don	Bk	The decoction of the bark is antiseptic, and carminative given in cough.
6	*Brassica napus* L.	Fr, Lf, Sd, St	Used to treat chronic cough and bronchial catarrh.
7	*Chenopodium botrys* L.	Wh Pl	Whole plant is used in catarrh and asthma
8	*Cissampelos pareira* Linn.	Lf	Leaf extract is useful in asthma, cough and cold. It is also used as expectorant.
9	*Colchicum luteum* L.	Cm,	Fresh and crushed corms are mixed with gur and then fried to cure fever and cough.
10	*Cordia diacotoma* G. Forst.	Fr, Sd	Fruit and seed are used to cure fever, cough and cold.
11	*Datura stramonium* Linn.	Lf, Sd,	Smoke of burned leaf is inhaled to cure asthma. Seed powder is used to treat cough
12	*Datura metel* Linn.	Lf, Tw	Smoke from burned leaves and twigs are used to treat asthma and whooping cough
13	*Elaeagnus umbellata* Thunb.	Wh Pl	Whole plant is used to treat cold and pulmonary disorder.
14	*Euphorbia hirta L.*	La	Plant latex is applied in asthma.
15	*Fritillaria roylei* Hook. F.	Wh Pl	Herb is powdered and is taken to treat Tuberculosis and Broncho-asthma.
16	*Foeniculum vulgare* Millx	Sd	Seed powder is used with water to get relief from cough.
17	*Galium pauciflorium*	Wh Pl	Whole plant is used to treat throat infection.
18	*Gentiana kurroo* Royale	Wh Pl	Whole plant is used as Blood purifier. It is used to treat fever, cough.
19	*Hordeum vulgare* L.	Fr	Grain is used to cure asthma and cough.
20	*Hyoscyamus niger L*	Fr, Lf, Fl	Fruit, flower and leaf is used to treat asthma and whooping cough.
21	*Hypericum perforatum L.*	Young Sh	Tea made of young shoots is used to treat respiratory disorders.
22	*Inula racemosa* Hook.f. Royleana.	Rt	Formulation of root extract mixed with roots of Saussurea lappa and mixed with powdered seeds of Punica granatum which is taken thrice a day for 15-30 days to treat cold, cough and fever. Root is anti-asthmatic.
23	*Inula rhizocephala Shrenk. var. rhizocephaloides* (Cl.)Kitam.	Rt	It is used as substitute for *Inula racemosa*
24	*Lavatera kashmiriana* Mast.	Fl, Rt	Paste of flower and milk is used to treat mumps in children. Root is used to treat respiratory disorder.
25	*Luffa aegyptiaca* Mill	Wh Pl	Whole plant is used to cure asthma and used s expectorant.
26	*Lychnis coronaria* Lamak.	Rt, Fl	Extract of root and flower is used to cure lung troubles.
27	*Malaxis acuminate* D.Don	Bb	Pseudobulb is used to treat tuberculosis.
28	*Malva neglecta* Wall.	Lf	Leaf decoction is used to treat cold and cough.
29	*Mentha longifolia* Host.	Sh	Aerial shoot powder is used to cure cough and sore throat. The leaves are crushed in hand and smelled to open respiratory tract.

30	*Mentha arvensis L.*.	Sh	Powdered ariel part mixed with curd is used to treat sore throat and cough.
31	*Mirabilis jalapa* L.	Rt	Dried root is used to treat cough of animal.
32	*Morchella esculenta*	Fr	Decoction of fruiting body is given to treat cold and cough for 2-3 days.
33	*Myrica esculenta* Buch.-Ham. ex D. Don	Fr, Bk	Bark is used to treat Cold and cough, Asthma, Sinusitis and chronic bronchitis.
34	*Rosa macrophylla* Lindl.	Fl	Decoction prepared from leaves is used to treat cold and cough.
35	*Swertia cordata* Wall ex D.Don	Wh Pl	Whole plant is used to treat cough.
36	*Swertia chiryata* Karst. Syn: S. Chirata buch. Ham.	Rt, St	Powdered form of roots and stem is used to treat fever, cold and cough.
37	*Tanacetum dolichophyllum* (Kitam.) Kitam.	Fl	Flower is used to treat cold and cough
38	*Tanacetum tibetica*	Fl	Flower is used to treat cold, cough and fever.
39	*Tagetes erecta* L.	Wh Pl	Whole plant is used to treat cold and bronchitis.
40	*Tagetus minuta L.*	Wh Pl	Volatile oil from the plants is showing anti-inflammatory, and also as bronchodilator.

CONCLUSION

A total of 178 plants belonging to 138 Genera and 51 families were found to be used to treat various respiratory disorders by different communities of study areas. Despite the study area possessing a rich medicinal flora, the ethnomedicinal knowledge is mainly confined to local inhabitants. The young generation shows no interest in inculcating ethnomedicinal knowledge from their elders due to many reasons. Although the market is glutted with medicines for all the respiratory disorders, these may be costly or have side effects. Also, the ongoing covid pandemic affects the respiratory organs of a great number of populations. Thus, the present documentation of the ethnomedicinal knowledge on plants used to treat respiratory disorder will assist scientists in searching for novel herbal drugs. To validate the claimed activities of listed plant species, further scientific research is required. Such studies may help in isolation of vital phytoconstituents to help in the discovery of novel drugs to treat respiratory diseases.

FUTURE PROSPECTS

Usage of synthetic antibiotics in treatment of respiratory disorder is facing continuous limitation because of the side effects on health and development of bacterial resistance due to
its continuous usage. Thus, there is an increasing demand for the medicinal herb for the treatment of respiratory disorders. Since medicinal herbs are considered sources of phytoconstituents which play an important role for novel drug discovery.

The medicinal plants were used by local communities without scientific know-how and proper guidance for thousands of years. Scientific studies have shown that every part of the plant, like root, stem, bulb, corm, flower, fruit and seed etc. have medicinal properties. There is a great scope of scientific studies to be carried out on these medicinal plants for isolation of bio active compounds and further pharmacological studies to discover a very effective and safe drug for the treatment of various respiratory diseases. Increasing knowledge in phyto-constituents and their inclusion in daily diet chart may give enough
support to human body to fight against many common diseases. In the era of Covid pandemic which affects the respiratory organs, there is every possibility that a novel drug may be discovered from the above listed medicinal herbs.

It is the right time to explore and identify traditional ethnomedicinal knowledge and plants sources to interpret it according to the recent development to fight many of the common diseases. We the Humans must use the foresight and wisdom to protect and preserve these plant resources for the present and future generations.

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