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Ethnomedicinal plants traditionally used in health care practices by inhabitants of Western Himalaya

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ABSTRACT

Ethnopharmacological relevance: Inspite of tremendous advances made in allopathic medicine, herbal practice still plays an important role in management and curing various ailments in remote and rural areas of India. However, traditional knowledge on the use of medicinal plants is eroding day by day and there is a need to document such knowledge, before it is lost forever. The aim of the present study was to document the indigenous and traditional knowledge of medicinal plants used by local inhabitants in and around Kedarnath Wildlife Sanctuary of Indian Himalaya for the advancement of biomedical research and development.

Materials and methods: The intensive field survey was carried out at three different altitudes of Kedarnath Wildlife Sanctuary (KWLS) and its adjoining areas. The inhabitants were interviewed about the local name of plants having ethno-medicinal values, plant parts used, mode of processing/application and preparation and dosage through discussions and semi structured questionnaires.

Results: A total of 97 medicinal plant species belonging to 52 families and 83 genera were reported for curing various ailments like fever, cough, cold, digestive disorders, constipation, menstrual disorders etc. Out of 97 plant species reported, 21 are rare or threatened. Literature review revealed that 11 out of the 97 plant species are reported with new therapeutic uses. The most frequently utilized plant part was the root/rhizome (33%) followed by leaf (27%). In some cases whole plant was utilized. A few medicinal plants had some veterinary uses also.

Conclusion: The study provides comprehensive information about the eroding indigenous and traditional knowledge of medicinal plants used by local inhabitants in a part of Western Himalaya, India. The identification of the active ingredients of the plants used by the local people may provide some useful leads for the development of new drugs and such new approaches of traditional knowledge regarding medicinal plants and laboratory analysis might help pharmaceutical industry in new chapters for the wellbeing of mankind.

1. Introduction

The prevalent practice of herbal remedies has descended down from generation to generation and includes the cure from simple ailments to the most complicated ones. Plant containing active chemical constituents (alkaloids, glycosides, saponins, essential oils, tannins and mucilages) in any of its part like root, stem, leaves, bark, fruit and seed, which produces a definite curing physiological response in the treatment of various ailments in humans and other animals, is regarded as medicinal plant (Adhikari et al., 2010). Medicinal plants have been used for millennia in virtually all cultures and serve both as a source of income and a source of

Abbreviations: WHO, World Health Organization; NTFPs, Non-timber forest products; KWLS, Kedarnath Wildlife Sanctuary; GUH, Garhwal University Herbarium; R, Rare; VU, Vulnerable; EN, Endangered; CR, Critically Endangered; IUCN, The International Union for Conservation of Nature and Natural Resources; NMPB, National Medicinal Plant Board; CAMP, Conservation Assessment and Management Plan; RDB, Red Data Book of Indian plants

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affordable healthcare (World Bank, 1997). Worldwide, about 53,000 plant species are used for medicinal purposes (Hamilton, 2004). The World Health Organization estimates that 70–95% of people living in developing countries rely chiefly on medicinal plants for their primary healthcare needs (WHO (World Health Organization), 2011) and that their sale accounts for 15–30% of the total income of poorer households (Hamilton, 2004). India has the highest number of medicinal plants that are cultivated and grown naturally. Out of over 15,000 species used in different systems of health care in Asia, 7,000 species are found in China and 8000 in India (Negi et al., 2010). Medicinal plants play a significant role in the subsistence economy of the people, especially those living in the mid-altitudes and the highlands (Sati, 2013). About 65% of the Indian population depends on the traditional system of medicine (Timmermans, 2003).

The Himalaya extends to eight countries including Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan, all of which are rich in the abundance and diversity of valuable medicinal plant species. The Himalayas cover 18% of the Indian subcontinent and harbour about 8000 species of angiosperms, 1748 of which are used medicinally (Kala, 2005). Medicinal plants form a high percentage of non-timber forest products (NTFPs) collected from the Himalayas (Ghimire et al., 2005). In recent years there has been a gradual rise in the demand of herbal products and plant based drugs across the world resulting in the heavy exploitation of medicinal plants. Habitat degradation, unscientific harvesting and over exploitation to meet the demands of illegal trade in medicinal plants have led to the extinction of more than 150 plant species in the wild (Singh and Rawat, 2011). Today more than 90% of plant species used in the herbal industries are extracted from the wild, majority of which comes from the sub-alpine and alpine regions of the Himalaya (Singh and Dey, 2005). Aspirin, atropine, artimesinin, colchicine, digoxin, ephedrine, morphine, physostigmine, pilocarpine, quinine, quinidine, reserpine, taxol, tubocurarine, vincristine and vinblastine are a few important examples of what medicinal plants have given us in the past. Most of these plant-derived drugs were originally discovered through the study of traditional cures and folk knowledge of indigenous people and some of these could not be substituted despite the enormous advancement in synthetic chemistry (Kumar et al., 2011a).

The Kedarnath Wildlife Sanctuary, one of the largest protected areas in Western Himalaya, is not only rich in floristic composition and panoramic views but also has enough scope for medicinal stock. The inhabitants of the sanctuary have significant and variable reservoir of primitive knowledge about the usage of the plants. They use the folk medicines through different ways, depending on plant species, specific method of preparation, doses and pattern of application. Due to the heavy exploitation, a few species like *Taxus baccata, Cypripedium cordigerum, Dactylorhiza hatagirea, Aconitum heterophyllum* and *Picrorhiza kurrooa* etc have witnessed rapid decline during recent decades (Singh, 2008). Several studies have been carried out on the use of the medicinal plants in the Indian Himalayan region in general and Uttarakhand state in particular (Joshi et al., 1999; Pande and Joshi, 2001; Kala, 2005; Negi et al., 2010; Singh and Rawat, 2011; Bhat et al., 2013). Ethnobotanical information on medicinal plants and their uses by indigenous cultures is useful not only for the conservation of traditional knowledge and biodiversity, but also to promote community health care, and might serve in drug development. The information can provide a guide for drug development, assuming that a plant that has been used by indigenous people over a long period of time may well have an allopathic application (Farnsworth, 1993). Keeping in view the importance of traditional knowledge about local flora, the present study was under taken to document and present the list of medicinal plants commonly used by local denizens at different altitudes of Kedarnath Wildlife Sanctuary and its adjoining areas and the main aim of the study was to gather the indigenous knowledge and documentation of the ethnomedicinal plants in view of the future opportunities to discover the new drugs.

2. Materials and methods

2.1. Study area

The Kedarnath Wildlife Sanctuary (KWLS) is one of the largest protected areas (975 km^2) located in two districts *viz.,* Chamoli and Rudraprayag of Uttarakhand between the coordinates 30°25′–30°41′N, 78°55′–79°22′E in the Garhwal region of Greater Himalayas. It is bordered by high mountain peaks *viz.,* Kedarnath (6940 m), Mandani (6193 m) and Chaukhamba (7068 m) and extensive alpine meadows in the north and several dense broad leave oak mixed forests in the south (Bhat et al., 2013). The present study was carried out at three different altitudes of KWLS (Fig. 1) *i.e.* lower altitude, Site-I—Kund (900–1200 m asl) which included Pathali, Barmadi and Lamgundi villages; middle altitude, Site-II—Phata (1600–1900 m asl) which included Jamu, Rail, and Dhar Gaon villages and higher altitude, Site-III—Triyuginarayan (2200–2600 m asl) which included Triyuginarayan and Toosi villages. The climate in the study area can be divided into four distinct seasons, *viz.*, summer (May–July), rainy (mid, July–September), winter (October–January) and spring (February–April). The rainfall pattern in the region is largely governed by the monsoon rains (July–September), which account for about 60–80% of the total annual rainfall. However, at higher altitudes, raining is almost a daily routine (Malik et al., 2014).

2.2. Methodology

The above mentioned villages were frequently visited for ethnomedicinal surveys and studies during the study period (2011–2013). After establishing oral prior informed consent the ethno-medicinal data was gathered from the local people especially from women and elderly people through interviews and semi structured questionnaires. Informants were selected by snowball system, starting with suggestions from the local village councils. Local healers (*Vaidhyas*—Traditional medical practitioners) wherever available, were also interviewed for the medicinal uses of different plants. During the survey information about the local names of plants, plant part used, mode of processing/application and preparation and dosage was recorded. The respondents and/or the person having the knowledge of the plants accompanied us to the adjoining forests to get the herbarium specimens for the authentication of plants. Each of the collected plants was given a collector number starting from 1001 in the field itself. Medicinal plants were also identified by the matching of live plants with the pictorial field guide (Murthy, 2011) and specimens of all plants were collected and rechecked for proper identification using standard literature (Gaur, 1999; Naithani, 1984–1985) and doubtful specimens were further verified at the herbarium of HNB Garhwal University (GUH Srinagar, Uttarakhand).

3. Results

3.1. Ethno-medicinal plants and uses reported by the informants

A total of 97 medicinal plant species belonging to 52 families and 83 genera were recorded. Of these 21, 22 and 60 medicinal plants were recorded from Site-I (Lower altitude), Site-II (Middle altitude) and Site-III (Higher altitude), respectively (Table 1).