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Research paper

An ethnopharmacological analysis of medicinal plants used by the Adiyan community in Wayanad district of Kerala, India

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ABSTRACT

Introduction: Medicinal plants have been used to treat various ailments since ancient times, as a result ethnobotanical investigations have a major role in pharmacological studies. The present study was conducted among the ethnic population known as the 'Adiyans', located in one of the little explored rich biodiversity areas in the Western Ghats. The aim was to collect and document information on the indigenous knowledge of medicinal plants.

Methods: The field survey was carried out during August 2015 to July 2016 among the Adiyan people in Chandanatodu, Thavihal and Thirunelly villages of the Wayanad district located in Kerala, India. Ethnomedicinal information was obtained through interviews/discussions and the collected data were analyzed using the informant consensus factor (F_{ic}).

Results: Folk medicines practiced by indigenous people in the study area are used for their primary healthcare needs. The data gathered exemplified the knowledge of people using folk medicinal practices. Most of the documented claims used by Adiyans in the present study have not been shown in previous research in the nearby regions of Kerala, India and across the globe.

Conclusion: Finding further evidence for medicinal claims used by the indigenous community in this study highlights the need for scientific research to support documented folk use. Of the documented ethnomedicinal plants, *Caesalpinia mimosoides*, *Desmodium triflorum*, *Elaeocarpus tuberculatus, E. serratus, Hydnocarpus macrocarpa*, *Pterospermum reticulatum*, *P. rubiginosum* and *Zizyphus nummularia* have been poorly studied in vitro and in vivo models. It is important to validate their usage in terms of pharmacological activity.

1. Introduction

Ethnopharmacological studies document folk knowledge about medicinal plants and these are vital for discovery of novel drugs [1]. Out of the recorded 422,000 flowering plants recorded globally [2] around 70,000 species have been identified which have been used in old and modern medicinal practices throughout the World. In most of the traditional systems of medicine across the globe, medicinal plants are playing a major role in developing herbal drugs.The Indian Materia Medica comprises of nearly 2000 drugs of natural origin which are derived from different traditional systems and folklore practices [3]. The study of medicinal plants through ethnobotanical surveys is one of the methods of scrutinizing the relationship between the biological and cultural components of environment which shows great variation in folk uses of herbal medicines among different cultural and social groups [4]. Increasingly there has been attention on the potential of herbal medicines. However, the use of herbals in folk practices among indigenous communities has raised concern regarding the preservation of plant genetic resources and the conservation of folk knowledge for future generations [5].

The Indian subcontinent has a very rich in biodiversity containing ~47,000 plant species and there are thousands of known medicinal plants in its different biogeographical zones. These are used in different systems of medicine viz., Ayurveda, Siddha, Unani, Homeopathy and Tibetan as well as modern medicine [3]. Ayurveda is a widespread medical system in most of the states of northern India and Kerala, Siddha is exercised in Dravidian cultures (especially among Tamils) while Unani is practiced sporadically all over the country. Ayurveda is a holistic approach of medicine focusing on balancing quality of life, health promotion and disease management and uses plants, minerals, diet, lifestyle and spirituality [6]. Ayurveda is a widespread and integral medical system and remains extensively valued for its distinctiveness and global reception as it offers natural ways to treat various diseases and promote health [7].

Many herbal drugs derived from medicinal plants, available in the market were used to treat a number of ailments in India since the time

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of Rig Veda (~2000 BCE). Plants and plant based medicinal products are an integrated part of most of the traditional and alternative systems (TSMs). According to World Health Organisation estimates, populations in developing countries like India (70%), Ruwanda (70%), Uganda (60%), Tanzania (60%), Benin (80%) and Ethiopia (90%) extensively use TSMs for primary health care [8]. Indigineous people are recognized for their sound knowledge about the uses of medicinal plants and they favor herbal medicines due to their easy availability and inexpensiveness as compared to costly drugs [9]. In rural areas folk healers pass indigenous herbal knowledge orally to the next generations [10]. Most of the recently conducted studies in India have revealed that, herbal medicines practiced by indigenous healers integrate with traditional systems of medicine such as Ayurveda and Siddha [11–14].

Kerala is one of the smallest states in India located in the south-western corner of country, recorded with high literacy rate and remarkable health indices as compared to other Indian states [12]. The state is inhabited by diverse groups of ethnic people with a variety of folk systems. Ethnobotanical studies among the ethnic people of Kerala were first studied by Pushpangadan & Atal, [13,14] and Nagendra Prasad & Abraham [15]. They explored the folk life, culture and medical wisdom of some ethnic groups. Very recently, use of this knowledge system on medicinal plants in Kerala has become wider and attracted global concern [12,16–20].

Publications on the medicinal plants used by Adiyan people in Wayanad district of Kerala are scanty and previously researchers have not conducted a comprehensive study of plants used by these ethnic people from ethnopharmacological point of view. Hence, the present study was designed with following objectives, (a) to document the folk medicinal knowledge of Adiyans to treat various diseases; (b) to analyze the acquired data (frequency of cited claims for each plant); (c) to identify the threat status of documented plants and (d) to comparatively analyse ethnomedicinal claims of present study with previously published literature on folk/Ayurveda/Siddha medicines in study area as well as nearby and other regions of the World.

2. Methods

2.1. Study area

Wayanad district is recognized as southern tip of the Deccan Plateau and comprised parts of the Western Ghats and located in north-east of Kerala, India. The name Wayanad is believed to be derived from *vayal nadu* which means land of paddy fields [16]. The district lies between 11°27′–15°58′N latitude and 75°47′–70°27′E longitude covering an area of about 2124 km^2 which comprises 5.48% of total area of the state. The altitude varies from 700 to 2100 m above Mean Sea Level. The district is constituted by three taluks, Mananthavadi, Sulthanbathery and Vythiri. The present survey was conducted in Chandanatodu, Thavihal and Thirunelly villages in Mananthavadi taluk. Location map of study site was created using QGIS software version 2.6.0 (Fig. 1). This region is unique for its rich wealth of flora and fauna. A limited number of publications on folk medicine studies from forests of Wayanad district and adjoining areas are available [16,17,21–25] and all these studies were conducted qualitatively with gaps in statistical, ethnopharmacological and comparative analysis.

2.2. Ethnic people in the study area

The people living in mainland are comprised of mixed races of Dravidian, Aryan, Mediterranean, Polynesian and to a lesser extent Indo-European, Alpine and Mongolian origin. Adiyan is one of the least represented ethnic groups in Kerala with 11,526 individuals (2.38% of total ethnic population in Kerala). Adiyans are the dominant tribal community in Wayanad district and they also reside in a few districts of neighbouring states like Tamil Nadu and Karnataka but they are fewer in number. Hence, though their mother tongue is Malayalam, most of them speak Tamil and Kannada which are official languages of those states. Main occupation of Adiyans is agriculture, wood cutting, fish hunting and collection of minor forest products. Pushpangadan & Atal [13] stated that Adiyans are semi-nomadic people and showed mixed features of Negroid, Veddoid and Dravidian race.

2.3. Data collection and identification of medicinal plants

Prior to starting field work, proper permission was obtained from the Chief Wildlife Warden, Kerala and the Wildlife Warden, Wayanad wildlife division, Salthanbathery (PO), Wayanad district, Kerala to undertake field surveys. For using animal models/experimental models, ethical approval is required by our institution. For undertaking surveys for documenting ethno-medicinal knowledge from ethnic people, the college does not require ethical approval according to the norms of our state. To undertake surveys within forest boundaries, it is necessary to obtain permission from forest department, so we obtained permission to enter the forests for field visits. Four surveys were conducted, each lasting at least six days during August 2015 to July 2016 to gather medicinal information. Folk uses of plants were documented through interviews and discussions among the knowledgeable persons who are practicing folk medicines viz., traditional healers and village elders. Interviews were conducted in their local language (Malayalam). Questions were posed to informants about medicinal uses of plants for herbal preparations. Reported plants were collected at the flowering/fruiting stages for identification and preparation of herbarium specimens. Plant materials were preserved using standard procedures and identified by the 'Flora of Tamilnadu Carnatic' [26]. Nomenclatures of scientific names were confirmed with the standard database 'Plant List'. Voucher specimens of documented plants were deposited in the herbarium of A.V.V.M Sri Pushpam College, Poondi (SPCH), Thanjavur, India for future reference.

2.4. Data analysis

Collected ethnobotanical data were analysed with descriptive statistical patterns of informant consensus factor (F_{ic}). F_{ic} was calculated to identify the agreement in the use of plants in the ailment categories between plant users in the study area. The F_{ic} was calculated using the following formula [27].

$$F_{ic} = N_{ur} - N_t / N_{ur} - 1$$

Where, N_{ur} is number of use reports for a particular ailment category and N_t is number of taxa used for particular ailment category. A high value of 1.0 indicates that rather few taxa are used by large proportion of informants and low value indicates informants' disagreement ratio on taxa used in treatment within a category of illness.

2.5. Ailment categories

Based on ethnomedicinal information acquired from ethnic groups, all the reported claims were sorted into 10 ailment categories for the purpose of statistical calculations (Table 3). These were, circulatory system/cardio-vascular disorders (CSCD), dermatological infections and disorders (DID), fever (FVR), gastro-intestinal ailments (GIA), genito-urinary problems (GUP), gynaecological disorders (GD), poisonous bites (PB), respiratory system disorders (RSD), skeletal/muscular system disorders (SMSD) and others (dental care; ENT problems; endocrinal disorders; general health; hair care; liver problems and oncology). Various diseases were placed in one ailment category based on the body systems treated.