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Review Article

Ethnopharmacological Application of Folk Medicines Available in Central India

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Abstract

Among the Central Indian tribal communities, folk medicine is still a vital component of their medical regimen, particularly when it comes to treating bacterial diseases. This paper examines how indigenous groups including the Gond, Baiga, and Bhill have historically employed medicinal plants, often known as folk medicines, in ethnopharmacological settings to treat bacterial illnesses. During the field survey, a sample was taken from a chosen region, and its pharmacological impact on the development of bacterial cultures was examined in order to determine its resistance activity. We gathered plants from the survey location, including *Terminalia chebula, Azardirachta indica,* and *cardifolia*, to determine their pharmacological impact on bacterial infections. Since ancient times, these herbs have been used in India to treat bacterial infections without causing any negative side effects. Scientific data indicates that they have broad range antibacterial activity. These papers' primary significance lies in their familiarity with the relevance of knowledge, its validation through contemporary research, and its integration into modern healthcare to address issues such limited access to healthcare in rural areas.

Keywords: Rural Health; Bacterial Infection; Ethnopharmacology; Antibiotic Resistance

Introduction

The use of herbal remedies and other traditional treatments to treat bacterial infections is a long-standing tradition in Central India. Depending on local customs and particular illnesses, these treatments frequently include herbs like neem, turmeric, tulsi, and others, with slightly different applications. These plants' geographic range and related knowledge are linked to the region's varied ecosystems and indigenous populations. the rural and tribal communities' dependence on natural remedies. India is a cultural custom as well as a necessity brought on by the lack of access to contemporary medical care. Various tribal people, like the Gond, Bega, and Bill, call Central India, which includes Madhya Pradesh, Chhattisgarh, and a portion of Maharashtra, home. As antibiotic resistance increases worldwide, examining these traditional practices provides important leads for new antimicrobial agents. These communities have long used local flora to treat a variety of illnesses, especially bacterial infections affecting the skin, gastrointestinal tract, and respiratory system.

Medicinal plants have been central to the treatment of various ailments in ancient time and are vital component of traditional healing systems. Approximately 70% - 80% of global populations still depends on these systems for primary healthcare, driven by proven effectiveness, cultural relevance, and limited assay to modern healthcare [1,2]. Globally the transmission of traditional knowledge to subsequent generation is limited, suggesting the need for measure to safeguard existing traditional wisdom and facilitate its dissemination to future generation [3]. Plants serve as an natural resources for traditional as modern medicinal systems all over the world [4]. Medicinal plants have been integral to human healthcare for centuries, serving as the primary source of therapeutic agents before the advent of modern pharmaceuticals [5]. Herbal medicines have been used since the dawn of the civilization to maintain health and to treat disease. There is a tremendous historical legacy in folklore uses of plants used in medicines. Scientific studies on plants used in ethnomedicine led to discovery of many valuable

drugs [6]. Antimicrobial properties of medicinal plants are being increasingly reported from different parts of the world [7,8]. With increasing interest in natural remedies, the study of these plants has renewed attention, especially in content of traditional medicine system and the pharmacological properties [9]. Methicillin – resistant *S. aureus* acquires its resistance via the methicillin resistance gene mec A, which encodes a low affinity penicillin binding protein (PBP 2a) that is absent in susceptible *S. aureus* strains [10].

The emergence of additional bacterial resistance to commonly used antibiotics urged the requisite for novel powerful antimicrobial agents, from non- conventional sources [11]. These complex factors have obligated researchers to explore innovative antimicrobial agents from all available sources to act as alternative antimicrobial chemotherapeutic compounds; the high production cost of synthetic drugs and their adverse effects, compared with naturally plant derived agents, persuade the direction back to nature [11,12]. Plants are recognized for their ability to produce a wealth of secondary metabolites and mankind has used may species for centuries to treat a variety of diseases [13]. Despite the wide availability of clinically useful antibiotics and semisynthetic analogues, a continuing search for new anti-infective agents remains indispensable because some of the major antibacterial agents have considerable drawbacks in terms of limited antimicrobial spectrum or serious side effects [14].

The medical component of traditional knowledge that evolved over many generations within the folk beliefs of diverse communities, especially indigenous peoples, prior to the advent of modern medicine is known as folk medicine, often referred to as indigenous remedies (Traditional medicine). In order to maintain health and prevent, diagnose, improve, and treat physical and mental illnesses, traditional medicine is defined by the World Health Organization (WHO) as "the sum total of the knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures, whether explicable or not." Folk medicine is a combination of ancient therapeutic methods and beliefs that include physical therapy, herbal remedies, and/or spirituality to identify, treat, or prevent disease. Different ethnic groups or tribal communities use various kind of traditional healing methods. Some people in a culture are aware that the information has been passed down through the generations informally as general knowledge, and anyone with prior experience can practice or apply it. There are indiscriminate use of synthetic antimicrobial drugs for the treatment of infectious diseases and as a result drug resistance developed in human being as well as in plant also [15-17].

In folk medicine or ethnomedicinal studies, the most reliable method involving field survey [18]. During field surveys in forest areas and adjoining villagers, villagers were consulted about their primary method of treatment during illness. After getting information about the persons involved in local healing practices authors made attempt to come in contact with these healers with an idea of exchange of knowledge gathered from established system of herbal medicine like Ayurveda and local herbs used in other adjoining community.

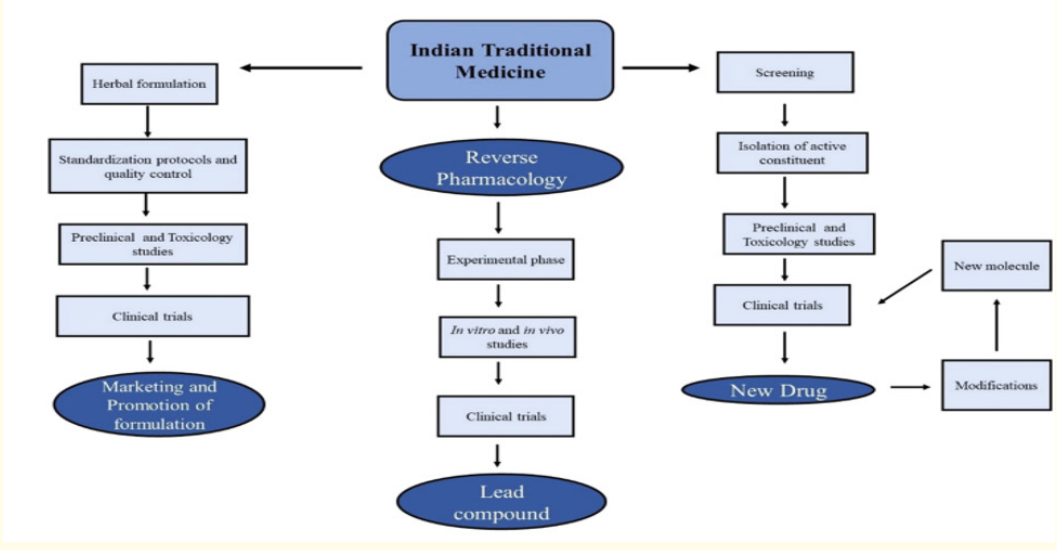

Figure 1: Distribution of Indian traditional medicines, Basu., et al. (2023).

Therapeutic efficacy

Medicines made from naturally occurring substances, such as plants and fungi, that have been used traditionally for therapeutic purposes by a particular group of people are the subject of ethnopharmacology, a scientific study. It entails recording and outlining the preparation and use of these plants and animals, followed by research to determine the active ingredients that impact humans. Sociocultural studies and medicinal plant study are linked in the discipline of ethnopharmacology. To find information about the plants that indigenous people employ to cure wounds and illnesses, ethnopharmacologists frequently conduct interviews with them.

Ethnopharmacology may be the first indication of a plant's therapeutic effectiveness, which might be used in a drug discovery program to rival conventional synthetic medicine. India is the birthplace of Indian traditional medicine, which has undergone constant change since the Vedic era. One substance or crudely formulated mixtures are preferred over numerous formulations. The fundamental principles and practices of these traditional medication processes, which use plants and plant-based preparation in the medical services, remain the same despite the fact that their origins and development periods differ.

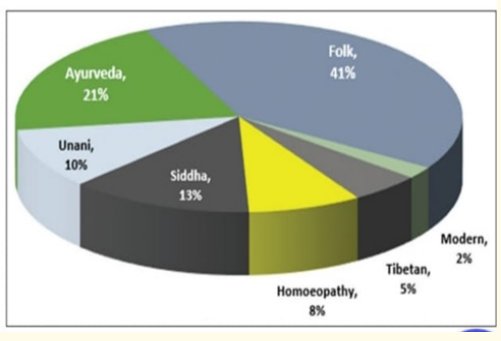

Figure 2: The extent of utilization of plants in different system of medication in India, Adhikari., et al. 2018.

The Indian tribes have a plethora of ethnomedicine expertise. The Indian subcontinent has multiple biogeographic zones with a diverse medicinal flora containing more than 47,000 plant species have remained to be documented as a source of medicinal plants on the Indian continent [20].

The Western Ghats of India are being exhaustively explored through ethnobotanical studies, whereas the satpuda hills have remained relatively unexplored [21]. The tribal population residing in the satpuda hills uses the local medicinal flora wisely to treat disease, infection and health problems [22,23]. The documentation of traditional knowledge of local species has resulted in the development of several vital drugs. Currently, Scientific validation of traditional uses proper plant species has attracted notable attention in the scientific community.

Distribution of medicinal flora in central India

Central India is known for its richness of medicinal flora. Plants, of immense medicinal values are abundantly found in satpuda, Vindhyachal, Khurchel valleys, Kager Reserve, Amarkantak, Pachmarhi and Patalkot areas. Central India is covered with tropical forest, which are rich in biodiversity. However subtropical hill forest are found in few areas. There are two divisions of Bhil. National institute of science and communication, New Delhi, has published exhaustive information of about 700 medicinal plants [24]. Same institution has published Glossary of Indian medicinal plants [25,26].

Status report on ethnobiology published by Govt. of India (1994) shows that 7500 plant species are used all over India by tribal as medicinal [27]. Jain (2012) has enumerated 2500 species and 15000 folk uses. The tribal person does not have knowledge of education but they have the knowledge of traditional medicines and their use for remedies to various diseases. This knowledge is transmitted from generation to the next generation [30]. Status report on ethnobiology published by Govt. of India (1994) shows that 7500 plant species are used all over India by tribal as medicinal [29]. Jain (2012) has enumerated 2500 species and 15000 folk uses [30]. The tribal person does not have knowledge of education but they have the knowledge of traditional medicines and their use for remedies to various diseases. This knowledge is transmitted from generation to the next generation [28].

Traditional medicine and ethanobotanical information play an important role in scientific research [31]. Scientific interest in traditional medicine in India has continuously increasing. The tribal people like Bhil, Gond and Baiga are used these plants for various diseases. The use of this herbal medicine has important role in modern medicine stream like homeopathy, Ayurveda, Unani etc. The use of herbal medicine is not cost effective but also safe and almost free from serious side effects [28]. There are two division of bhill. The tribal have the knowledge of medicinal and another uses of plants growing in the forest. Tribal medicines men know the exact preparation of the medicine and diagnosis of the diseases. However, though widely used, it is not a codified system [32].

Ethnopharmacological background

A wide variety of indigenous plants are used by Central Indian tribal healers, also referred to as vaidyas or bhagat. These remedies are applied physically or taken orally, depending on the type of infection, and are frequently made using fresh leaves, roots, barks, or decoctions. Typically, forests in areas like Central India's Satpuda Hills are used to gather plants.

Methodology

A comprehensive review of the literature was conducted using PubMed, Scopus, Web of Science, and Google Scholar, incorporating specific search terms such as ethanopharmacological, 'antibiotic resistance', focusing on publications in English from the year 2015 to 2025. Studies which had a focus on research in original articles, systematic reviews, or a meta-analysis and dealt with biofilm-related disease and its treatment were eligible for inclusion. Conversely, non-English publications, conference abstracts, and studies deemed to be of low quality were excluded from consideration. Data from the selected studies were extracted and synthesized in a narrative format, emphasizing biofilm mechanisms, clinical implications, and therapeutic approaches. A quality assessment was performed using suitable evaluation tools, and the findings were organized into thematic categories, with a descriptive analysis that underscored significant trends.

Initially, 84 articles were identified from databases including PubMed, Google Scholar, Scopus, ResearchGate, and ScienceDirect. After excluding irrelevant articles (09), removing duplicates (10), and accounting for articles that couldn't be retrieved (14), 51 articles remained. Of these, 14 were excluded due to access issues or lack of relevance, resulting in 35 studies being included in the final review. Ethical approval was not required since the review relied on previously published research, with potential limitations including variability among studies and language constraints.

Identification of studies via databases and registers

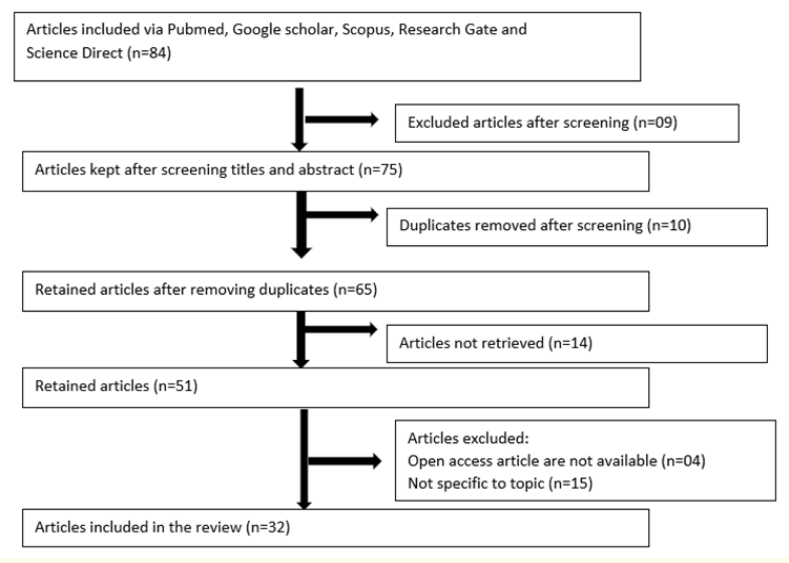

Figure 3: PRISMA flow chart.

PRISMA: Preferred Reporting Items for Systematic Reviews, n: Number of studies.

In Madhya Pradesh, areas Chhindwara district is situated on satpura plateau at 1550-3820 feet above the sea level. The region of Patalkot, Pachamadi and Tamiya in Madhya Pradesh are rich in traditional knowledge of medicinal plants, especially among the Baria and Gond tribes. These communities have utilized local flora for centuries to treat various ailmenyts, including wound infections.

Patalkot Region (Madhyapardesh), Patalkot is a secluded valley inhabited by the Bharia tribe, known for its dense forests and divers medicinal plants. Herbal healers, known as Bhumkas, play a pivotal role in the community healthcare practices. A study identified 77 plant species used to treat various ailments with several noted for their wound healing properties. Pachmarhi (Madhyapradesh) is only hills station in Madhyapradesh, is surrounded by forest rich in medicinal plants. While specific studies on wound healing plants in Pachmari are limited, the region shares in flora with nearby areas like Udaipura in Raisen district, where several plants are used for skin diseases and wound healing.

Study design

The study design is a qualitative review based on an ethnopharmcological framework. It synthesizes existing literature, filed based, survey and published research on medicinal plants used by tribal communities in central India to treat bacterial infection.

Results

According to the ethnopharmacological survey, 52 species of medicinal plants are used traditionally in Pachmari, Patalkot, Tamiya, Chandrpur, and Amaravati (Madhya Pradesh), as well as in Maharashtra, to cure bacterial illnesses.

List of plants used as medicinal purpose

Sr. No.	Botanical Name	Local Name	Part used	Traditional use	Suspected antimicrobial action
01	*Azardirachta indica*	Neem	Leave, bark	Skin infection, wounds	Active against *S. aureus, E, coli*
02	*Ocimum sanctum*	Tulsi	Leaves	Colds and respiratory issue	Inhibits respiratory pathogen
03	*Terminalia chebula*	Harad	Fruits	Diarrhea, infected wounds	Broad spectrum antimicrobial activity
04	*Tinospora cordifolia*	Guduchi	Stem	Fever and internal infection	Antimicrobial activity
05	*Curcuma Longa*	Haldi	Rhizome	Cuts and skin infection	Active against *pseudomonas, staphylococcal* infection
06	*Andrographis paniculata`*	Kalmegh	Leaves	Fever and GTI	Effective against *salmonella, E. coli*
07	*Buchanania Lanzan*	Chirongi	Edible seeds	Skin infection and wounds	Antimicrobial activity
08	*Ageratum conyzoides L.*	Jungali pudina	Leaves, root, flower buds	Fever, infection throat infection	Antimicrobial activity
09	*Bambusa vulgaries*	Bamboo	Stem decoction	Menstrual dissorder	Rheumatism, malaria and heart problems
10	*Vitex Negundo Linn.*	Nirgundi	Leaves, stem	Wound ulcer, Nasal discharge	Antitnflamatory, Antioxident
11	*Cyperus rotundus*	Nagarmotha	Root, Powder mixed with oil	Wound infection	Antimicrobial activity
12	*Tribulus terrestris*	Gokhru	Fruit	Used in healing process	Anti inflammation
13	*Aspilia Africans*	Wild sunflower	Leaves, roots buds and powder	Infection	Antimicrobial and anti-inflammatory
14	*Bacopa monnieri*	Brahmi	Leaves	Applied on skin ulcers sunburn	Use for cancer
15	*Santalum album*	Sandalwood	Powder	Used for skin infection	Inflammation
16	*Adhatoda vasica*	Adulsa	Leaves Paste	infected wounds	Inflammation

Table 1

Scientific validation

Modern studies have confirmed many traditional claims:

- **Neem:** Extract show inhibition of Staphylococcus aureus, a common cause of skin infection.
- **Tulsi:** Has essential oils with activity against Respiratory pathogen.
- **Guduchi:** Not only exhibit Antibacterial activity but also boosts host immunity.
- Extract from turmeric and harad have been tested against drug resistant strains shows result.

Conservation

Man and medicinal plant availability is threatened by over-harvesting, deforestation, and climate change. Furthermore, the younger generation frequently shows little interest in conserving traditional knowledge; hence, cooperation with tribal communities and ethical biopropagation are essential to protecting indigenous wisdom and biodiversity. Medicinal plants are a vital source of herbal goods worldwide, but they are rapidly going extinct. Fok medicinal plant conservation refers to worldwide trends, advancements, and opportunities for methods and strategies related to the preservation and sustainable use of medicinal plant resources in order to offer a trustworthy resource for the preservation and sustainable use of medicinal plants.

Conclusion

The ethnopharmacological knowledge of Central Indian Tribes offers a valuable but unutilized resources in fight against bacterial infection. Scientific exploration and conservation of this traditional wisdom can contribute to the development of new antimicrobial therapies in a age of growing antibiotic resistance.

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Conflict of Interest

The authors declare no financial or commercial conflict of interest.

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