

Traditional Medicinal Plants and their Role in Modern Healthcare: Perspectives from Tripura

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Abstract: *Traditional medicinal plants have long served as the foundation of primary healthcare systems among indigenous communities worldwide, particularly in biodiversity-rich regions where access to modern medicinal facility is often limited. Tripura, a northeastern state of India, is endowed with diverse flora and a rich repository of ethnomedicinal knowledge preserved by tribal communities such as the Tripuri, Reang (Bru), Jamatia, Halam, Chakma and Mog. These communities have traditionally relied on medicinal plants to treat a wide range of ailments, including fever, gastrointestinal disorders and skin diseases. This article examines the role of traditional medicinal plants in modern healthcare from the perspective of Tripura, emphasizing their therapeutic significance, cultural values and potential contribution to sustainable healthcare systems. The study adopts a qualitative approach based on extensive review of scholarly literature, ethnobotanical studies and publications, simultaneously interacting with the local Plants medicinal providers within the reachable parameters. However, the modern healthcare potential of Tripura's traditional medicine faces dual challenges. Furthermore, the rapid erosion of oral indigenous knowledge is a thinkable subject to ponder upon. Synthesizing Tripura rich tribal heritage with rigorous biochemical validation can creates a robust framework for developing safer, more affordable and culturally inclusive modern pharmaceuticals in alignment with the Traditional Medicinal Plants and Their Role in Modern Healthcare.*

Keywords: Traditional medicine, Indigenous knowledge, Modern Healthcare, Tribal

1. Introduction

Traditional medicine constitutes one of the oldest and most enduring forms of healthcare, developed through the accumulated experiences, observations and cultural practices of communities over generations. Across societies, medicinal plants have served as important sources of remedies for the treatment of various health conditions. The World Health Organization (WHO) defines traditional medicine as a body of knowledge, skills and practices based on indigenous theories, beliefs and experiences used for the maintenance of health and the prevention, diagnosis, improvement or treatment of physical and mental illness (World Health Organization, 2013). In many developing regions, traditional medicine remains an essential component of primary healthcare, particularly among rural and indigenous populations where modern medical facilities may be geographically inaccessible or economically unaffordable. The global significance of traditional knowledge has increasingly been recognised by international organizations and scientific institutions. A substantial proportion of the world's population continues to use traditional medicine, while medicinal plants contribute to the development of pharmaceuticals products and other healthcare interventions. The WHO has emphasised the need to strengthen traditional medicine through appropriate research., regulation, quality assurance and evidence-based integration into health systems (WHO,2013). India possesses exceptional biological and cultural diversity and has a long history of plants-based healthcare through systems such as Ayurveda, Siddha, Unani and various local and indigenous healing traditions. Medicinal plants continue to play an important role in healthcare, livelihoods and cultural practises across the country. The northeast Indian region is particularly significant because of its high biodiversity and the presence of numerous indigenous communities possessing extensive ethnobotanical knowledge. The region's forest provides a diverse range of plants used traditionally for treating common ailments and such knowledge is often transmitted orally from one

generation to another (Chetia & Gogoi, 2010). Tripura, situated within the biodiversity-rich landscape of Northeast India, has considerable potential for ethnobotanical research. Its forest and varied ecological conditions support numerous plant species with medicinal value, while indigenous communities have historically developed intimate relationships with their natural environment. Communities such as the Tripuri, Reang (Bru), Jamatia, Halam, Chakma and others have maintained distinctive knowledge regarding the identification, collection, preparation and application of medicinal plants. Traditional healers and community knowledge holders have therefore played an important role in preserving and transmitting medicinal plant knowledge. However, this knowledge is increasingly threatened by deforestation, habitat degradation, changing lifestyles, modernization and the gradual weakening of intergenerational transmission.

2. Objectives

- 1) To examine the traditional knowledge, uses, and healthcare significance of medicinal plants among indigenous and rural communities in Tripura.
- 2) To assess the potential of traditional medicinal plants for integration into modern healthcare systems.

Traditional Medicine and Ethnobotany

Traditional medicine represents a complex body of knowledge, practices, beliefs and skills developed by communities through long-term interaction with their physical, social and cultural environment. The World Health Organization (WHO) defines traditional medicine as the totality of knowledge, skills and practices based on indigenous theories, beliefs and experiences used for maintaining health and preventing, diagnosis, improving or treating physical and mental illness (WHO, 2013). Unlike modern biomedical systems, traditional healthcare practices are often embedded within local cultural institutions and are closely connected with community perceptions of health,

disease, spiritually, ecology and social relationships. In many rural and indigenous societies, traditional medicine continues to provide accessible and affordable healthcare, particularly where formal medicinal infrastructure is limited. Ethnobotany provides an important interdisciplinary framework for understanding the relationship between human societies and plants. It examines how communities identify, classify, use, manage and culturally interpret plant resources. Ethnobotanical research has demonstrated that medicinal plants are not merely biological resources but are embedded within systems of indigenous knowledge that have developed through generations of experimentation and observation. Indigenous communities frequently possess detailed knowledge regarding the medicinal properties, habitats, seasonal availability, methods of collection, preparation, dosage and administration of plants. The significance of ethnobotanical studies extends beyond the documentation of traditional remedies. They contribute to biodiversity conservation, pharmacological research, cultural preservation, and sustainable resource management. Traditional knowledge has also played a role in identifying plants with potential therapeutic properties that may subsequently be subjected to phytochemical and pharmacological investigation. However, researchers have emphasised that documentation should be undertaken ethically, with prior informed consent and recognition of community rights, particularly because indigenous knowledge may be vulnerable to commercial exploitation and biopiracy (Convention on Biological Diversity, 1992).

Medicinal Plants in India

India possesses one of the world's most diverse and historically developed systems of traditional medicine. The use of medicinal plants is deeply rooted in the country's medical traditions, particularly Ayurveda, Siddha, Unani, and various local and folk healing systems. Ayurveda, one of the oldest documented systems of traditional medicine, developed a sophisticated understanding of health, disease, herbal formulations, and the therapeutic use of natural resources. Classical Ayurvedic texts, including the Charaka Samhita and Sushruta Samhita, provide extensive descriptions of medicinal substances and their applications. Over centuries, this knowledge evolved through continuous interaction between textual medical traditions and local community practices. Medicinal plants remain significant in Indian healthcare because of their therapeutic, cultural, economic, and ecological value. They are used in the preparation of traditional formulations and are also important sources of pharmaceutical compounds. According to the WHO, traditional and complementary medicine continues to have substantial relevance in global healthcare, particularly in countries where traditional systems are culturally accepted and widely practised (WHO, 2013). In India, the use of medicinal plants also intersects with rural livelihoods, forest-based economies, and indigenous knowledge systems.

Medicinal Plants in Northeast India

Northeast India represents one of India's most biologically and culturally diverse regions. Its varied topography, climatic conditions, forests, and ecological zones support a rich diversity of plant species. The region is also home to numerous indigenous and tribal communities whose livelihoods and cultural practices are closely connected with

forests and natural resources. As a result, traditional medicinal knowledge has developed as an important component of local healthcare systems. Ethnomedicinal practices among Northeast India's tribal communities demonstrate a close relationship between ecological knowledge and health practices. Communities have traditionally used leaves, roots, bark, stems, fruits, seeds, flowers, and other plant parts to address a range of health conditions. The preparation of remedies may involve decoctions, infusions, pastes, juices, powders, or direct application. Such practices are generally based on locally accumulated knowledge rather than formal biomedical experimentation, although many medicinal plants have subsequently attracted scientific interest because of their phytochemical properties.

Ethnomedicinal Knowledge in Tripura

Tripura provides an important context for studying the relationship between medicinal plants, indigenous knowledge, and traditional healthcare. The state's forest ecosystems and rich cultural diversity have supported the development of ethnomedicinal practices among several indigenous communities. The Tripuri, Reang/Bru, Jamatia, Halam, Chakma, and other communities have historically relied on locally available plant resources for treating common illnesses and maintaining health. Traditional medicinal practices are often integrated with cultural beliefs and community-based understandings of the human body, disease, and the natural environment. Existing ethnobotanical studies of Tripura have documented the use of diverse plant species for conditions such as fever, gastrointestinal disorders, respiratory problems, skin diseases, wounds, inflammation, pain, and other common ailments. Such studies demonstrate that indigenous communities possess detailed knowledge concerning plant identification, medicinal properties, collection methods, preparation, and administration. The knowledge is often transmitted orally from elders to younger members of the community and is particularly preserved by traditional healers and experienced knowledge holders.

Indigenous Communities and Traditional Healthcare Practices in Tripura

Tripura, located in the northeastern region of India, is characterized by rich biological diversity and a culturally diverse indigenous population. Indigenous communities, including the Tripuri, Reang (Bru), Jamatia, Halam, Chakma, Mog, and other tribal groups, have historically developed close relationships with their surrounding forests and natural resources. Traditional healthcare practices form an important component of these communities' cultural heritage and continue to complement modern healthcare services, particularly in rural and forest-dependent areas. Indigenous healthcare knowledge is largely based on the identification and utilization of medicinal plants, locally available natural resources, and culturally embedded healing practices.

Traditional healthcare systems among indigenous communities in Tripura are based on an extensive understanding of local flora and their medicinal properties. Plants are used to manage a wide range of health conditions, including fever, stomach disorders, skin diseases, wounds, respiratory problems, inflammation, and reproductive health

issues. Different plant parts, such as leaves, roots, bark, stems, flowers, fruits, and seeds, may be used in fresh or processed forms. Ethnobotanical investigations in Tripura have documented substantial medicinal plant diversity and demonstrated the importance of indigenous knowledge in the identification and sustainable use of plant resources (Deb, 1983; Das et al., 2006; Chakma et al., 2015). Such practices also illustrate the significance of ethnobotany in understanding the relationship between human communities and plant resources. Traditional healers occupy an important position within indigenous healthcare systems. Locally known healers possess specialized knowledge regarding medicinal plants, preparation methods, dosage, and treatment procedures. Their knowledge is generally acquired through observation, apprenticeship, family traditions, and long-term interaction with the natural environment. In many communities, traditional healers are consulted for ailments that may be treated through herbal remedies, spiritual practices, or a combination of both. Their role extends beyond treatment to include the preservation and transmission of ecological and medicinal knowledge. Forests and home gardens constitute significant sources of medicinal plants. Forest ecosystems provide access to wild medicinal species, whereas home gardens allow households to cultivate commonly used plants near their residences. Home gardens are particularly important for maintaining plant diversity and ensuring the availability of frequently used medicinal species. Studies of ethnobotanical practices emphasize that such traditional systems contribute not only to healthcare but also to biodiversity conservation and sustainable resource management (Deb, 1983; Das et al., 2006).

3. Role of Traditional Medicinal Plants in Modern Healthcare

Traditional medicinal plants occupy an important position at the intersection of indigenous knowledge, primary healthcare, pharmacology, and sustainable development. In regions such as Tripura, where rural and indigenous communities maintain close relationships with forests and biodiversity, medicinal plants continue to serve as accessible healthcare resources. Their contemporary relevance extends beyond traditional use to include scientific research, drug discovery and complementary medicine.

a) Primary Healthcare

Traditional medicinal plants contribute significantly to primary healthcare, particularly in rural and remote areas where modern medical facilities may be limited. Indigenous communities have traditionally used locally available plants to manage common ailments such as fever, cough, cold, digestive disorders, skin infections, wounds, and minor inflammations. The availability of medicinal plants within forests, agricultural landscapes, and home gardens makes them relatively accessible to rural households. In addition, herbal remedies are often more affordable than commercially manufactured medicines, making them particularly important for economically disadvantaged populations.

b) Pharmacological Potential

Medicinal plants are important sources of biologically active compounds, including alkaloids, flavonoids, terpenoids, tannins, glycosides, and phenolic compounds. These

phytochemicals may possess antimicrobial, antioxidant, anti-inflammatory, antidiabetic, or other therapeutic properties. Scientific investigation of traditionally used plants can therefore contribute to the identification of novel bioactive molecules and potentially support drug discovery.

c) Complementary and Integrative Healthcare

Traditional medicine and biomedical healthcare can potentially function as complementary systems rather than mutually exclusive alternatives. In India, the institutional frameworks of Ayurveda, Yoga and Naturopathy, Unani, Siddha, Sowa-Rigpa, and Homoeopathy (AYUSH) provide opportunities for the organized development of traditional healthcare. Integration, however, requires evidence-based approaches, standardized medicines, trained practitioners, and appropriate regulatory mechanisms.

4. Integration of Traditional Knowledge with Modern Healthcare

a) Indigenous Knowledge

The process should begin with the systematic recognition of indigenous knowledge regarding medicinal plants, their identification, therapeutic uses, methods of preparation, dosage, and cultural significance. Traditional healers, elders, women, and other knowledge holders should be recognized as important custodians of this knowledge. Their participation is essential because traditional medicinal knowledge is often transmitted orally through generations and is closely connected with local ecosystems and cultural beliefs.

b) Ethnobotanical Documentation

The second stage involves documenting medicinal plants and associated traditional practices through ethnobotanical surveys. Documentation should include local names, botanical identification, plant parts used, preparation methods, therapeutic applications, habitat, availability, and conservation status. Herbarium specimens and botanical authentication are important for preventing misidentification. Importantly, documentation should be undertaken with prior informed consent from knowledge-holding communities and should respect indigenous intellectual property rights.

c) Safety and Efficacy Assessment

Scientific validation must be accompanied by rigorous assessment of safety and efficacy. Toxicological studies are necessary to identify harmful effects, appropriate dosage ranges, and possible contraindications. Where appropriate, preclinical studies and well-designed clinical trials should establish therapeutic effectiveness in humans. Traditional use alone should not be considered sufficient evidence of safety or efficacy, particularly when medicinal plants are proposed for wider clinical application.

d) Standardisation

Standardisation is essential for developing reliable herbal medicines. It requires accurate botanical identification, quality control of raw materials, consistent preparation methods, and appropriate testing for contaminants and adulterants. Standardisation can reduce variations in the chemical composition and therapeutic effectiveness of herbal products. It also facilitates their responsible incorporation into regulated healthcare systems.

e) Healthcare Integration

Validated and standardized medicinal plant-based therapies may be integrated into healthcare through appropriate institutional mechanisms, including relevant AYUSH frameworks and community-based healthcare programmes. Collaboration among traditional healers, AYUSH practitioners, biomedical professionals, ethnobotanists, pharmacists, and community health workers can promote culturally appropriate healthcare. Such integration should be evidence-based and should ensure that patients receive appropriate referrals when conditions require biomedical intervention.

5. Discussion

The findings of this study demonstrate that traditional medicinal plants continue to occupy an important position in the healthcare practices of indigenous and rural communities in Tripura. The use of medicinal plants is not merely a reflection of the limited availability of modern healthcare facilities but represents a deeply rooted system of knowledge developed through generations of interaction with forests, agricultural landscapes, and local biodiversity. The findings indicate that indigenous communities possess considerable knowledge regarding plant identification, medicinal properties, preparation methods, and therapeutic applications. This knowledge constitutes an important component of the biocultural heritage of Tripura and provides valuable insights for ethnobotanical and pharmacological research. The relationship between traditional and modern healthcare should be understood as complementary rather than necessarily oppositional. Modern biomedical healthcare provides scientifically established diagnosis, emergency treatment, surgery, vaccination, and specialized care, whereas traditional healthcare remains particularly relevant for the management of common ailments and culturally familiar forms of treatment. In remote and rural areas, medicinal plants may offer an accessible and affordable first line of healthcare. However, the integration of traditional and modern systems requires caution because traditional remedies may vary in dosage, preparation, potency, and safety. Consequently, scientific validation, appropriate regulation, and professional guidance are essential before traditional plant-based remedies are incorporated into formal healthcare programmes.

Tripura's medicinal plant knowledge has considerable potential to contribute to healthcare development. The state's rich biological diversity provides an important resource for the identification of plants with potentially valuable therapeutic properties. Indigenous knowledge can serve as a starting point for ethnobotanical investigations and pharmacological research, helping researchers identify plant species that may contain bioactive compounds of medicinal significance. Systematic documentation of traditional knowledge, followed by phytochemical, pharmacological, toxicological, and clinical research, may contribute to the development of evidence-based herbal medicines. Such research could also strengthen the role of medicinal plants within appropriate AYUSH and community healthcare frameworks. The socio-cultural implications of medicinal plant use are equally significant. Traditional healthcare practices are closely connected with indigenous identity,

cultural beliefs, environmental relationships, and intergenerational knowledge transmission. Traditional healers, elders, and women play important roles in maintaining this knowledge. Women frequently participate in collecting, preparing, and administering medicinal plants within household healthcare systems and contribute to the transmission of knowledge to younger generations. The decline of traditional practices due to modernization, environmental degradation, and changing lifestyles therefore represents not only a healthcare concern but also a potential loss of cultural heritage.

From an economic perspective, medicinal plants may provide opportunities for livelihood diversification among rural and forest-dependent communities. Sustainable cultivation, collection, processing, packaging, and value addition can generate employment and supplementary income. Community-based enterprises based on locally available medicinal plants may contribute to rural development while encouraging biodiversity conservation. However, commercialization must be accompanied by ethical safeguards to prevent overharvesting, biopiracy, and the exploitation of indigenous knowledge. Indigenous communities should receive appropriate recognition and equitable benefits when their knowledge contributes to commercial or pharmaceutical development.

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