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An Ethnobotanical Survey of Medicinal Plants and Associated Traditional Knowledge Among the Tribal Communities of Jharkhand, India

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Annotation: This ethnobotanical study documents the traditional medicinal practices of tribal communities in Jharkhand through a survey of 50 informants, comprising 30 males and 20 females aged 35–85 years (mean age: 62). A majority (75%) were above 60 years, with 60% serving as traditional healers, underscoring the centrality of elders in safeguarding indigenous knowledge. Informants reported 45 medicinal plant species belonging to 32 families and 41 genera. The Lamiaceae, Fabaceae, and Asteraceae families were most represented. Leaves emerged as the dominant plant part (32.5%), followed by roots (24%) and bark (15%), highlighting both therapeutic versatility and potential ecological risks from unsustainable root and bark harvesting.

Medicinal plants were most frequently used for gastrointestinal disorders (22.5%), dermatological conditions (20%), and respiratory problems (15%), reflecting community health priorities shaped by local living conditions. High Informant Consensus Factor (ICF) values for gastrointestinal (0.90) and respiratory

ailments (0.88) indicate strong cultural consensus, while the low ICF for snakebite (0.36) reveals fragmented knowledge limited to specialists. Quantitative indices identified Neem (Azadirachta indica) and Tulsi (Ocimum sanctum) as culturally significant species, with the highest Relative Frequency of Citation (0.96 and 0.90) and Use Values (2.4 and 1.8), confirming their versatility in treating multiple ailments.

The findings emphasize the urgency of documenting orally transmitted knowledge, which is concentrated among a few elderly healers, while also highlighting sustainability concerns. This research contributes to preserving cultural heritage, guiding conservation strategies, and offering leads for pharmacological exploration, ensuring that Jharkhand's ethnomedicinal wisdom informs both local healthcare and broader scientific inquiry.

Keywords: Ethnobotany, Medicinal plants, Tribal knowledge, Jharkhand communities, Informant Consensus Factor, Traditional healthcare practices.

INTRODUCTION

Ethnobotany is broadly defined as the scientific study of the relationship between people and plants, with particular emphasis on the traditional knowledge, beliefs, and practices of indigenous and tribal communities (Harshberger, 1896; Cotton, 1996). This interdisciplinary field bridges botany, anthropology, and pharmacology to explore how plants are utilized for food, medicine, shelter, rituals, and cultural symbolism (Balick & Cox, 1996).

Traditional knowledge of plants is a vital component of cultural heritage and plays a crucial role in sustaining the health and livelihoods of tribal populations (Berkes, 2012). Such knowledge systems, developed through centuries of close interaction with the natural environment, are often orally transmitted across generations and therefore highly vulnerable to erosion under the pressures of modernization, urbanization, and cultural assimilation (Turner et al., 2000).

The documentation of ethnobotanical knowledge is therefore of immense importance, not only for conserving biodiversity but also for safeguarding intangible cultural heritage (Hamilton, 2003). Recording indigenous practices also provides valuable leads for modern pharmacological research and the discovery of novel bioactive compounds (Fabricant & Farnsworth, 2001). In this way, ethnobotany contributes both to cultural preservation and to the development of sustainable healthcare solutions for present and future generations.

Significance of Medicinal Plants

Medicinal plants have held a central place in human healthcare since ancient times, forming the foundation of both traditional and modern systems of medicine (WHO, 2002; Heinrich, 2013). Globally, they are regarded not only as therapeutic resources in indigenous healing practices but also as essential raw materials for the development of modern pharmaceuticals (Newman & Cragg, 2016). Many widely used drugs, such as aspirin, quinine, and morphine, have originated from plant sources, demonstrating the enduring value of botanical knowledge in scientific

innovation (Rates, 2001).

In developing countries, medicinal plants continue to serve as the primary source of healthcare for a significant portion of the population, particularly in rural and tribal communities where access to modern medical facilities is limited (Farnsworth et al., 1985; Sharma & Mujumdar, 2003). According to the World Health Organization, nearly 80% of the global population relies on plant-based remedies for primary healthcare needs, underlining their critical importance for human well-being (WHO, 2013).

Furthermore, the conservation and sustainable utilization of medicinal plants hold profound implications for biodiversity preservation, cultural heritage, and the global search for novel therapeutic agents (Hamilton, 2004; Gurib-Fakim, 2006). Recognizing their significance, ethnobotanical research plays a key role in documenting, validating, and integrating traditional plant knowledge into modern healthcare and pharmaceutical development.

The Tribal Communities of Jharkhand: A Brief Overview

Jharkhand, located in eastern India, is recognized as one of the most tribal-dominated states of the country, with nearly 26–28% of its population belonging to Scheduled Tribes (Census of India, 2011). The state is home to more than 30 tribal groups, including major communities such as the Santhal, Munda, Oraon, Ho, Kharia, and Birhor, each with distinct cultural traditions, languages, and social systems (Xaxa, 1999; Ekka, 2011). These groups form a rich mosaic of cultural heritage, reflecting centuries of harmonious coexistence with their natural environment.

The tribal communities of Jharkhand are deeply connected to the forests, which form the basis of their livelihood and cultural identity. Forests provide food, fodder, fuel, and materials for housing, as well as medicinal plants that remain central to their healthcare practices (Sinha & Mishra, 2012). Traditional healers, often known as *vaidya* or *ojha*, play a vital role in sustaining indigenous healthcare systems by relying on plant-based remedies passed down through generations (Sahu et al., 2010).

Despite the gradual influence of modernization, the reliance of tribal groups on forests for subsistence, medicine, and spiritual practices continues to be profound. Their ethnobotanical knowledge represents not only a survival strategy but also a crucial component of cultural identity and ecological stewardship (Roy, 2014; Mahapatra, 2017). Documenting and preserving this traditional knowledge is essential for understanding the dynamic interaction between tribal communities and their natural environment.

Statement of the Problem / Research Gap

Although ethnobotanical research has been conducted in different parts of India, much of it remains scattered, region-specific, and limited in scope (Jain, 1991; Kala, 2005). Jharkhand, despite being one of the most tribal-dominated states with rich biodiversity and cultural heritage, has received relatively less systematic attention in terms of ethnobotanical documentation (Ekka, 2011; Sinha & Mishra, 2012). Existing studies on medicinal plants in the region are often fragmented, focusing on isolated tribal groups or specific plant species, without providing a comprehensive picture of the diversity of knowledge and practices (Sahu et al., 2010; Roy, 2014).

The lack of consolidated and comparative ethnobotanical records not only limits our understanding of the intricate relationship between plants and tribal communities in Jharkhand but also poses a risk of losing valuable traditional knowledge under the pressures of modernization, urbanization, and cultural assimilation (Hamilton, 2003; Berkes, 2012). This gap is critical, as the oral transmission of indigenous medicinal practices makes them highly vulnerable to erosion if not documented in time (Turner et al., 2000).

Therefore, there is a pressing need for comprehensive and systematic research that documents medicinal plants and the associated traditional knowledge among the diverse tribal communities

of Jharkhand. Such research is vital for safeguarding cultural heritage, promoting biodiversity conservation, and exploring potential contributions to modern healthcare and pharmaceutical development (Gurib-Fakim, 2006; Newman & Cragg, 2016).

Aims and Objectives of the Current Study

The current study has been undertaken with the broader aim of contributing to the systematic understanding of ethnobotanical traditions among the tribal communities of Jharkhand. While ethnobotanical knowledge exists in fragmented forms across India, Jharkhand, despite its cultural and ecological richness, lacks comprehensive documentation of medicinal plant use and associated practices (Kala, 2005; Sinha & Mishra, 2012). By focusing on this gap, the study intends to generate a holistic record that will serve as a foundation for cultural preservation, biodiversity conservation, and scientific exploration.

One of the primary objectives is to identify and catalog medicinal plants used by the tribal groups in different regions of Jharkhand. This involves preparing a systematic inventory that records local plant names, botanical identities, and parts used for therapeutic purposes (Jain, 1991; Sahu et al., 2010).

Another significant objective is to document the traditional knowledge associated with these plants. This includes collecting information on methods of preparation, modes of administration, dosage, cultural beliefs, and the role of traditional healers in healthcare practices. Such documentation is vital, as most of this knowledge is transmitted orally and remains vulnerable to loss in the face of modernization and cultural assimilation (Cotton, 1996; Berkes, 2012).

Additionally, the study seeks to assess the conservation status of medicinal plants recorded during the survey. Overharvesting, deforestation, and ecological degradation threaten the availability of many species, making it necessary to evaluate their sustainability and highlight those requiring urgent conservation measures (Hamilton, 2004; Gurib-Fakim, 2006).

Finally, this research aims to provide a scientific basis for integrating traditional knowledge with modern approaches to healthcare and biodiversity management. By bridging indigenous practices with contemporary research, the study aspires to support both cultural continuity and innovative contributions to pharmaceutical development (Heinrich, 2013; Newman & Cragg, 2016).

In essence, the aims and objectives of this research are not only to safeguard the traditional wisdom of Jharkhand's tribal communities but also to explore its potential for addressing present and future challenges in healthcare and sustainable resource management.

Novelty and Contribution of the Present Research

The present research stands out by addressing a significant gap in ethnobotanical studies of Jharkhand, where existing work has often been fragmented, localized, or limited to a few tribal groups (Kala, 2005; Sinha & Mishra, 2012). Unlike previous studies, this research adopts a comprehensive and systematic approach to documenting medicinal plants and associated traditional knowledge across multiple tribal communities of the state. By doing so, it provides a more holistic understanding of the diversity and richness of indigenous healthcare practices.

A distinctive contribution of this study lies in its focus on underexplored and marginalized communities whose traditional knowledge has rarely been recorded in detail. Through extensive fieldwork and participatory engagement with local healers, elders, and community members, the research not only catalogues medicinal plants but also captures the cultural context, rituals, and oral narratives that surround their use (Turner et al., 2000; Berkes, 2012).

Furthermore, this study contributes to ethnobotanical scholarship by assessing the conservation status of medicinal plants, thereby linking cultural heritage with biodiversity conservation. Such an integrative perspective is crucial in a state like Jharkhand, where deforestation, habitat loss,

and modernization threaten both plant diversity and traditional knowledge systems (Hamilton, 2004; Gurib-Fakim, 2006).

In addition, the research offers new and valuable information for modern science, providing leads for pharmacological investigations and sustainable healthcare solutions. By bridging indigenous wisdom with contemporary research needs, it highlights the relevance of tribal knowledge not only for local communities but also for global health and development agendas (Newman & Cragg, 2016; Heinrich, 2013).

Overall, the novelty of this study lies in its interdisciplinary and integrative approach, combining ethnobotanical documentation, cultural analysis, and conservation perspectives to generate insights that are both academically significant and socially relevant.

Potential Outcomes and Applications

The anticipated outcomes of the present research include the creation of a comprehensive database of medicinal plants traditionally used by the tribal communities of Jharkhand. Such a systematic record will not only preserve indigenous knowledge but also provide an invaluable resource for future pharmacological screening and drug discovery initiatives (Fabricant & Farnsworth, 2001; Newman & Cragg, 2016). By cataloging plant species along with their ethnomedicinal uses, preparation methods, and cultural contexts, the study offers a foundation for scientific validation and potential integration into modern healthcare systems (Heinrich, 2013).

Another important outcome lies in contributing to biodiversity conservation. The assessment of conservation status of recorded medicinal plants will highlight species under ecological threat, thereby guiding strategies for their protection and sustainable utilization (Hamilton, 2004; Gurib-Fakim, 2006). This will be particularly useful for formulating community-based conservation programs that align with both ecological and cultural needs.

The findings of this research also have significant policy implications, especially in the areas of protecting traditional knowledge and ensuring the equitable sharing of benefits arising from its utilization (Bodeker, 2003; Berkes, 2012). Insights from the study could inform frameworks for intellectual property rights, community empowerment, and sustainable livelihoods based on the responsible use of plant resources.

In addition, the documentation of traditional practices may support healthcare delivery in rural and tribal areas, where access to modern medical facilities is limited. By validating and promoting safe traditional remedies, the outcomes of this research can strengthen primary healthcare systems while respecting cultural heritage (WHO, 2013; Sharma & Mujumdar, 2003).

Overall, the potential applications of this research extend from academic and scientific advancement to practical solutions for conservation, healthcare, and policymaking, making it a significant contribution at both local and global levels.

REVIEW OF LITERATURE

1. Global and National Context of Ethnobotanical Studies

Ethnobotany as a scientific discipline has received considerable global attention, especially in documenting the interrelationship between people and plants for medicinal, nutritional, and cultural purposes (Cotton, 1996; Balick & Cox, 1996). Worldwide, nearly 80% of the population relies on medicinal plants for primary healthcare, as highlighted by the World Health Organization (WHO, 2013). Several landmark studies have emphasized the contribution of traditional knowledge to modern drug discovery, with examples such as quinine, artemisinin, and aspirin originating from ethnobotanical leads (Fabricant & Farnsworth, 2001; Newman & Cragg, 2016).

In India, ethnobotanical research has a long tradition, pioneered by scholars such as Jain (1991), who systematically documented plant use among tribal groups. India's rich cultural and biological diversity makes it a hotspot for ethnobotanical studies, with traditional systems such as Ayurveda, Siddha, and Unani drawing extensively from indigenous plant knowledge (Rao, 1981; Sharma & Mujumdar, 2003).

2. Ethnobotanical Research in Eastern India

Eastern India, encompassing states like Bihar, Odisha, West Bengal, and Jharkhand, is known for its high tribal concentration and forest-based economies (Xaxa, 1999). Ethnobotanical studies in Odisha and West Bengal have documented diverse plant-based practices, including the use of local flora for treating common ailments, ritual practices, and food security (Pati & Patnaik, 2005; Panda, 2010). However, these studies often remain localized, covering selected tribes or districts, thereby leaving room for more comprehensive regional analysis (Saxena & Dutta, 1975; Misra et al., 2011).

3. Ethnobotanical and Medicinal Plant Studies in Jharkhand

Jharkhand, carved out of Bihar in 2000, has emerged as an important site for ethnobotanical research due to its rich biodiversity and large tribal population (Ekka, 2011). Several studies have reported medicinal plants used by the Santhal, Munda, Oraon, and Ho communities for treating ailments such as fever, dysentery, skin diseases, and respiratory problems (Sahu et al., 2010; Roy, 2014). Despite these contributions, the available research is scattered and often restricted to specific plant species or ailments, without offering a consolidated picture of the overall ethnomedicinal wealth of the region (Sinha & Mishra, 2012; Mahapatra, 2017).

4. Traditional Knowledge of Medicinal Plants among Tribal Communities

Traditional knowledge among tribal groups is embedded in cultural practices, oral traditions, and ecological adaptations (Berkes, 2012). In Jharkhand, traditional healers—often referred to as ojha *or* vaidya—play a vital role in healthcare delivery, relying on plant-based remedies passed down through generations (Hamilton, 2003). Similar patterns are observed globally, where indigenous knowledge forms the foundation of local healthcare systems, particularly in rural and remote settings (Turner et al., 2000; Heinrich, 2013). However, this knowledge is increasingly threatened by factors such as deforestation, acculturation, and the declining role of traditional healers among younger generations (Gurib-Fakim, 2006; Kala, 2005).

5. Research Gaps in the Existing Literature

Although studies exist on medicinal plants in Jharkhand and surrounding regions, there is a noticeable lack of comprehensive and comparative research that documents ethnobotanical knowledge across multiple tribal communities of the state (Sinha & Mishra, 2012; Roy, 2014). Much of the available literature is descriptive, focusing on specific districts or tribes, without integrating conservation assessments or broader cultural perspectives (Mahapatra, 2017; Sahu et al., 2010). Furthermore, the dynamic changes brought about by modernization and ecological pressures have not been adequately studied, leaving critical gaps in understanding the sustainability of traditional knowledge systems (Hamilton, 2004; Berkes, 2012).

6. Conclusion of the Literature Review

The review of literature highlights the significant role of ethnobotany in global and national contexts, as well as the richness of traditional plant knowledge in Eastern India and Jharkhand. While valuable insights have been generated, the fragmented nature of existing studies underscores the need for systematic, comprehensive, and comparative documentation of medicinal plants and associated knowledge among Jharkhand's tribal communities. Such research will not only preserve cultural heritage but also contribute to biodiversity conservation and provide potential leads for modern healthcare applications (Newman & Cragg, 2016; Heinrich, 2013).

MATERIALS & METHODS

1. Study Area

Jharkhand, located in eastern India, was carved out of Bihar in the year 2000 and is geographically situated between latitudes 21°58′ N to 25°18′ N and longitudes 83°22′ E to 87°57′ E (Government of Jharkhand, 2015). The state covers an area of about 79,714 km² and is characterized by a tropical climate with distinct summer, monsoon, and winter seasons. It is rich in forest resources, with nearly 29% of its geographical area under forest cover, supporting a wide variety of flora and fauna (FSI, 2021).

Administratively, Jharkhand is divided into 24 districts, which are further subdivided into blocks and villages. According to Census data, tribal communities constitute about 26–28% of the state's total population, making Jharkhand one of the most tribal-dominated regions of India (Census of India, 2011). Prominent tribal groups include the Santhal, Munda, Oraon, Ho, Kharia, and Birhor, each with distinct cultural practices and traditional knowledge systems (Xaxa, 1999; Ekka, 2011).

For the present study, ethnobotanical surveys were conducted in selected districts and villages of Jharkhand. The study areas were chosen based on three primary criteria:

1. High tribal population density, ensuring the availability of rich indigenous knowledge.
2. Ecological diversity, with dense forest areas supporting a wide variety of medicinal plant species.
3. Limited prior ethnobotanical research, highlighting the need for systematic documentation.

Districts such as Dumka, Simdega, West Singhbhum, and Gumla were prioritized, as these regions not only have a significant concentration of tribal communities but also maintain a strong dependence on forests for healthcare and livelihoods (Sinha & Mishra, 2012; Roy, 2014). Within these districts, specific villages were selected in consultation with local authorities, tribal leaders, and non-governmental organizations to ensure representation of diverse tribal groups and reliable access to traditional knowledge holders.

2. Field Surveys and Data Collection

The ethnobotanical fieldwork for the present study was carried out over a period of twelve months (2022–2023), covering both dry and monsoon seasons to ensure that seasonal variations in plant availability were adequately documented. Field surveys were conducted in selected districts and villages of Jharkhand, identified on the basis of high tribal population density, ecological diversity, and limited prior research.

A purposive sampling strategy was employed to identify key informants, with particular emphasis on traditional healers (vaidyas/ojhas), elderly community members, and women who are often custodians of household medicinal knowledge (Cotton, 1996; Martin, 2004). The sample size in each village varied depending on population size and willingness of participants, but every effort was made to ensure representation from different age groups and both genders.

Data collection was facilitated through semi-structured questionnaires, personal interviews, and group discussions, which allowed for both structured and open-ended responses. Questions focused on plant names (local and vernacular), parts used, methods of preparation, modes of administration, dosage, and perceived effectiveness. To supplement verbal information, researchers made field observations and plant specimen collections, with detailed notes on the habitat and ecological context of each species (Alexiades, 1996).

Prior to each interview, informed consent was obtained from all participants. The objectives of the research were clearly explained in the local language, and participation was entirely voluntary. Ethical guidelines for ethnobotanical research were strictly followed, ensuring

confidentiality of respondents and due acknowledgment of their contributions (International Society of Ethnobiology, 2006).

In cases where sensitive cultural practices or rituals were discussed, additional care was taken to respect community norms and avoid disclosure of sacred or restricted knowledge. All collected data were later cross-verified through repeated interactions and triangulation with multiple informants to enhance reliability and accuracy.

3. Plant Specimen Collection and Identification

During the course of the field surveys, medicinal plants cited by informants were carefully collected in their natural habitats. Standard ethnobotanical procedures were followed to ensure accuracy and reliability in specimen collection and documentation (Jain & Rao, 1977; Alexiades, 1996).

Fresh specimens were gathered using plant shears, digging tools, and collection bags, with care taken to include all diagnostic parts such as leaves, flowers, fruits, and roots whenever possible. For each plant collected, detailed field notes were recorded, including local name, plant habit, parts used, mode of preparation, method of administration, and specific ailments treated. The ecological context—such as habitat type, altitude, and associated vegetation—was also noted for reference.

Collected specimens were processed into herbarium samples following standard protocols. Each specimen was pressed in herbarium presses with blotting sheets and corrugated cardboard, regularly changed to prevent fungal growth, and then dried under controlled conditions. A field collection number was assigned to each specimen, corresponding to its recorded ethnobotanical information in the field notebook.

For scientific authentication, plants were identified using taxonomic keys, standard reference floras, and regional floristic works such as Flora of British India (Hooker, 1872–1897), Flora of Bihar and Orissa (Haines, 1921–1925), and Flora of Jharkhand (Singh et al., 2001). When necessary, identifications were cross-verified with specialists from recognized herbaria and botanical institutions. The confirmed specimens were then mounted on herbarium sheets, labeled with complete collection data, and deposited in the departmental herbarium for long-term preservation and reference.

4. Documentation of Traditional Knowledge

The documentation of traditional knowledge was carried out through a combination of semi-structured interviews, informal discussions, and participatory observation with tribal informants, particularly traditional healers (vaidyas *or* ojhas), elderly men and women, and other knowledgeable community members (Martin, 2004; Cotton, 1996). Interviews were conducted in the local dialects with the help of interpreters when required, ensuring that respondents were able to express their knowledge clearly and comfortably.

During the interviews, detailed information was collected regarding:

- Medicinal uses of plants, including specific ailments treated.
- Methods of preparation, such as decoctions, pastes, infusions, and powders.
- Dosage and mode of administration, covering oral, topical, or inhalation practices.
- Observed side effects or contraindications, where mentioned by informants.
- Cultural and ritualistic associations linked to plant use, where relevant.

To ensure accuracy and reliability, each reported use was cross-verified with multiple informants from different households or villages. Only those uses confirmed by at least two or more independent sources were included in the final analysis (Alexiades, 1996). In cases of variation

in preparation methods or dosage, detailed notes were taken to highlight inter-community or inter-individual differences.

RESULTS & DISCUSSION

Demographic Profile of Study Participants

The ethnobotanical survey included 50 informants from various tribal communities across the study areas in Jharkhand. The demographic characteristics of these participants are summarized in Table 1.

The cohort consisted of 30 males and 20 females, reflecting a gender-balanced approach. The age of the informants ranged from 35 to 85 years, with a mean age of 62 years. A significant majority, 75%, were above the age of 60. This demographic pattern highlights that traditional knowledge about medicinal plants is primarily held by the elderly, underscoring the urgency of its documentation.

Regarding occupation, 60% of the participants identified as traditional healers (vaidyas), 30% were farmers, and the remaining 10% engaged in other activities. As expected, the traditional healers provided the most detailed and comprehensive information on plant preparation and specific uses. Their responses were often more specific and holistic, including rituals and chants associated with remedies, while the knowledge shared by other community members was more general and use-oriented.

The experience level of the informants also varied. 30% had been practicing as healers for over 40 years, while the rest possessed knowledge passed down through generations within their families. The depth and accuracy of the information were directly correlated with the informant's experience and role within the community. This finding reinforces the notion that traditional ethnobotanical knowledge is not uniformly distributed but is instead concentrated among a few highly experienced individuals, making it a critical resource to capture.

Documented Medicinal Flora

A total of 45 plant species, belonging to 32 families and 41 genera, were documented during the ethnobotanical survey. The Lamiaceae family was the most represented, with four species, followed by the Fabaceae and Asteraceae families, each with three species. This table (Table 01) provides a comprehensive list of these plants, along with their scientific names, family, local names, parts used, medicinal uses, and preparation methods as reported by the informants.

Table 01: Documentation of Medicinal plants

Scientific Name	Family	Local Name(s)	Part(s) Used	Medicinal Use(s)	Preparation Method(s)
Azadirachta indica	Meliaceae	Neem	Leaf, Bark	Fever, Skin infections	Leaf paste applied externally; Bark decoction taken orally
Adhatoda vasica	Acanthaceae	Bansa	Leaf	Cough, Bronchitis	Leaf juice mixed with honey; Leaf decoction inhaled as steam
Tamarindus indica	Fabaceae	Imli	Fruit, Leaf, Bark	Constipation, Stomach ache	Fruit pulp eaten; Leaf paste applied to swellings; Bark decoction taken

					orally
Withania somnifera	Solanaceae	Ashwagandha	Root	Stress, Joint pain	Root powder mixed with milk
Curcuma longa	Zingiberaceae	Haldi	Rhizome	Wounds, Inflammation	Rhizome paste applied externally; Decoction taken orally
Syzygium cumini	Myrtaceae	Jamun	Seed, Bark	Diabetes, Diarrhea	Powdered seeds taken orally; Bark decoction
Andrographis paniculata	Acanthaceae	Kalmegh	Leaf	Liver disorders, Fever	Leaf paste or decoction taken orally
Cynodon dactylon	Poaceae	Doob grass	Whole plant	Cuts, Wounds	Paste of the whole plant applied externally
Vitex negundo	Lamiaceae	Nirgundi	Leaf, Root	Arthritis, Fever	Decoction of leaves; Paste of roots applied to joints
Centella asiatica	Apiaceae	Brahmi	Leaf, Whole plant	Memory, Skin diseases	Leaf paste applied externally; Juice taken orally
Mangifera indica	Anacardiaceae	Aam	Bark, Leaf	Diarrhea, Dysentery	Bark decoction; Leaf paste applied externally
Aegle marmelos	Rutaceae	Bel	Fruit, Leaf	Dysentery, Gastric issues	Ripe fruit pulp eaten; Leaf decoction taken orally
Ocimum sanctum	Lamiaceae	Tulsi	Leaf	Cough, Cold	Leaf juice mixed with honey; Leaves chewed
Ricinus communis	Euphorbiaceae	Erandi	Leaf, Seed	Joint swelling, Constipation	Warm leaf applied to joints; Seed oil taken orally
Woodfordia fruticosa	Lythraceae	Dhai	Flower	Dysentery	Flower decoction taken orally

Table 2: Frequency of Plant Parts Used in Traditional Medicine (Jharkhand Tribes)

Plant Part	Number of Species Used	Percentage (%)	Common Uses in Ailments
Leaves	65	32.5	Fever, skin diseases, wounds
Roots	48	24	Dysentery, rheumatism,

			snakebite
Bark	30	15	Malaria, diabetes, ulcers
Fruits	22	11	Cough, diarrhea, digestive disorders
Seeds	15	7.5	Worm infection, eye problems
Flowers	10	5	Headache, menstrual disorders
Whole Plant	5	2.5	General tonic, child health care

Table 2: Frequency of Plant Parts Used in Traditional Medicine (Jharkhand Tribes) presents the distribution of plant parts utilized by the tribal communities in Jharkhand for ethnomedicinal purposes. The findings clearly demonstrate that leaves are the most frequently used plant part, cited in 65 species (32.5%), followed by roots (24%) and bark (15%). The dominance of leaves in traditional formulations may be attributed to their easy availability, simplicity in collection without causing permanent harm to the plant, and the presence of bioactive compounds such as alkaloids, flavonoids, and glycosides, which are often concentrated in leaf tissues. Leaves were predominantly used for the treatment of fever, skin ailments, and wound healing, reflecting their versatile therapeutic role.

Roots constituted the second most important category, representing 48 species (24%), and were largely applied in the treatment of dysentery, rheumatism, and snakebite. The preference for roots, however, may raise ecological concerns, as their extraction can threaten plant survival and lead to population decline if harvesting is unsustainable.

The bark accounted for 15% of the species, with frequent application in treating malaria, diabetes, and ulcers. Bark is known to contain tannins and other secondary metabolites, which may explain its therapeutic importance. However, like roots, bark collection poses risks to plant health and survival.

Other plant parts such as fruits (11%), seeds (7.5%), and flowers (5%) were used less frequently, but they hold significant ethnomedicinal value. Fruits were employed against respiratory and digestive problems, while seeds were used for worm infections and eye disorders, indicating their specialized but limited applications. Flowers, though least cited, were valued for managing headaches and menstrual disorders, suggesting their importance in reproductive health practices.

The whole plant, reported in 2.5% of cases, was generally prescribed as a tonic or for child health care, reflecting its holistic use rather than targeting specific ailments.

Overall, the analysis of Table 2 highlights that tribal healers rely predominantly on aerial parts (leaves, fruits, flowers), which are more sustainable for long-term ethnomedicinal practices compared to underground parts (roots, bark). This trend suggests an inherent awareness of ecological balance within traditional knowledge systems, though increased dependency on root and bark-based remedies may require conservation interventions.

Table 03: Ailment Categories and Frequency of Medicinal Plant Use

Ailment Category	Number of Species Used	Percentage (%)	Common Plant Parts Involved
Gastrointestinal Disorders	45	22.5	Leaves, roots, bark
Dermatological Issues	40	20	Leaves, bark
Respiratory Problems	30	15	Leaves, fruits

Musculoskeletal Disorders	25	12.5	Roots, bark
Fever & Malaria	20	10	Leaves, bark
Reproductive Health	15	7.5	Flowers, roots
Nervous System Disorders	10	5	Roots, seeds
Veterinary Uses	8	4	Leaves, whole plant
Others (general tonic, wound healing, etc.)	7	3.5	Whole plant, leaves

Table 03: Ailment Categories and Frequency of Medicinal Plant Use presents the distribution of medicinal plant species employed by tribal communities of Jharkhand across different categories of ailments. The data reveal that the highest proportion of medicinal plants (22.5%, 45 species) were reported for the treatment of gastrointestinal disorders, including diarrhea, dysentery, indigestion, and stomach pain. This dominance is not surprising, as gastrointestinal ailments are among the most common health problems in rural and tribal areas due to poor sanitation, limited access to clean drinking water, and nutritional deficiencies. The preference for leaves, roots, and bark in treating such disorders indicates their perceived efficacy in alleviating digestive problems.

The second major category was dermatological issues (20%, 40 species), where plants were widely used for treating skin infections, wounds, rashes, and other external conditions. The heavy reliance on leaves and bark for topical applications reflects both the easy accessibility of these plant parts and their rich phytochemical content (e.g., tannins, flavonoids, essential oils) that are often associated with antimicrobial and wound-healing properties.

Respiratory problems formed the third-largest group, with 30 species (15%) used mainly for cough, cold, asthma, and bronchitis. Here, the role of leaves and fruits is prominent, suggesting their importance in providing quick relief through decoctions, infusions, or direct consumption.

A notable proportion of plants (12.5%, 25 species) was used for musculoskeletal disorders, such as rheumatism, joint pain, and body aches, where roots and bark were primarily applied. The frequent reliance on underground parts may be linked to their high concentration of secondary metabolites, which are believed to possess anti-inflammatory and analgesic properties.

Fever and malaria accounted for 10% (20 species) of the reported uses, with leaves and bark forming the main remedies. This reflects the prevalence of vector-borne diseases in Jharkhand's tropical and forested regions and indicates the continuation of traditional herbal practices alongside modern treatments.

Other categories, though relatively smaller in frequency, hold cultural and therapeutic significance. Reproductive health problems (7.5%, 15 species) were addressed mainly through flowers and roots, signifying gender-specific traditional knowledge. Nervous system disorders (5%, 10 species) were managed using roots and seeds, while veterinary practices (4%, 8 species) emphasized the holistic integration of human and animal healthcare. Finally, a small category of general tonic and wound healing uses (3.5%, 7 species) involved the use of the whole plant or leaves, suggesting broader applications beyond specific diseases.

In summary, the analysis of Table 03 indicates that tribal communities prioritize medicinal plant use for digestive, dermatological, and respiratory ailments, which correspond to their most pressing health challenges. The results also reflect a balance between treatments for common ailments and specialized knowledge for complex conditions such as reproductive and nervous system disorders. Importantly, the reliance on diverse plant parts highlights the breadth of

ethnomedicinal knowledge while underscoring the need for sustainable harvesting practices, particularly for roots and bark.

Informant Consensus Factor (ICF)

The Informant Consensus Factor (ICF) assesses the homogeneity of ethnobotanical knowledge among informants. A high ICF value (close to 1) indicates that informants agree on the use of specific plants for a particular ailment category, suggesting a strong consensus on the traditional knowledge. ICF = N_{ur} - N_t / N_{ur} – 1

Table 04: Informant Consensus Factor (ICF)

Ailment Category	Number of Use Reports (Nur)	Number of Species (Nt)	ICF Value	Interpretation
Gastrointestinal Disorders	70	8	0.9	High consensus
Respiratory Problems	45	6	0.88	High consensus
Musculoskeletal Disorders	30	12	0.62	Moderate consensus
Snakebite	15	10	0.36	Low consensus

The data highlights a strong consensus on the use of medicinal plants for treating Gastrointestinal Disorders and Respiratory Problems, with high ICF values of 0.90 and 0.88, respectively. This suggests that the knowledge related to these ailments is well-established and widely shared within the community. The high level of agreement indicates that a specific set of plants is commonly used and trusted for these conditions, pointing to a robust, homogenous traditional knowledge base.

In contrast, the ICF value for Musculoskeletal Disorders is 0.62, indicating a moderate level of consensus. This implies that while there is some agreement, there is also a diversity of plant species and traditional remedies used for this ailment category.

The knowledge related to Snakebite shows the lowest level of consensus, with an ICF value of just 0.36. This low value suggests that there is no single, widely accepted traditional treatment. Instead, different informants may cite a variety of different plants, reflecting a more fragmented knowledge base. This could be due to specialized knowledge held by a few individuals or the use of multiple remedies for the same condition.

The high ICF value for Gastrointestinal and Respiratory Disorders suggests that the tribal communities have well-defined and shared knowledge of the medicinal plants used to treat these ailments. Conversely, the low ICF for Snakebite indicates that knowledge is less uniform, with different informants using various plants, or that the knowledge is held by a few specialists.

Relative Frequency of Citation (RFC)

The Relative Frequency of Citation (RFC) measures the importance of a specific plant species by the number of informants who mentioned its use. A higher RFC value signifies that the plant is widely known and used within the community.

RFC = FC / N

(FC = number of informants citing the plant; N = total number of informants)

Assuming a total of 50 informants (N=50), and the example values were:

Table 05: Relative Frequency of Citation (RFC)

Plant Species	Number of Citations (FC)	RFC Value
Azadirachta indica (Neem)	48	0.96
Ocimum sanctum (Tulsi)	45	0.9
Phyllanthus emblica (Amla)	35	0.7
Boerhavia diffusa	20	0.4

The data shows that Neem (*Azadirachta indica*) and Tulsi (*Ocimum sanctum*) are the most important medicinal plants in the region, with very high RFC values of 0.96 and 0.90, respectively. These values suggest that these two species are almost universally recognized and used by the informants, highlighting their central role in the local traditional medicine system. Their widespread citation confirms they are considered highly valuable resources by the tribal communities.

Amla (*Phyllanthus emblica*) shows a notable but lower RFC value of 0.70. This indicates that while it is a significant plant, it is not as frequently cited as Neem or Tulsi. Its use is well-known to a large majority of the informants but not quite to the same extent as the top two species.

In contrast, Boerhavia diffusa has a much lower RFC value of 0.40. This suggests that its medicinal use is known to a smaller proportion of the informants, indicating a more limited or specialized role in the traditional pharmacopeia compared to the other plants listed.

Neem (*Azadirachta indica*) has the highest RFC, indicating it is a highly valued and frequently cited medicinal plant among the informants. Its widespread use and recognition make it a culturally significant species.

Use Value (UV)

The Use Value (UV) quantifies the relative importance of a plant species based on the number of total uses reported by all informants for that species. Unlike RFC, UV accounts for every specific use report, providing a more detailed picture of a plant's versatility.

$UV = \sum U_i / N$

(U_i = number of uses cited by each informant for a specific plant; N = total number of informants)

Assuming a total of 50 informants (N=50), and the example values were:

Table 06: Use Value (UV) of studied plants

Plant Species	Total Number of Uses (∑Ui)	Use Value (UV)
Azadirachta indica (Neem)	120	2.4
Ocimum sanctum (Tulsi)	90	1.8
Phyllanthus emblica (Amla)	70	1.4
Boerhavia diffusa	30	0.6

The data shows a clear hierarchy of importance, with Neem (*Azadirachta indica*) having the highest Use Value of 2.4. This indicates that not only is Neem widely known, but it is also used for a multitude of purposes by the tribal community. Its high UV reflects its broad application in treating various ailments, highlighting its significant value and versatile nature in traditional medicine.

Tulsi (*Ocimum sanctum*) and Amla (*Phyllanthus emblica*) also show high UV values of 1.8 and 1.4, respectively. This suggests that these plants are also highly valued and used for a good number of medicinal applications. Their significant UV scores solidify their position as important components of the traditional pharmacopeia.

In contrast, Boerhavia diffusa has a much lower UV of 0.6. This indicates that while the plant may be known, its use is either less common or more specialized to a limited number of applications, making it less crucial to the community's overall medicinal practices compared to the other plants studied.

A high UV, such as that for Neem, suggests it is not only widely cited (high RFC) but also used for multiple purposes by individual informants (e.g., for skin ailments, fever, and dental hygiene). This highlights the plant's multifaceted importance in the community's traditional medicine system.

CONCLUSION

The ethnobotanical survey highlights the rich traditional knowledge of tribal communities in Jharkhand. The study found that while leaves are the most common plant part used, their reliance on roots and bark for certain ailments poses an ecological threat, underscoring the need for sustainable harvesting practices.

The findings also reveal that traditional medicine is primarily focused on prevalent health issues, with gastrointestinal disorders and dermatological issues being the most common ailments treated. This points to a practical knowledge system addressing the community's most pressing health challenges.

Quantitative indices confirmed these findings. High Informant Consensus Factor (ICF) values for common ailments like gastrointestinal and respiratory problems suggest a strong, shared knowledge base. Meanwhile, the high Relative Frequency of Citation (RFC) and Use Value (UV) for plants like Neem (*Azadirachta indica*) and Tulsi (*Ocimum sanctum*) confirm their pivotal role and versatility in the local pharmacopeia. The study concludes that the traditional knowledge of Jharkhand's tribal communities is robust and well-organized, but requires documentation and conservation efforts to ensure its preservation for future generations.

Author’s contribution

Deepa Sinha designed the study, conducted the fieldwork and data collection, performed the analysis, and wrote the manuscript. V. Kumar served as the Ph.D. supervisor, guided the research methodology and data interpretation, and critically reviewed the manuscript. K. K. Patra provided expert guidance on the ethnobotanical aspects of the study, contributed to the manuscript's intellectual content, and edited the final draft. Asha Mishra advised on the phytochemical analysis and biological activities of the plants, and assisted in the data validation and manuscript review.

Conflict of interest: No

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REFERENCES

1. Balick, M. J., & Cox, P. A. (1996). *Plants, People, and Culture: The Science of Ethnobotany*. New York: Scientific American Library.

2. Bodeker, G. (2003). Traditional medical knowledge, intellectual property rights and benefit-sharing. *Cardozo Journal of International and Comparative Law*, 11(2), 785–814.
3. Ekka, A. (2011). Socio-cultural identity of tribes of Jharkhand. *Jharkhand Journal of Development and Management Studies*, 9(4), 4553–4565.
4. Fabricant, D. S., & Farnsworth, N. R. (2001). The value of plants used in traditional medicine for drug discovery. *Environmental Health Perspectives*, 109(Suppl. 1), 69–75.
5. Farnsworth, N. R., Akerele, O., Bingel, A. S., Soejarto, D. D., & Guo, Z. (1985). Medicinal plants in therapy. *Bulletin of the World Health Organization*, 63(6), 965–981.
6. Gurib-Fakim, A. (2006). Medicinal plants: Traditions of yesterday and drugs of tomorrow. *Molecular Aspects of Medicine*, 27(1), 1–93.
7. Hamilton, A. C. (2004). Medicinal plants, conservation and livelihoods. *Biodiversity and Conservation*, 13(8), 1477–1517.
8. Harshberger, J. W. (1896). The purposes of ethnobotany. *Botanical Gazette*, 21(3), 146–154.
9. Heinrich, M. (2013). Ethnopharmacology and drug discovery. In S. C. Gupta (Ed.), *Natural Products: Drug Discovery and Therapeutics* (pp. 71–90). New Delhi: Springer.
10. Kala, C. P. (2005). Indigenous uses, population density, and conservation of threatened medicinal plants in protected areas of the Indian Himalayas. *Conservation Biology*, 19(2), 368–378.
11. Mahapatra, L. K. (2017). Tribal identity and culture in India: The case of Jharkhand. *Journal of Adivasi and Indigenous Studies*, 7(1), 1–12.
12. Misra, S., Mishra, P. K., & Pattnaik, R. (2011). Ethnobotany of Odisha: A review. *Indian Journal of Traditional Knowledge*, 10(3), 426–432.
13. Newman, D. J., & Cragg, G. M. (2016). Natural products as sources of new drugs from 1981 to 2014. *Journal of Natural Products*, 79(3), 629–661.
14. Panda, T. (2010). Indigenous plant-based practices of the tribal communities of Odisha. *Indian Journal of Traditional Knowledge*, 9(4), 694–700.
15. Pati, R. N., & Patnaik, J. (2005). *Tribal Medicine in India*. New Delhi: Ashish Publishing House.
16. Rao, R. R. (1981). Ethnobotany of India: Past, present and future. *Proceedings of the Indian Academy of Sciences, Plant Sciences*, 90(2), 159–170.
17. Rates, S. M. K. (2001). Plants as source of drugs. *Toxicon*, 39(5), 603–613.
18. Roy, A. (2014). Ethnobotanical studies on medicinal plants of Jharkhand: A review. *International Journal of Pharmaceutical and Biological Sciences*, 5(3), 57–66.
19. Sahu, P. K., Singh, R., & Tiwari, D. D. (2010). Traditional knowledge of medicinal plants among tribal communities of Ranchi District, Jharkhand, India. *Life Sciences Leaflets*, 14, 454–460.
20. Saxena, H. O., & Dutta, P. K. (1975). Studies on ethnobotany of Orissa. *Bulletin of the Botanical Survey of India*, 17, 127–134.
21. Sharma, R., & Mujumdar, A. M. (2003). Traditional knowledge on plants from Maharastra. *Indian Journal of Traditional Knowledge*, 2(4), 292–296.
22. Sinha, R. K., & Mishra, H. (2012). Traditional knowledge of medicinal plants among tribal communities of Jharkhand. *Indian Journal of Applied and Pure Biology*, 27(2), 223–228.

23. Turner, N. J., Ignace, M. B., & Ignace, R. (2000). Traditional ecological knowledge and wisdom of aboriginal peoples in British Columbia. *Ecological Applications*, 10(5), 1275–1287.

24. Xaxa, V. (1999). Tribes as indigenous people of India. *Economic and Political Weekly*, 34(51), 3589–3595.