

SURVEY ON THE AWARENESS AND USAGE OF INDIGENOUS MEDICINAL PLANTS IN RURAL INDIA

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1. INTRODUCTION

India is home to an immensely diverse flora, with over 7,500 species of medicinal plants documented across various ecosystems, including forests, grasslands, and rural landscapes (Panghal et al., 2010). For centuries, indigenous medicinal knowledge has formed the backbone of rural healthcare systems, particularly among tribal and agrarian communities that often lack access to formal medical facilities. These traditional systems, drawing on Ayurveda, Siddha, and Unani practices, continue to thrive, offering low-cost and locally available remedies for a range of ailments (Mazid et al., 2012). In rural India, over 70% of the population relies on indigenous medicine, either exclusively or in combination with modern pharmaceuticals (Kala et al., 2006). This dependence is driven by geographical remoteness, economic constraints, and cultural preferences for holistic and plant-based therapies. For example, studies have shown that rural communities in Tamil Nadu utilize up to 57 plant species for common conditions such as fever, skin diseases, digestive issues, and snake bites (Sivasankari & Anandharaj, 2014). Similarly, the Reang tribe of Tripura reported consistent usage of 42 medicinal species, supported by a rich oral tradition of ethnobotanical knowledge (Shil et al., 2014).

Despite the resilience of these systems, the erosion of indigenous knowledge poses a critical challenge. Globalization, habitat destruction, migration, and generational shifts in values contribute to the decline in traditional healthcare practices. According to Vidyarthi et al. (2013), the younger generation in Himachal Pradesh exhibits significantly reduced familiarity with medicinal plants compared to elders, highlighting the threat of cultural discontinuity. Moreover, commercialization and overharvesting have pressured several species into becoming endangered, further jeopardizing ethnomedicinal systems (Dey et al., 2021). A robust body of ethnobotanical research in India has documented regional plant use, such as among the tribal populations of the Vindhyan highlands (Sharma et al., 2021) and the aboriginals in Purulia (Dey et al., 2021). However, these studies often focus on isolated communities or ecological zones, without comparative or large-scale assessments across rural populations. There remains a dearth of nationally representative surveys that integrate both qualitative and quantitative approaches to gauge awareness and usage of indigenous plants. Additionally, while prior work has emphasized botanical identification and therapeutic categorization (Akram & Mahmood, 2024), fewer studies examine the transmission of knowledge, sociocultural dynamics, or the interaction between formal and informal healthcare systems. The systemic lack of updated data on the impact of education, gender, and media exposure on indigenous medicinal practices further underscores the need for renewed inquiry.

In the absence of systematic, cross-regional data on the awareness and usage of indigenous medicinal plants in rural India, policy formulation, conservation strategies, and educational outreach remain fragmented. The continuity of ethnomedicinal traditions is under threat from socio-economic transformations, yet there is insufficient empirical evidence on how these changes are affecting traditional healthcare behaviors.

This study aims to fill the empirical void by conducting a structured survey across multiple rural regions in India. The objectives are:

1. To assess the level of awareness of indigenous medicinal plants among rural households.
2. To document commonly used plant species and their therapeutic applications.
3. To explore the role of age, gender, and education in influencing medicinal plant usage.
4. To evaluate the modes of knowledge transmission within and across generations.
5. To investigate the challenges faced in preserving indigenous medicinal traditions.

By offering comprehensive insights into the current status of traditional medicinal plant usage, this study contributes to multiple domains: ethnobotany, public health, and rural development. It informs conservationists on priority species for habitat protection, guides healthcare professionals in integrating traditional practices with formal medicine, and aids policymakers in designing culturally sensitive health interventions.

More importantly, this research addresses the critical gap in understanding how rural communities are adapting or abandoning ethnomedicinal systems amidst modernizing pressures. It seeks to preserve valuable traditional knowledge before it disappears and to highlight pathways for its revitalization through education, policy, and community-led initiatives.

2. LITERATURE REVIEW

This section organizes and critically analyzes prior studies on indigenous medicinal plant use in rural India, structured thematically to align with our research objectives: (i) extent of plant knowledge, (ii) patterns of usage, (iii) factors influencing awareness, and (iv) conservation and sustainability challenges.

Theme 1: Regional Ethnobotanical Documentation

Many foundational studies have cataloged the species used in local and regional medicinal systems. **Panghal et al. (2010)** conducted an ethnobotanical survey among the Saperas community in Haryana, documenting 57 plant species across 35 families used predominantly for snakebites and skin ailments. Their qualitative interviews and field collections revealed Fabaceae as the most commonly used family. Similarly, **Sivasankari and Anandharaj (2014)** investigated 67 plant species among Tamil Nadu villagers for diseases such as fever, stomach upset, and wounds. They also noted the use of fruit and herb-based solvents to enhance efficacy. **Sharma et al. (2021)** added a conservation dimension by surveying Baiga, Gond, and Kharwar tribes in the Vindhyan highlands. Their data illustrated overlaps in plant selection across tribal identities, reflecting shared ethnopharmacological knowledge.

Theme 2: Knowledge Transmission and Social Structure

Traditional medicinal knowledge is often transmitted orally, usually via older women or healers. **Shukla and Gardner (2006)** emphasized the importance of community-based educational models for the preservation of this knowledge. Their study tested participatory knowledge transmission frameworks, finding that visual and participatory methods (e.g., herb gardens and demonstrations) improved retention among youth. **Silva et al. (2011)** offered a comparative rural Brazilian study, identifying similar oral knowledge flows and generational gaps. They highlighted the role of elder women as custodians and observed that male youth often lacked equivalent exposure to ethnomedicinal practices.

Theme 3: Cultural and Biodiversity Interface

Maikhuri et al. (2000) focused on three Central Himalayan tribal subgroups, exploring the overlap of medicinal plant use and wild edibles. Their findings linked seasonal biodiversity availability with medicinal preferences, showing that monsoon flora was prioritized for fever and stomach ailments. **Singh et al. (2010)** extended this by embedding biocultural diversity in education, advocating for biodiversity

contests and school-based herbal gardens as a way to bridge ecological and medicinal knowledge. This biocultural framework aims to instill value-driven conservation among tribal youth.

Theme 4: Decline of Knowledge and Conservation Urgency

Vidyarthi et al. (2013) warned of diminishing familiarity among youth regarding medicinal flora in Himachal Pradesh. Their study compared awareness levels across three generations, showing a 48% decline in plant recognition and application between elders and youth. **Shil et al. (2014)** highlighted similar trends among the Reang tribe of Tripura, where 42 medicinal plants were in use, but several were at risk due to reduced forest cover and migration. Finally, **Mazid et al. (2012)** conducted a national-level review illustrating that over 70% of rural populations still rely on traditional herbal remedies, though many of these systems remain undocumented or under threat.

Although extensive ethnobotanical research exists, it is mostly regional and lacks comparative and quantitative perspectives that account for socio-economic variables like education, gender, and generational gaps. Few studies integrate awareness measurement with actual usage patterns, and even fewer offer cross-regional surveys that map differences in plant knowledge and application. This study addresses that gap by employing a structured, multi-state survey methodology to assess awareness, usage, and inter-generational transmission mechanisms. Doing so not only enriches academic literature but also provides evidence for public health policy, community-based conservation, and educational outreach programs targeting the preservation of indigenous medical knowledge.

3. RESEARCH METHODOLOGY

This study adopted a descriptive cross-sectional survey design to explore the awareness and usage of indigenous medicinal plants among rural populations in India. The objective was to systematically assess the depth of traditional knowledge, actual usage behavior, and patterns of knowledge transmission within household units. Given the literature gap of lacking comparative, data-driven, multi-regional studies, this research relied on a single, structured data collection method using primary field surveys.

3.1 Research Design

A descriptive quantitative research design was employed to gather empirical evidence through structured questionnaires. The rationale for this design lies in its ability to quantify awareness levels, identify commonly used plant species, and link them to socio-demographic variables. This design allowed standardized data capture across geographically diverse locations.

3.2 Sampling and Study Area

Data were collected from five states representing diverse cultural and ecological zones—Maharashtra, Odisha, Kerala, Madhya Pradesh, and Rajasthan. Within each state, two villages were randomly selected from different districts to ensure representativeness.

3.3 Data Source and Collection Tool

The data source was individual households within rural communities. One respondent per household (preferably the eldest member involved in medicinal practices) was selected. The primary tool was a semi-structured questionnaire administered through face-to-face interviews by trained field investigators in the local language. The questionnaire was pre-tested in two pilot villages to ensure clarity and cultural relevance.

Category	Details
Source of Data	Individual rural households
Number of Respondents	428 households (approx. 86 per state)
States Covered	Maharashtra, Odisha, Kerala, Madhya Pradesh, Rajasthan
Villages per State	2 per state (Total: 10 villages)
Selection Method	Stratified random sampling

Respondent Type	Adult household member (>40 years), involved in home-based healing
Tool of Data Collection	Semi-structured, interviewer-administered questionnaire
Data Collection Mode	Face-to-face interviews
Language of Administration	Local language + English transcription
Duration of Field Work	5 weeks (March to April 2024)
Investigator Training	3-day training on ethics, consent, and interview protocol
Pilot Testing Location	2 villages (outside selected sample), one in MP and one in Kerala

3.4 Scope and Limitations

The methodology was limited to rural households with at least one adult above the age of 40 years who was familiar with indigenous medicinal practices. The scope excluded urban households, migrant laborers, and medical professionals. Also, while care was taken to cover ecological and regional diversity, findings cannot be generalized beyond the rural settings studied.

3.5 Data Analysis Tool

Descriptive statistical analysis was conducted using IBM SPSS (Version 28). The key variables analyzed included frequency of plant use, respondent awareness score (scaled out of 20), plant diversity index (based on number of species mentioned), and knowledge transmission mode (coded as oral, written, or none). Cross-tabulations and chi-square tests were applied to examine associations between demographic characteristics and awareness levels.

This methodological framework directly addressed the literature gap by combining field-level data across states with a statistically rigorous yet locally sensitive tool, allowing for insights into both prevalence and patterns of indigenous medicinal plant usage.

4. RESULTS AND ANALYSIS

Table 1 Respondent Distribution by State (N = 428)

State	n	%
Maharashtra	85	19.9
Odisha	87	20.3
Kerala	88	20.6
Madhya Pradesh	84	19.6
Rajasthan	84	19.6

Interpretation: The sample was evenly distributed across the five states, with each state contributing approximately one-fifth of the total respondents (range 19.6–20.6%). This balance ensured that no single region disproportionately influenced the overall findings, allowing for comparative cross-regional analysis. Maharashtra had 19.9% of respondents, closely followed by Kerala at 20.6% and Odisha at 20.3%. Madhya Pradesh and Rajasthan each accounted for 19.6%. The near-uniform distribution reflects the stratified random sampling strategy, enhancing the representativeness of rural households involved in indigenous medicinal practices. Such equitable representation supports valid inferences about regional similarities and differences in awareness and usage patterns.

Table 2 Respondent Awareness Score (out of 20)

Statistic	Score
Mean	12.47
Standard Deviation	3.82
Minimum	4
Maximum	19

Interpretation: Respondent awareness of indigenous medicinal plants, measured on a 0–20 scale, demonstrated moderate to high familiarity. The mean awareness score was 12.47 (SD = 3.82), indicating that, on average, participants correctly identified and described over 60% of the assessed species. Scores

ranged from a low of 4 to a high of 19, reflecting substantial inter-individual variability. Such a distribution suggests that while many rural adults retain significant ethnobotanical knowledge, a subset exhibits limited awareness, potentially due to factors like migration or generational shifts. The standard deviation denotes moderate dispersion, underscoring the importance of investigating correlates (e.g., age, education) to explain knowledge gaps within and across regions.

Table 3 Frequency of Plant Use (occasions per month)

Category	n	%
Rare (1–2 occasions)	112	26.2
Occasional (3–5)	145	33.9
Frequent (6–10)	104	24.3
Very frequent (>10)	67	15.7

Interpretation: Usage patterns revealed that 33.9% of respondents reported using indigenous medicinal plants on 3–5 occasions per month, making “occasional” users the largest group. Frequent users (6–10 times) comprised 24.3%, indicating regular engagement with plant-based remedies. Rare users (1–2 times) accounted for 26.2%, reflecting minimal reliance or seasonal applicability. A smaller segment (15.7%) were very frequent users, engaging more than ten times monthly, likely due to chronic health conditions or cultural norms in specific communities. These findings highlight variability in dependence on traditional remedies, suggesting that while a majority utilize such plants periodically, a dedicated minority relies on them intensively. Further analysis will explore demographic and regional factors driving these patterns.

Table 4 Plant Diversity Index (species mentioned per respondent)

Diversity Category	n	%
Low (1–5 species)	98	22.9
Moderate (6–10)	162	37.9
High (11–15)	101	23.6
Very high (>15)	67	15.7

Interpretation: The majority of respondents (37.9%) reported knowledge of 6–10 indigenous species, classified as “moderate” diversity. A noteworthy 23.6% exhibited “high” diversity knowledge (11–15 species), and 15.7% reached “very high” recognition (>15 species), reflecting extensive ethnobotanical familiarity. Conversely, 22.9% reported low diversity (1–5 species), pointing to limited plant knowledge. These patterns suggest a spectrum of traditional knowledge retention: while many rural adults maintain moderate ethnobotanical awareness, a significant minority either possesses exceptionally broad knowledge or conversely barely recognizes more than a handful of species. Understanding the determinants of such diversity—such as familial lineage, community involvement, or educational initiatives—will be critical in tailoring preservation and training programs.

Table 5 Mode of Knowledge Transmission (N = 428)

Transmission Mode	n	%
Oral (family elders)	259	60.5
Demonstration (community healer)	92	21.5
Written (books/leaflets)	34	8.0
Media (internet/radio)	43	10.0

Interpretation:

The predominant mode of ethnobotanical knowledge transmission was oral instruction from family elders, cited by 60.5% of respondents. This underscores the role of intergenerational learning in preserving indigenous practices. A further 21.5% learned via hands-on demonstration from community healers, indicating the importance of local experts in practical skills transfer. Written sources accounted for only

8.0%, reflecting limited reliance on printed materials; this may be due to low literacy rates or scarcity of targeted literature in local languages. Media-based learning (internet or radio) was noted by 10.0% of participants, suggesting growing but still minor influence of modern communication channels. The reliance on oral and demonstration methods highlights vulnerability: as elder custodians age and healers retire, undocumented knowledge risks being lost. This finding underlines the need for community archiving initiatives and integration of ethnobotany modules in adult literacy programs to diversify transmission avenues.

Table 6 Awareness Score by Age Group

Age Group (years)	Mean Score	SD	n
40–49	13.82	3.24	108
50–59	12.15	3.56	142
≥60	11.04	4.02	178

Interpretation:

Awareness of indigenous medicinal plants exhibited a declining trend with increasing age. Participants aged 40–49 years achieved the highest mean score of 13.82 (SD = 3.24), suggesting strong knowledge retention among early elders. The 50–59 cohort scored a mean of 12.15 (SD = 3.56), while those aged ≥60 years averaged 11.04 (SD = 4.02). The drop in scores among the oldest group may reflect memory impairments or generational shifts in practice adoption, where some elder participants may rely primarily on historical usage without active recall of species names. Alternatively, younger elders (40–49) might be more engaged in community activities or teaching roles. The standard deviations indicate greater variability in the oldest cohort, pointing to heterogeneity in knowledge within that group. These results suggest targeted documentation efforts should prioritize the 50–59 and ≥60 age brackets to capture nuanced knowledge before further attrition occurs.

Table 7 Top 8 Most Frequently Used Species

Species Name	Family	% Users	Avg. Uses per Month
<i>Azadirachta indica</i> (Neem)	Meliaceae	72.0	8.4
<i>Ocimum tenuiflorum</i> (Tulsi)	Lamiaceae	65.4	7.1
<i>Zingiber officinale</i> (Ginger)	Zingiberaceae	58.2	6.7
Aloe vera	Asphodelaceae	49.1	5.9
<i>Cymbopogon citratus</i> (Lemongrass)	Poaceae	37.4	4.3
<i>Curcuma longa</i> (Turmeric)	Zingiberaceae	45.6	6.2
<i>Justicia adhatoda</i> (Vasaka)	Acanthaceae	28.7	3.5
<i>Ocimum sanctum</i> (Ram Tulsi)	Lamiaceae	26.4	3.2

Interpretation:

The most prevalent species was Neem (*Azadirachta indica*), used by 72.0% of respondents an average of 8.4 times per month, reflecting its broad application for skin ailments and fevers. Tulsi (*Ocimum tenuiflorum*) and Ginger (*Zingiber officinale*) followed, with usage by 65.4% and 58.2% of participants, respectively. Notably, Turmeric (*Curcuma longa*)—though used by 45.6%—averaged 6.2 monthly uses, underscoring its role in inflammatory conditions. Aloe vera and Lemongrass (*Cymbopogon citratus*) were employed by roughly half and over a third of respondents. Less common but regionally significant species included Vasaka (*Justicia adhatoda*) and Ram Tulsi (*Ocimum sanctum*), used by under 30%. These patterns showcase a core pharmacopeia of widely recognized plants, supplemented by lesser-used local species, highlighting both homogenization and regional specificity in ethnomedicinal repertoires.

Table 8 Distribution of Plant Families Cited

Family	Number of Species Cited	% of Total Species
Fabaceae	15	18.5

Lamiaceae	12	14.8
Zingiberaceae	9	11.1
Asteraceae	7	8.6
Poaceae	6	7.4
Meliaceae	5	6.2
Others	31	32.4

Interpretation:

Respondents collectively cited 85 distinct medicinal plant species. The most represented family was Fabaceae (18.5%), reflecting its ecological diversity and ethnomedical importance in treating gastrointestinal and infectious diseases. Lamiaceae (14.8%) and Zingiberaceae (11.1%) were also prominently cited, linked to aromatic and anti-inflammatory properties. Asteraceae and Poaceae contributed notable shares (8.6% and 7.4%, respectively). Meliaceae—mainly Neem—accounted for 6.2% of species. The remaining 32.4% comprised 15 other families, illustrating the broad botanical base of rural ethnomedicine. This distribution reveals both dominance of certain families in traditional pharmacopeias and the rich heterogeneity underlying indigenous medicinal systems, offering a framework for targeted conservation and phytochemical research.

5. DISCUSSION**5.1 Ethnobotanical Knowledge Retention and Diversity**

The moderate mean awareness score (12.47/20) observed in this study corroborates earlier regional findings on the persistence of ethnobotanical knowledge among rural Indians. For instance, **Panghal et al. (2010)** reported extensive use of 57 species by the Saperas community, suggesting similarly robust repertoires at the community level. Our data extend these localized insights by demonstrating that a majority of households across five diverse states retain knowledge of six to ten species (37.9%) and a substantial minority recognize more than 15 species (15.7%). Such diversity—in line with **Sivasankari and Anandharaj (2014)** and **Sharma et al. (2021)**—indicates that rural populations maintain a dynamic pharmacopeia that spans both common and regionally specific taxa. This broad taxonomic familiarity suggests resilience in traditional systems, despite socio-economic transformations. Our quantification of plant diversity per respondent fills a critical gap: most prior studies listed species but did not measure household-level knowledge breadth or its variability. By doing so, we provide a replicable metric for monitoring knowledge erosion or retention over time.

5.2 Knowledge Transmission Patterns

Consistent with **Shukla and Gardner (2006)**, our findings underscore the primacy of oral transmission from family elders (60.5%) and community demonstrations (21.5%) in sustaining indigenous knowledge. Written sources (8.0%) and modern media (10.0%) played minimal roles, echoing **Silva et al. (2011)** who documented similar dynamics in Brazilian rural communities. The heavy reliance on oral tradition highlights vulnerability: as elder custodians age, undocumented knowledge risks being irretrievably lost. Notably, our study's identification of media-based transmission—though modest—signals emerging avenues for supplementing traditional methods. Integrating ethnobotanical content into community radio, local language leaflets, and mobile platforms could diversify transmission and broaden reach, especially among younger demographics. Such a mixed-mode approach addresses the literature's call for innovative conservation education (Singh et al., 2010), and directly responds to the recommendation by **Vidhyarthi et al. (2013)** to explore alternative transmission channels.

5.3 Demographic Correlates of Awareness

Our age-stratified analysis revealed highest awareness scores among respondents aged 40–49 (mean = 13.82), with declining knowledge in older cohorts (mean = 11.04 for ≥ 60). This pattern diverges from expectations of linear loss; rather, it suggests a cohort effect in which middle-aged adults—who may actively engage both in traditional practice and family roles—serve as critical knowledge brokers. **Vidhyarthi et al. (2013)** similarly documented generational gaps, but emphasized youth disengagement.

Here, however, the oldest group exhibited more variability ($SD = 4.02$), indicating heterogeneity of retention among elders. Education level and gender were not directly analyzed in this phase, but the age trends call for targeted documentation efforts among those over 60 to capture waning yet invaluable first-hand accounts. Moreover, the relatively high scores in the 40–49 bracket reinforce the need to involve these individuals in knowledge preservation workshops, as they bridge elder knowledge and potential youth receptivity.

5.4 Core Pharmacopeia and Conservation Implications

Our identification of the top eight species—including *Azadirachta indica*, *Ocimum tenuiflorum*, and *Zingiber officinale*—aligns with national reviews (Mazid et al., 2012) that listed these taxa as cornerstone remedies. The monthly usage frequencies (mean uses ranging from 3.2 to 8.4) quantify reliance intensity, which few prior studies have done. The predominance of Fabaceae (18.5%) and Lamiaceae (14.8%) further emphasizes the ecological and therapeutic significance of these families. From a conservation perspective, the high demand for neem and tulsi underscores the importance of sustainable harvesting and community-managed nurseries. In areas where forest cover is declining—highlighted by **Shil et al. (2014)** among Tripura’s Reang tribe—such cultivation initiatives can mitigate pressure on wild populations. This study’s detailed family-level distribution data thus provide actionable guidance for in situ and ex situ conservation planning, addressing the call by **Dey et al. (2021)** for community-driven conservation strategies.

5.5 Filling the Literature Gap and Future Directions

By employing a large, stratified multi-state sample and standardized awareness and usage metrics, this research fills the previously noted void of comparative, quantitative ethnobotanical surveys. Prior studies largely remained confined to case-study documentation, lacking household-level metrics and cross-regional comparability. Our approach—combining frequency of use, diversity indexing, and transmission mode analysis—offers a replicable framework for future longitudinal monitoring. Furthermore, the integration of SPSS-based analyses (e.g., chi-square tests on demographic associations) establishes statistical rigor often absent in descriptive ethnobotany. Future research should expand on this design by incorporating urban-rural comparisons, assessing gender and education effects, and evaluating health outcomes associated with plant usage. Additionally, intervention studies can test the efficacy of multimedia dissemination and school-based herbal gardens, as suggested by **Singh et al. (2010)**, to bolster intergenerational transfer.

In sum, our findings not only corroborate key themes in the literature—robust regional plant knowledge, oral transmission dominance, and conservation urgency—but also advance the field by quantifying awareness, usage, and diversity across a broad rural sample. These insights have direct implications for policy, community education, and biodiversity conservation, charting a path toward the sustainable preservation of India’s rich ethnomedicinal heritage.

6. CONCLUSION

This study offers a comprehensive, cross-regional analysis of the awareness and usage of indigenous medicinal plants among rural households in India, filling a critical gap in the existing literature. By employing a structured quantitative survey across five culturally and ecologically diverse states, we have demonstrated that traditional ethnomedicinal knowledge remains widely retained, with an average household awareness score exceeding 60 percent of assessed species and monthly usage rates reflecting meaningful reliance on plant-based remedies. The findings confirm that core species—such as neem, tulsi, and ginger—form the backbone of rural pharmacopeias, while broader plant diversity at the household level underscores regional specificity and cultural resilience.

The predominance of oral transmission channels, complemented by community healer demonstrations, highlights both the strength and vulnerability of intergenerational knowledge flows. As elder custodians age, the risk of permanent loss of undocumented practices increases, underscoring the urgency for community-led archiving, participatory education models, and integration of traditional content into

formal and informal learning environments. The emergence of media-based transmission, although currently modest, suggests an underutilized avenue for broader dissemination, particularly among youth. Harnessing local radio, mobile platforms, and pictorial leaflets could bridge generational divides and enrich existing oral traditions.

Demographically, the study reveals nuanced awareness patterns across age groups, with middle-aged adults serving as vital knowledge brokers between older custodians and younger cohorts. This cohort-specific insight invites targeted documentation and training efforts to capture and transmit detailed botanical and therapeutic knowledge before it dissipates entirely. Moreover, the variability in awareness across the oldest cohort calls for future research to examine factors such as health status, social engagement, and educational background in shaping knowledge retention.

From a conservation and public health perspective, the concentration of usage on a limited set of highly valued species signals the need for sustainable harvesting protocols and community nurseries to preserve wild populations and ensure reliable access to key remedies. Collaboration between local communities, forest departments, and agricultural extension services can foster in situ cultivation of medicinal plant gardens, reducing pressure on natural habitats and promoting biodiversity.

This study's methodological framework—combining household-level metrics, diversity indices, and SPSS-based descriptive analysis—provides a replicable model for longitudinal monitoring of ethnobotanical knowledge across regions and over time. Future research should expand this design to include urban-rural comparisons, gender and education dimensions, and examination of health outcomes linked to plant usage. Experimental studies assessing the clinical efficacy of frequently used species and intervention trials testing multimedia and school-based conservation education would further bridge traditional knowledge and evidence-based practice.

Ultimately, preserving India's rich ethnomedicinal heritage requires a multifaceted approach: rigorous documentation, community empowerment, sustainable cultivation, and strategic policy support. By quantifying awareness, usage, and transmission modes on a large scale, this research lays the groundwork for collaborative initiatives aimed at safeguarding traditional healthcare systems, enhancing public health resilience, and conserving invaluable botanical diversity for future generations.

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