

Study of Intra-Cultural Variation in Ecological Knowledge and Natural Resource Use among Tribal Communities of Chikhaldara, Maharashtra, India

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Abstract:

This study examines intra-cultural variation in Ecological Knowledge (EK) and its association with Natural Resource Use (NRU) among the tribal communities of Chikhaldara in the Melghat region of Maharashtra, India. The Korku, Gond, and Bhil tribes residing in this ecologically sensitive landscape maintain long-standing relationships with forest ecosystems that shape their livelihoods, cultural identity, and resource governance systems. The research investigates whether variations in ecological knowledge across age, gender, education, and tribal affiliation influence the intensity and diversity of natural resource utilization, including medicinal plants, edible forest products, construction materials, fodder, and water resources. A cross-sectional mixed-method approach was employed, incorporating semi-structured interviews, focus group discussions, participatory observation, and statistical analysis using Pearson's correlation, Chi-square tests, and Analysis of Variance (ANOVA). Findings reveal a statistically significant positive association between EK and NRU across all groups, with stronger correlations observed among adults and elders compared to youth. Noticeable inter-group differences were identified, particularly with the Korku tribe demonstrating relatively higher knowledge-use integration. Gendered dimensions of ecological knowledge were evident, as women exhibited specialized expertise in ethnobotanical resources while men were more engaged in timber and construction-related extraction. The study also identifies gradual erosion of ecological knowledge among younger generations due to migration, formal education systems lacking local ecological integration, and weakening intergenerational transmission. The results highlight that ecological knowledge is socially differentiated, culturally embedded, and central to sustainable resource governance. The study underscores the importance of integrating indigenous knowledge systems into conservation planning, participatory forest management, and culturally contextualized educational frameworks to ensure ecological sustainability and cultural continuity.

Keywords: Ecological Knowledge; Natural Resource Use; Tribal Communities; Intra-Cultural Variation; Melghat; Indigenous Knowledge Systems.

1. INTRODUCTION

Natural resources have historically sustained indigenous and tribal communities whose livelihoods, cultural systems, and belief structures are closely intertwined with ecological landscapes. In India, Scheduled Tribes constitute approximately 8.6% of the population [1], and a substantial proportion depend directly on forests, land, and water systems for subsistence and socio-cultural identity. Chikhaldara, located in the Melghat region of Maharashtra and forming part of the buffer zone of the Melghat Tiger Reserve, represents a distinctive socio-ecological setting where biodiversity richness intersects with traditional forest-based livelihoods [2]. The region is predominantly inhabited by the Korku, Gond, and Bhil tribes, each possessing unique yet overlapping ecological knowledge systems developed through generations of experiential interaction with forest ecosystems [3]. Ecological Knowledge (EK), often conceptualized within the broader framework of Traditional Ecological Knowledge (TEK), encompasses cumulative understandings of species behavior, seasonal cycles, resource regeneration, conservation taboos, and sustainable harvesting practices [4,5]. Such knowledge systems are embedded within language, rituals, social organization, and customary institutions, and historically functioned as informal regulatory mechanisms ensuring ecological balance. However, contemporary transformations including formal education, migration, market integration, conservation regulations, and technological exposure are reshaping traditional livelihoods and potentially weakening the knowledge–practice linkage. While tribal communities are often treated as homogeneous holders of ecological wisdom, growing scholarship suggests that knowledge distribution is socially differentiated across age, gender, education, and exposure to modern institutions [6,7]. Against this background, the present study examines intra-cultural variation in ecological knowledge within and between the Korku, Gond, and Bhil communities of Chikhaldara and empirically tests whether variations in EK correspond to differences in Natural Resource Use (NRU). The research further explores how socio-demographic factors mediate the knowledge–use relationship and whether generational transitions are contributing to knowledge erosion [8-10].

The study contributes to interdisciplinary debates in ecological anthropology, environmental governance, and sustainable development by providing empirical evidence from a protected forest landscape. By situating ecological knowledge within socio-cultural and institutional contexts, the research advances a nuanced understanding of how indigenous knowledge systems adapt, persist, or decline in response to modernization and policy interventions [11-15].

2. STUDY AREA

Chikhaldara is situated in the northern part of Amravati district in the Vidarbha region of Maharashtra, India, within the Satpura mountain range at an elevation of approximately 1,100 meters above sea level. The region lies between 21.4°N latitude and 77.2°E longitude and forms part of the Melghat Tiger Reserve, one of India's earliest designated tiger reserves under Project Tiger. The landscape is characterized by undulating plateaus, steep valleys, dry and moist deciduous forests, and seasonal streams, with dominant vegetation including teak (*Tectona grandis*), bamboo (*Dendrocalamus strictus*), mahua (*Madhuca indica*), and tendu (*Diospyros melanoxylon*).

The tribal population primarily comprises the Korku, Gond, and Bhil communities, whose livelihoods are closely linked to forest-based subsistence, small-scale agriculture, non-timber forest product (NTFP) collection, and wage labor [16,17]. Resource use patterns are seasonal and gendered, reflecting traditional divisions of labor and ecological specialization. The region's legal and conservation status introduces regulatory dimensions that shape access to forest resources and influence traditional knowledge practices.

3. METHODOLOGY

The study employed a cross-sectional mixed-method research design integrating quantitative and qualitative approaches. Five tribal villages—Semadoh, Kolkas, Harisal, Chunkhadi, and Gullarghat—were purposively selected based on tribal composition, proximity to forest resources, and dependence on natural resource-based livelihoods. A total of 150 respondents were selected through purposive stratified sampling to ensure representation across tribal affiliation, age cohorts, gender, and educational levels. The sample included 60 Korku, 50 Gond, and 40 Bhil respondents, categorized into youth (18–30 years), adults (31–50 years), and elderly (51+ years), with balanced male and female participation.

Data collection involved semi-structured interviews, focus group discussions, and field observations. Interviews assessed respondents' ability to identify local species, describe seasonal availability, and explain sustainable harvesting practices, and report frequency and diversity of natural resource use. Focus group discussions explored themes of intergenerational transmission, perceived ecological change, and cultural continuity. Observational methods were used to document harvesting techniques and validate reported practices [18-20].

Ecological Knowledge (EK) was operationalized through a composite scoring index incorporating species identification, seasonal awareness, sustainable practices, and conservation norms [21,22]. Natural Resource Use (NRU) was quantified using a weighted index based on frequency and diversity of resource utilization across food, medicinal, fodder, fuelwood, and construction categories [23-25]. Descriptive statistics were computed to summarize patterns, while Pearson's correlation coefficient assessed the strength of association between EK and NRU. Chi-square tests examined categorical relationships, and one-way ANOVA tested differences across tribal, gender, and age groups. Qualitative data were analyzed thematically to contextualize statistical findings. Ethical protocols included informed consent, anonymity, and consultation with village leadership prior to fieldwork. A mixed-method cross-sectional design was adopted [26-30].

Sample Size: 150 respondents (Table-1)

- Korku (n=60)
- Gond (n=50)
- Bhil (n=40)

Table 1: Socio-Demographic distribution of respondents

Variable	Category	Frequency (n=150)	Percentage (%)
Tribe	Korku	60	40
	Gond	50	33.3
	Bhil	40	26.7
Age Group	Youth (18–30)	45	30
	Adult (31–50)	60	40
	Elderly (51+)	45	30
Gender	Male	75	50
	Female	75	50

4. RESULTS AND DISCUSSION

The analysis demonstrates a statistically significant positive correlation between Ecological Knowledge and Natural Resource Use across all tribal groups, indicating that individuals possessing higher ecological understanding engage more intensively and diversely with natural resources. Adults exhibited the strongest knowledge–use relationship, reflecting accumulated experiential knowledge combined with active livelihood participation. Elders retained high ecological knowledge scores but showed comparatively lower physical involvement in extraction activities. Youth respondents displayed weaker correlations, suggesting generational shifts and reduced immersion in traditional ecological practices (Figure 1 & 2).

Inter-group comparison revealed that the Korku community demonstrated relatively higher EK scores and stronger knowledge–use integration compared to the Gond and Bhil groups. These differences may be attributed to settlement patterns, historical forest integration, and differential exposure to external socio-economic influences. Gender analysis revealed domain-specific specialization, with women exhibiting extensive ethnobotanical knowledge related to medicinal plants and wild edibles, while men were more engaged in timber extraction and construction-related activities [31-35].

Qualitative findings confirm that ecological knowledge transmission primarily occurs through oral traditions, ritual participation, and experiential learning. However, migration, digital exposure, and formal education systems lacking localized ecological content have weakened traditional transmission pathways [36]. The results underscore that ecological knowledge is dynamic and socially stratified rather than uniformly distributed. Pearson's correlation showed significant positive association ($r = 0.68, p < 0.01$), confirming that higher ecological knowledge predicts diversified and intensive resource utilization (Table-2).

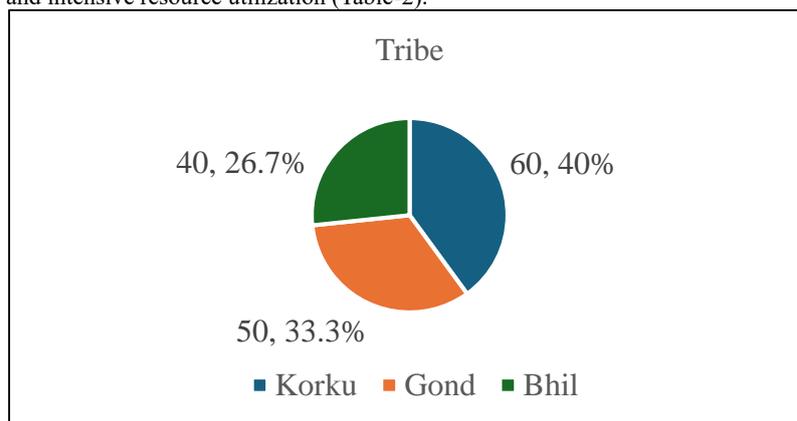


Figure 1: Tribal distribution of respondents

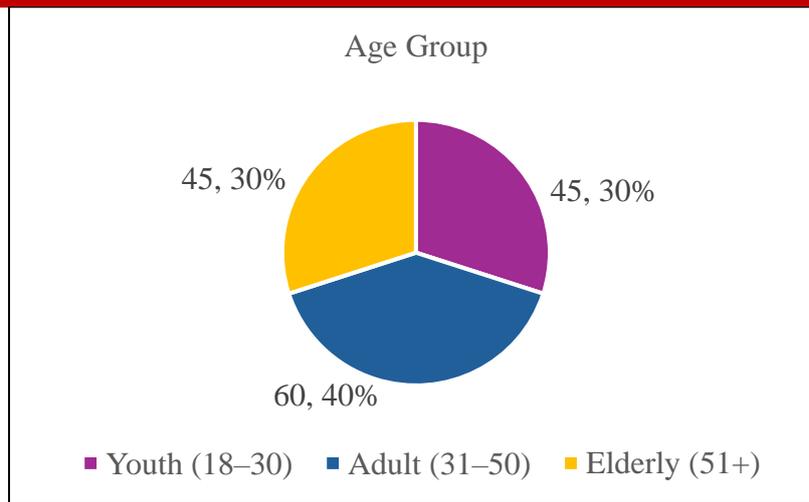


Figure 2: Age group distribution of respondents

Table 2: EK–NRU Correlation by age group

Age Group	Mean EK Score	Mean NRU Index	Correlation (r)
Youth	54.2	48.5	0.42
Adults	71.6	69.3	0.74
Elderly	78.9	61.4	0.69

5. CONCLUSION

This study establishes that ecological knowledge and natural resource use among the tribal communities of Chikhaldara are significantly interconnected but socially differentiated across tribal affiliation, age, gender, and education. The strongest knowledge–use integration is observed among adults and elders, particularly within the Korku community, while youth cohorts demonstrate emerging signs of knowledge erosion. Ecological knowledge in this region functions as a living adaptive system critical for sustainable resource governance and cultural resilience. Its preservation requires integrative strategies that align conservation policies, educational reforms, and community-based governance frameworks with indigenous epistemologies. Recognizing intra-cultural variation is essential for designing culturally sensitive sustainability interventions in protected forest landscapes.

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