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Traditional knowledge research in India: A bibliometric-based review and thematic analysis

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Traditional knowledge (TK) has gained substantial recognition for its utility in solution-seeking approaches to contemporary issues such as climate change, disaster risk resilience, and preservation of cultural identity. This makes it imperative to scrutinize the evolution of TK as a research field. However, there is a dearth of scholarly articles offering a holistic overview of TK-related research. The initial finding indicates that India is leading the field in such research among Asian countries. Consequently, the present study analyses the evolutionary trajectory of this research field in India, encompassing past, present and anticipated future discourse of such research. The present study employs insights from a bibliometric analysis of 836 literatures. Additionally, in-depth thematic analysis is based on the full-text review of 107 research papers. The study uncovers three prominent research themes emerging through the thematic analysis: (a) recording of TK through collation and documentation, (b) traditional medicinal systems, and (c) environment and sustainability. This critical exploration underscores the need for future research towards widening the scope of TK research, exploring the alternate forms of conservation, and deliberating on the efficient legal and policy measures aimed at uncovering the research field of TK while informing contemporary developments.

Keywords: Bibliometric analysis, Conservation, Cultural identity, Documentation, Thematic analysis, Traditional knowledge

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The term ‘traditional knowledge’ (TK) connotes a broader meaning. It includes a range of subject matter such as agricultural practices, forestry, cattle rearing, disaster management, resource conservation, traditional medicine, art and craft. The domain of TK also incorporates “oral accounts of human histories, astronomy along with methods of measuring time, modes of communications, production of specialized tools and technologies for survival needs”[1]. This knowledge is transmitted through various performances, including story narration, dances, and ritual performances, along with the development of art and craft, aligning with knowledge dissemination. These factors of passing the knowledge from older generations to the younger ones helped attract intergenerational characteristics.

TK is a community’s cumulative corpus of information about local customs and beliefs[2]. This knowledge signifies the local content, often termed as local knowledge. This content primarily depends on the local environment where the community resides, shaping the attributes of knowledge. The characteristics of TK can be ascertained with the help of (Fig. 1). The terms Indigenous Knowledge (IK) and TK are often used interchangeably[3]. For the development of a country's knowledge capital, the role of IK is paramount, especially for developing nations. The relevancy of IK in the developmental process is suggested at three levels, namely, (i) at the Local or community level, (ii) at the organizational level, such as Non-Governmental Organizations (NGOs) and governments, thereby contributing to (iii) the global level[3]. The authors argue that the recent development in the IK process makes it crucial to acknowledge the role of the regional-level contribution of such a knowledge system. Despite hosting an incredible knowledge base, TK still faces the threat of erosion due to socio-political changes, increased consumerism and marketization, and constant development pressures[4,5]. To aid through quick response to these complex and pressing problems, TK systems and the associated mechanisms developed over time can become crucial[6].

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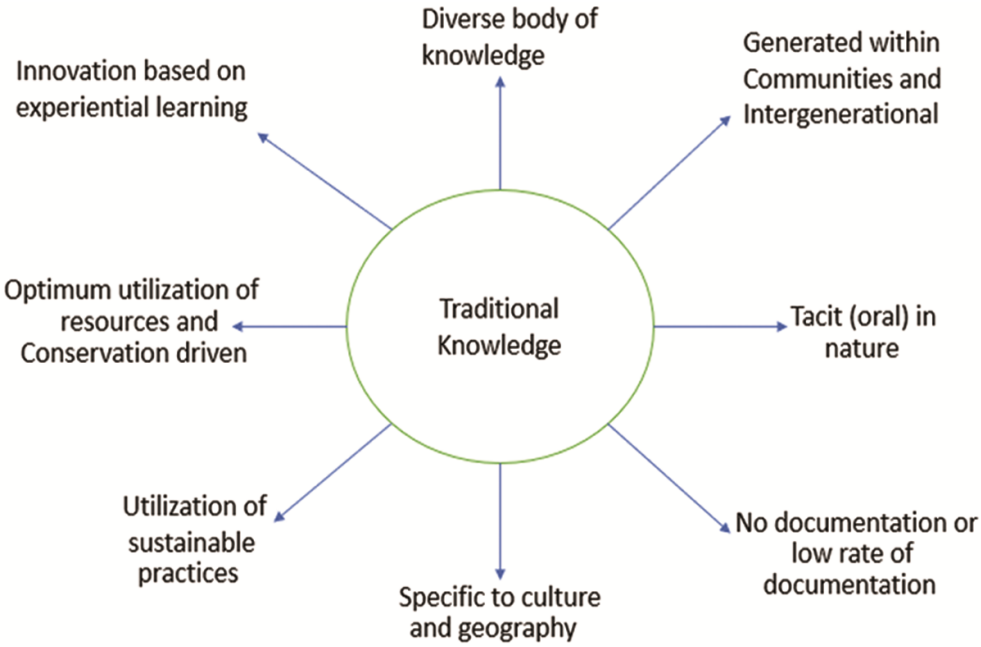

Fig. 1 — Characteristics of traditional knowledge

The indigenous communities are estimated to be around 476 million, making up approximately 6% of the global population. These populations are the custodians of traditional heritage and contain crucial ancestral know-how in the form of knowledge and expertise in diverse areas such as adaptation, mitigation and reduction of climate and disaster risk[7,8]. In India, there are over 700 scheduled tribe communities spread over different states and union territories, as per the Ministry of Tribal Affairs, Government of India. A total of 75 Particularly Vulnerable Tribal Groups (PVTGs) exist across states and union territories in India. The highest share of PVTGs reside in the state of Odisha. These custodians have a vast repository of information resulting from diverse living systems, ecological differences and distinct cultures. If systematically garnished at appropriate levels, this knowledge can be of tremendous value in solving modern problems such as healthcare, climate change, and disaster risk mitigation[9].

India's rich legacy of traditional medicine is being recognized globally[10]. The domain of traditional medicine, including Ayurveda, Yoga and Naturopathy, Unani, Siddha, and Homoeopathy, is being strengthened by the creation of the Ministry of AYUSH in the Government of India. For economic and social reasons, the traditional medicine system and the TK system still cater to a large population despite the abundant presence of modern medicine[9]. Consequently, realizing the importance and current need of TK in the overall development of a country, it becomes quintessential to trace down the evolutionary trajectory of this research field in India, encompassing past, present and anticipated future discourse of such research. In this regard, our study aims to address the following broad research questions (RQs):

RQ 1. What is the present status of the research in the field of traditional knowledge in India?

RQ 2. What research contexts and themes in this field have been explored in the existing literature?

RQ 3. What themes or avenues can be addressed in future research in this field?

Our study is unique from the existing research in multiple ways. Firstly, we have focused on the research field of TK as a whole, which has not been investigated compared to theme-specific areas within TK. Secondly, we are carrying out an evolutionary perspective and adopting two-level methodological rigour to address the questions. We apply bibliometric analysis to gain a comprehensive understanding of TK. Further, we extend our analysis through a full-text review of select literature to understand the themes prevalent in the area and suggest the future scope of the research. The findings of the study will provide a systematic understanding of the existing body of knowledge. It will enable future researchers to develop an intelligible overview of the emerging

research on TK and pursue those for more in-depth and elaborative research.

The paper is structured as follows: Section 2 presents the literature review of TK and bibliometric analysis. Section 3 discusses the methodology applied in the present study and imports the descriptive statistics of the research field. The following part reports the results of the bibliometric analyses under section 4. It follows an exhaustive discussion of the findings and anticipated future research domains in section 5. A summary of the contribution of the present study, along with the limitations of the study, is presented in the last section.

Literature review

This section explores and reviews the existing scholarship on the subject matters of TK and bibliometric analysis. The review will help underscore TK's multifaceted role in diverse fields such as environmental protection, risk management, and climate change. Further, bibliometric analysis offers a process to gauge historical development trends, present state and anticipated future discourse of a specific field of research. The review aims to synthesize literature in both domains to provide the current state of scholarship in this interdisciplinary knowledge domain.

Traditional knowledge

There is no accepted definition of TK available worldwide. The World Intellectual Property Organization (WIPO) has acknowledged the criticality and challenges faced by the TK holders without such a definition. Subsequently, the WIPO has attempted to deliver a working description of the term[11]. In the broader connotation, TK incorporates 'information' like trees and plants that grow well together; 'practices and technologies' like bone setting methods; 'beliefs' like holy forests that form vital watersheds; 'education' like apprenticeships and 'communication' like folk media[12]. Most of these contents are influenced by rapid population growth, modern technology and development, globalization, and educational systems[13]. Nevertheless, failing to determine the contours of protection has aggravated the pace of loss of TK[14]. The prevailing situation poses an extinction risk, attributed directly to rapidly changing natural environments and fast-paced economic, political, and cultural changes at a global scale[3].

The issues of biopiracy, misappropriation and non-authorized use are the drivers of the discussion about TK at international fora. Specific to the Indian experience, the case of turmeric, neem, and basmati patents made the Indian government vigilant about protecting TK and associated knowledge through establishing a traditional knowledge digital library (TKDL)[15,16]. TKDL was, thus, the major step in response to the biopiracy through a defensive protection approach. There is a looming threat over these age-old rich cultural assets held by the local and indigenous communities, which have remarkable tacit knowledge relating to almost all segments of human life and the effective management of resources[17]. The lack of affirmative laws towards protecting TK in India makes it interesting to look into the academic discussion related to TK.

Bibliometric analyses

Pritchard introduced the bibliometric analysis techniques utilized as a scientific method to understand a field of research in terms of its evolution[18]. Bibliometric analysis is helpful because it rigorously makes a rational sense of huge volumes of unstructured data through interpreting and mapping cumulative knowledge[19]. The technique of bibliometric analysis helps and informs the researcher in many ways, such as identifying knowledge gaps, a comprehensive overview of the research field, new ideas emanating from the interpretation of the unstructured data, and establishing their contribution to the existing body of knowledge[19]. The primary goal behind encouraging the bibliometric technique in this present study is to circumvent subjective bias towards establishing the intellectual structure of the field. As a result, the present study focuses on how research oriented toward understanding the themes in TK has evolved through the existing literature and future research areas. With the help of this technique, we can provide a review of the past and present to predict future discourse of the research field with the available corpus of bibliometric data. The bibliometric technique comprises two approaches: performance analysis and science mapping. The initial approach offers the contributions of the research constituents, and the latter attempts to establish the relationship between the research constituents.

Methodology

The present study uses bibliometric analysis as a method to attain the objectives of the present study. This analysis supports assessing the historical orientation of a specific research theme along with the

future trajectory of the research with the help of selected scientific documents. However, in addition to this analysis, the present study takes a further approach to thematic analysis in providing holistic and comprehensive findings in the field of traditional knowledge research in India. The thematic analysis is carried out through a full-text review of the select literature refined through the citation criteria discussed in detail in the subsequent section.

Material and Methods

This section details the application and utilization of all the materials and methods to attain the objectives of the present study. It includes processes such as database curation and applying objective and subjective criteria to funnel the available body of literature and utilize them for the present study.

Database curation

We employed an initial hands-on approach to assess the broader scope of several databases, including Web of Science, Scopus and Science Direct, to choose the relevant database for our study. Subsequently, the Scopus database was finalized because of its more expansive and comprehensive coverage of various secondary sources and its prevalent incidence within the academic ecosystem[20,21].

Identifying keywords for database search

The most crucial aspect of getting authentic and appropriate literature while mining the database is the selection of the right keywords. We have adopted a multi-step procedure to finalize the keywords to be advanced to proceed with the study. At first, we conversed with various experts in this area to suggest the most appropriate keywords to get us the right perspective. Subsequently, the suggested keywords were verified from a range of literature searches on Google Scholar, using the initial keyword "traditional knowledge." Putting all these contents together, we arrived at "traditional knowledge", "indigenous knowledge", "local knowledge", and "community knowledge" keywords. These keywords were chosen to obtain a more exhaustive and comprehensive perspective on the research theme of the present study. Using the Boolean operator "OR" the search string was curated for the Scopus database.

Selecting articles from the database

We incorporated several objective parameters and subjective scrutiny to filter the documents. No time restriction was placed for the period considered. However, the time frame of the search was 1994-2023. Over the initial search result, we applied the country/territory-based inclusion criteria to gauge the research trajectory in this study theme in Asian countries. This step directed us towards the fact that India is leading in TK-related research through the maximum number of academic writings among all other Asian countries. Thereafter, we limited the inclusion criteria to the country 'India' and keywords' traditional knowledge' and 'indigenous knowledge.' These inclusion criteria resulted in a comprehensive database of 836 documents. Within this set of documents, citation-based criteria were applied to select articles for full-text review. For the literature published till 2020, documents with at least 25 citations were considered. Similarly, for publications in 2021, the citation criteria were at least five citations, and for 2022, at least three citations were considered. For the articles published in 2023, at least one citation criterion was followed. The citation-based inclusion criteria limited the corpus to 191 documents. The subjective criterion of title and abstract-based exclusion were applied to these documents. The PRISMA framework for identifying documents has been provided in (Fig. 2). Thus, 107

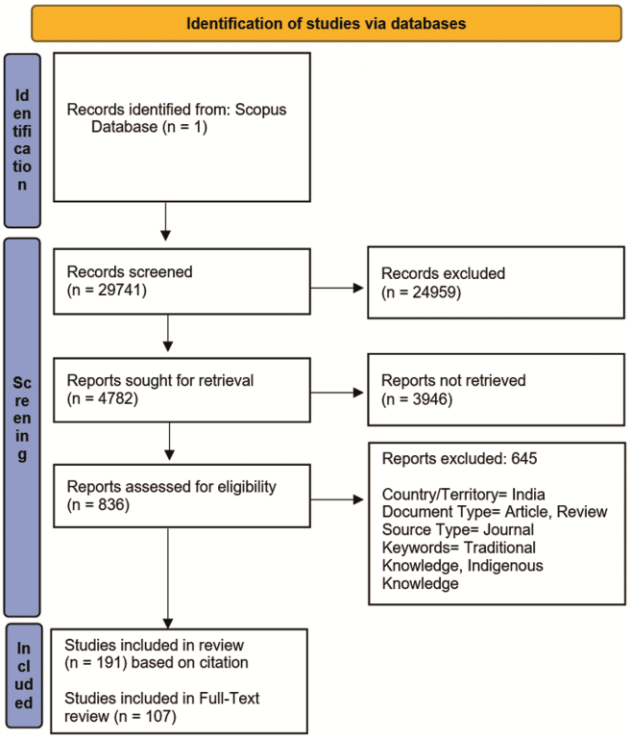

Fig. 2 — PRISMA Framework for identification of documents [Source: Page MJ, *et al.*, BMJ 2021; 372: n71.https://doi.org/10.1136/bmj.n71]

research papers (Supplementary Data Appendix A) were found relevant and were utilized for full-text analysis. This analysis gives insights into the study area's prevalent and emerging research themes.

Analysis

This section will delve into the preliminary findings of the study. Primarily, we wanted to achieve the objective of initially locating the leading country/territory in terms of producing the maximum number of academic writings. We have used Biblioshiny from the R package for the bibliometric analysis[22]. The analysis has been reported as per the respective RQs of the present study to enable an understanding of the motivation and outcome portrayed in this section.

Present status of the research in the field of TK in India

The present status of research in the TK domain is traced through the various analyses carried out using bibliometric data. The analysis includes country-based analysis, tree map analysis, keyword frequency, most relevant sources and co-occurrence analysis in answering RQ 1. (Fig. 3a-c) showcase descriptive analysis, while (Fig. 4a-c) present keyword analysis.

Country-based analysis

The authors' primary focus was to locate the geographical territory where the research over the domain of TK is being driven. This level of analysis was done using the Scopus database, which provided several parameters for analyzing the results. We resorted to the 'documents by country or territory' parameter. This analysis was also validated through the Biblioshiny software analysis, which gave the same result. The result shows that among Asian countries, India is leading in producing the highest number of scientific documents in this research field, with China coming second and Indonesia in third place (Fig. 3a). India produced 2077 documents from 1994-2023 out of 4782 documents.

Keyword frequency

Understanding the application of keyword frequency within the research community is crucial in demonstrating the practical utilization of keywords. Figure 3.b depicts the frequency of use of keywords through a temporal analysis. It is evident that till 2007, the keywords were consolidated within a few domains and did not occur cumulatively. With the growing scale of scientific writing, the literature started propagating specified themes within the

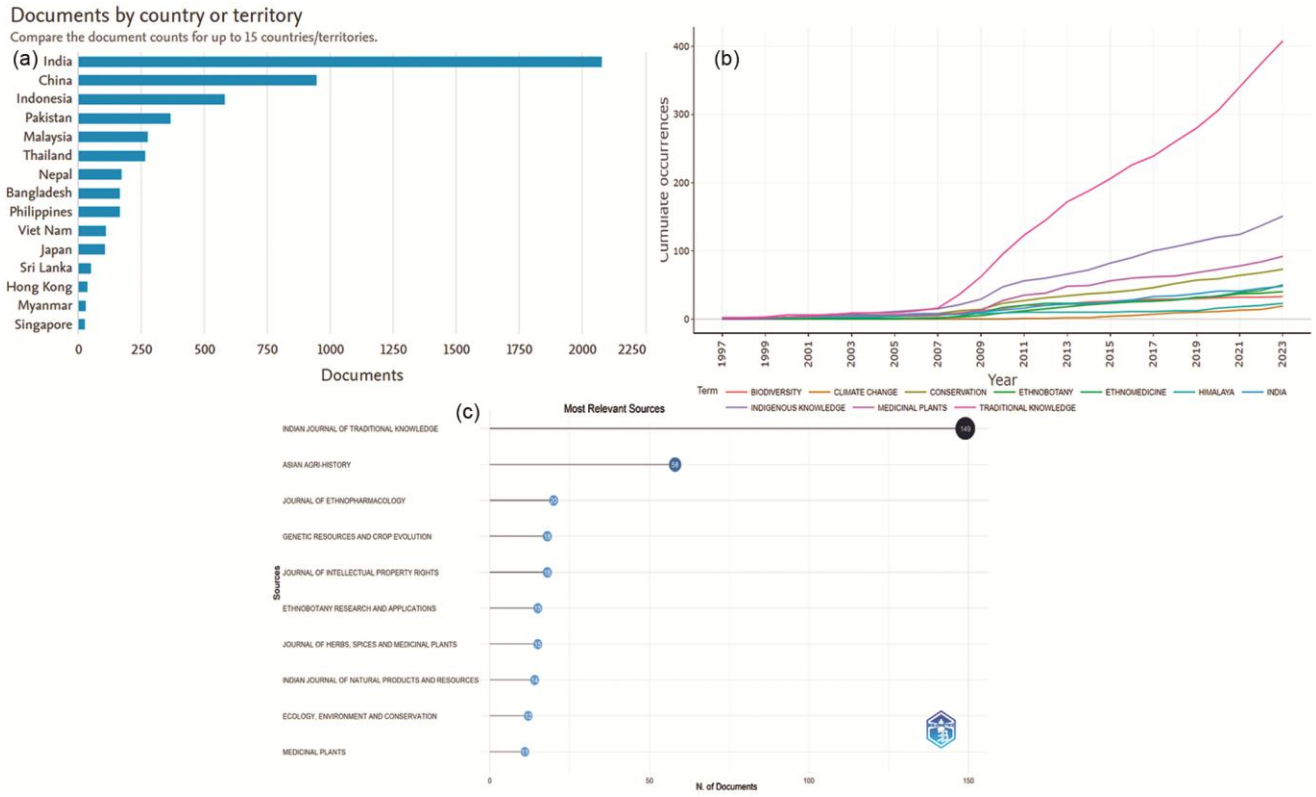

Fig. 3 — (a) Leading Country in production of articles (Range from 1994-2023), (b) Frequency of Keywords and (c) Most relevant sources

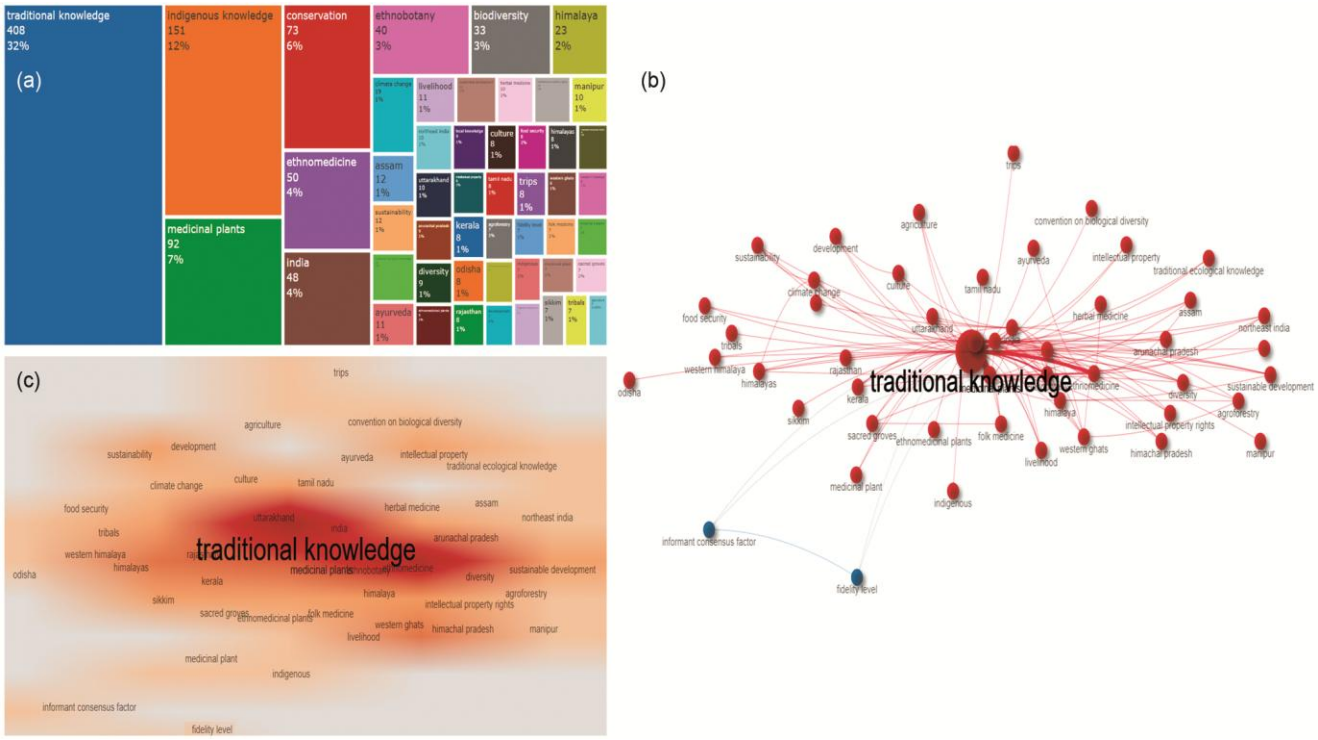

Fig. 4 — (a) Tree Map of keywords, (b) Network diagram for Author's keywords and (c) Density diagram for Author's keywords

research domain and attained acceptability. Post 2009, an apparent fragmentation in IK and TK is observed, whereby TK as a keyword has been used exponentially in the research field. Recently, 'medicinal plants' and 'conservation' as keywords have become highly frequent.

The most relevant sources

The enumeration of the most relevant sources signifies the prominent source showcasing most of the academic production over research activities relating to the field of TK. (Fig. 3c) illustrates the most relevant sources (journals). Around 18% of the total published articles on the TK are reported in the Indian Journal of Traditional Knowledge. Notably, the focus area of primary relevant sources among the top 10 is flora-based TK research.

Tree map

The tree-map analysis produces the occurrence of keywords within the given literature. The numerical and percentage values signify the use of the keyword and its prominence. This analysis helps us identify the most common keywords in the literature. Keywords such as traditional knowledge, indigenous knowledge, medicinal plants, and conservation are used significantly to showcase these domains' depth within the TK research field (Fig. 4a).

Co-occurrence analysis

The co-occurrence analysis (or co-word analysis) helps answer RQ1, which traces down the specific topics, signifying the core intellectual issues addressed by the researchers. This analysis helps in locating the central idea of a particular research theme. (Fig. 4b) depicts the network of author keywords where TK and medicinal plants emerge as significant keywords in the most integrated network. The significance of keywords is understood from the interlinking networks. These lines represent the strength and the relevancy of the connections between the keywords, which act as nodes[19]. The influence of TK as a research field is apparent across various domains such as sustainability, food security, medicinal plants, sustainable development, and climate change. (Fig. 4c) represents the density of the author keywords. The darker the shade, the denser the research theme within the TK field. Thus, the density signifies the broad reach of TK research that is not specific to few research disciplines.

Research contexts and themes in this field of TK

The thematic map, thematic evolution, and the manual content analysis of 107 research papers contribute to answering RQ 2, *i.e.*, the research context and themes explored by the existing literature

in the research field of TK. (Fig. 5a & Fig. 5b) represent the thematic analysis in this research field.

Thematic evolution

This research field's evolution through an alluvial diagram is depicted in (Fig. 5a). The evolutionary trajectory of the research field has been traced with the utilization of the author's keyword. The alluvial diagram has been produced with the help of the Biblioshiny tool. The evolution has been time-sliced from 1994 to 2008, 2009 to 2016, and 2017 to 2023. From 2007-08, as is evident from (Fig. 3b), there has been exponential growth in the frequency of the use of keywords like TK and IK. Therefore, the first period chosen was 1994-2008. Further, to maintain homogeneity within the period, the remaining periods were chosen to be 2009-2016 and 2017-2023. The motive behind producing the evolution in a phased manner is to gain more specific insights into the pattern of evolution.

First period: The period of evolution (*1994-2008*)

This period marks the evolution of the research field of TK in India. The authors acknowledge the presence of relevant literature even before 1994. However, a significant growth can be traced from 1994. The emergence of this field became substantial during this period. The probable reasons for such development may be signing the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement and establishing the WIPO Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (IGC). The major keywords the academic community and stakeholders utilized were TK, TRIPS, culture, Indian central Himalaya, ethnomedicine, etc. These keywords indicate the prominence of literature signifying the subject domains during this period.

Second period: The period of recognition (*2009-2016*)

From the analysis of (Fig. 3b & Fig. 5a), it is witnessed that the years 2008 and 2009 recorded rapid utilization of keywords like traditional knowledge and indigenous knowledge. This period may be called the beginning of extensive studies on traditional knowledge, evidenced by the diversification of keywords, as shown in (Fig. 5a). TK, India, development, traditional medicine, TRIPS, diversity, climate change and biodiversity conservation became prominent keywords that spotlight the research field on these themes. Notably, 2010 marked a new mandate to conduct 'text-based negotiations' under WIPO IGC. This mandate provided impetus to reach an international agreement to protect TK effectively.

Third period: The period of specialized research (*2017-2023*)

This period is building the research corpus based on the previous study period. Various themes have emerged into the broad theme of TK (Fig. 5a). The keyword 'TRIPS' is not prevalent but instead immersed in the convention on biological diversity in support of Article 8 (j), granting some relief to the indigenous communities. Another theme is IK, which is also gaining significance in this period. The analysis of the thematic evolution depicts that this research field has not attained maturity yet due to the diverse nature of its subject matter. The positive notion of this period is that active engagement is being picked up rapidly, highlighting the contribution of all the stakeholders within the research field. This period witnessed the global pandemic of COVID-19 and navigated the attention on traditional medicinal knowledge under the larger discourse of TK.

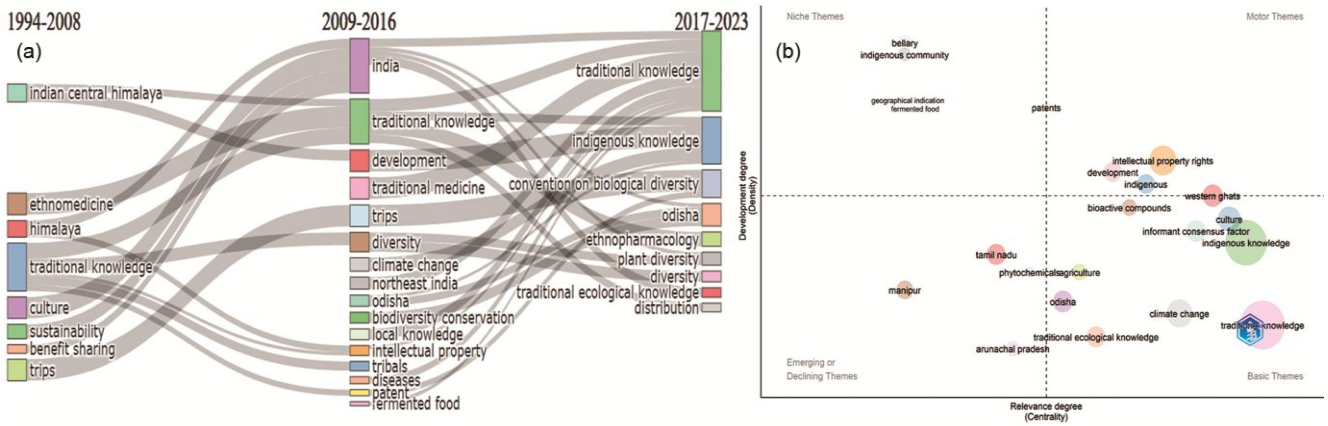

Fig. 5 — (a) Thematic Evolution of Research field of TK and (b) Thematic Map of the research field TK

Thematic map

The Strategic diagram is applied to a research field to identify the prevalent research themes[23]. This diagram utilizes two indicators to present the themes of research filed within four specified themes: centrality and density[24]. The thematic map is presented in (Fig. 5b).

This strategic diagram lists 27 clusters into four themes. Clusters such as indigenous community and geographical indication represent niche themes that denote density but have low relevancy and are marginal. States such as Manipur, Tamil Nadu, and Arunachal Pradesh, as a cluster, indicate that state/region-specific discussions over TK are progressing. IP rights and development as a cluster signifies well-developed domains within this field of research. The protection of this knowledge system is discussed within the framework of IP, where the IP system falls short of providing a comprehensive protection system to TK. The primary themes, such as TK, IK, climate change, and traditional ecological knowledge, are highly relevant to the ongoing challenges posed by environmental degradation and climate change. The list of keywords in each of the 27 clusters has been provided in (Supplementary Data Appendix B).

Full-text review and Thematic clustering

Manual content analysis is performed to assess the prominent themes and gain further insight into this field of research. The approach adopted to carry out this analysis of over 107 documents is the reading of full-text articles and identification of the themes/research domain of the articles, methodologies adopted to achieve the intended objectives, the key findings, and the uniqueness of the study. Seventy-three literature papers out of 107 reviewed dealt with documentation of TK in diverse domains. Around 82% of the literature dealing with TK documentation focuses on traditional medicines and medicinal plants. Other domains within documentation are conservation and resource management and TK associated with indigenous food. Based on these analyses, three broad themes are constructed. The research field of TK is diverse, and the identification and construction of the theme have been carried out using a more general approach rather than subject area specific. The list of literature corresponding to specific themes has been provided in (Supplementary Data Appendix C).

Theme 1: Recording of TK: collation and documentation

The literature published at this research field's inception suggests that the academic community's initial discussion revolved around the TK documentation theme. Traditional knowledge, mainly a tacit knowledge form, is always thought of as knowledge whose extinction is apparent. In devising a solution to the problem, significant attribution was paid to the idea of documentation, which would transform TK into an explicit form. Documentation is often seen as an instrumentation of conservation within this research field[25]. The theme of documentation is, at present, driving this research field. A significant amount of literature is attempting to document a range of TK, such as indigenous food and associated IK within the tribal community[26], the use of ethnomedicinal plants by inhabitants in a region-specific manner[27], practices of sustainable development in tribal communities[28], IK and cultivation practices of medicinal plants[29].

This cluster is the most prominent in the TK field of research and continues to grow as traditional and indigenous communities possess a large plethora of knowledge. With the non-availability of any other conservation means, the documentation strategy would be adopted within the academic discourse to prevent the possible loss of these valuable contents. As highlighted by the literature, the major hurdle towards documentation is that senior community members were uncomfortable sharing and disclosing knowledge and attached several superstitious beliefs against sharing knowledge[30,31]. Recording of TK and its documentation might be one of the ways to preserve the knowledge within their community and avoid any chance of misappropriation of such knowledge. Contradictorily, the mere documentation of this knowledge, devoid of security measures and legal mandate, may augment the misappropriation cases. The author believes the documentation initiatives should be directed towards established depositories like TKDL. Limited public access to these depositories would ensure effective conservation through documentation. Moreover, the government and concerned stakeholders may undertake a synthesized approach towards systematic documentation initiatives in the interest of TK holders.

Theme 2: Traditional Medicinal System (TMS)

This cluster has emerged from the extant literature where a diverse body of documents speaks about the documentation of medicinal plants, the conservation of these plants, and even the contribution of ethnomedicine as a prominent healthcare system

among the indigenous community across the country. Some literature reports the usage of ethnomedicine in treating a range of human ailments by tribal communities[31,32]. Documentation and conservation practices of ethnomedicinal plants and utilization of ethnomedicine in treating various diseases are prevalent[27,33,34]. Even precise ethnomedicine treating specific diseases such as diabetes[35,36] is practised within indigenous communities. The COVID-19 pandemic has brought forth more active deliberations over traditional medicinal knowledge. This knowledge system has substantial economic potential and is often victimized by biopiracy. These central arguments underscore the emergent theme of TMS under the TK-led research.

Theme 3: Environment and Sustainability

The articles within this cluster primarily discuss the intersection of TK with the fields of environment, climate change adaptation and mitigation, conservation of biological resources, resource management, sustainable development and Sustainable Development Goals (SDGs). This theme becomes crucial towards the contemporary challenges experienced by the human population at large. Greater reliance is on traditional and IK systems along with modern knowledge systems[37]. Reflection on the perception of an indigenous inhabitant over the issue of climate change and their strategies towards adaptation to cope with the after effects is also offered[38]. Interestingly, the significant discussion areas within this cluster are related to IK and cultural values towards climate change mitigation[39]. Similarly, in the case of environmental challenges to pollinators affecting the ecosystem[40], cultivation of medicinal plants and the practice of sustainable development towards conservation of medicinal plants is also emphasised[41,42]. The critical role of TK possessed by the indigenous communities in achieving the SDGs has also been analysed[43,44]. The conservation of biodiversity and the existing practices are diverse due to differences in geographical location, culture, ecosystem, and social system, but the end remains the same in conservation[45-47]. In this regard, the role of traditional knowledge cannot be neglected.

Prominent research methodologies

We have reviewed 107 research papers to find the research approaches used by the researchers. Strong emphasis is on empirical studies based on Participatory Rural Appraisal techniques such as unstructured interviews, focused group discussions, personal interviews, and key informant surveys[44,47-49]. These approaches enable the researcher to collect data through an emic perspective. The field survey is one of the most appropriate methodologies for gaining insights into reaching the objectives of the intended study. However, secondary literature has also been reviewed to validate the data collected[50-52]. Textual content analysis from the data collected is also performed to convert them into codes through the NVivo software tool[53].

Different measures are applied to analyze the quantitative data collected. The most utilized measures in the extant literature are Use Value (UV), Informant consensus factor (ICF), fidelity level (FL), and relative frequency of citation (RFC). These measures require a brief understanding. UV signifies the most frequently used plant species to treat an ailment. ICF is used to select plant species to cure a particular ailment, and various plants are reported to treat the ailment. FL indicates the informant's choice of a potential plant species to treat a disease. RFC helps determine the most popular plant the majority accepts to treat a particular disease. These analyses are applied to the TMS to understand the level of use and acceptance of such knowledge within the larger community[54-57].

Discussion

The analyses performed to achieve the present study's objectives also help us identify aspects that qualify for further discussion. These aspects include the conceptual evolution of the research field, the prominent methodologies and the emerging research areas interpreted from the available literature. The content analysis and findings from the thematic evolution and thematic clustering have been well established in the preceding section.

While answering RQ1, the co-occurrence analysis identifies the emergence of a core intellectual corpus within the research field of TK. Significant research is taking place to explore and identify traditional medicine and the associated TK, forming a base for an alternative healthcare system for the indigenous and local communities in India. The network linkages also indicated the rising importance of traditional medicine and associated TK due to filling up the healthcare system gap and the higher cost posed by modern medicines. These findings suggest the inclination of academic research to strengthen this domain of TK.

Other emerging domains include ethnomedicine, climate change, sustainable development and culture.

RQ 2 findings become crucial as the thematic evolution of the research field is portrayed. Also, identifying themes with the help of the strategic diagram is the attribution of new knowledge to the existing body of knowledge. The manual content analysis through full-text review helps construct three broad themes. The importance of TK is being felt with the exponential increase in the affirmation of its role in several current crises, such as climate change, environmental concerns, biodiversity conservation, resource management, and sustainable development. In these broad themes, the literature contributes by applying local and IK to gain working knowledge towards better mitigation and adaptation.

Future research avenues

The findings of RQ 1 & 2 enable us to identify the future themes which need to be addressed. The manual content analysis of the select articles directs to the future avenues, answering RQ 3, which are crucial and warrant intervention, as follows:

Widening the scope of research

The co-word analysis suggests that the extant literature has significantly contributed to understanding the role of TK in climate change, sustainability aspects, conservation of biodiversity, application of medicinal plants, and ethnomedicine. TK is not restricted to only these domains. Art and culture, as well as TK, are associated with culinary practices, animal husbandry practices, and agriculture, which are some areas that need greater attention in contemporary times. Similarly, the knowledge residing with the indigenous communities associated with disaster management and risk mitigation requires more appreciation because the disaster crisis is becoming more prevalent than ever due to anthropogenic activities.

Alternate conservation technique apart from documentation

The extant literature has extensively resorted to documentation of the rich content of TK towards achieving diverse objectives. Documentation helps conserve knowledge and prevent it from becoming extinct. It also requires identifying knowledge from a mainstream knowledge perspective, which can be used for a larger population. Documentation serves the dual purpose of legal protection and knowledge dissemination. The prior goal remains less visible than the latter in the extant literature. Documentation serves the purpose of conservation; the element of protection of TK remains unanswered[58]. More research on alternative conservation means is needed rather than sticking only to the documentation. The application of technology can be sorted to reach the conservation objective[59]. Technological intervention can be applied to advance the more considerable need to protect traditional knowledge content.

Legal and policy measures to enhance conservation

Intervention at legal and policy levels is crucial to protect and conserve this body of knowledge. However, only a few of the extant literature discuss the same. The interface of Intellectual Property and TK regarding legal protection and the advancement of a *sui-generis* system of protection needs more discussion[58]. It is necessary to frame a dedicated TK policy that involves all stakeholders. More so, as India possesses a rich repository of TK, it could lead the world in showcasing the pathway to meet SDG objectives. In this context, the reference to the National Intellectual Property Rights Policy, 2016, which highlights the need to provide an ecosystem for TK awareness, management, and commercialization, is essential. A full-fledged policy for TK and legal protection would be more beneficial for developing an ecosystem of rigorous research in this field of knowledge and sharing the benefit to the communities at large.

The key areas that need prompt attention in shifting focus to these themes are the future research avenues derived from the manual content analysis, such as widening the scope of TK research and resorting to alternate conservation techniques apart from documentation and legal and policy measures promoting conservation. These future areas hold the potential to cater to the more extensive needs of the indigenous communities in the interest of the conservation of TK and the realization of the SDGs.

Conclusion

The present study attempted to provide a synthesized synopsis of the research field of TK in India through the bibliometric analysis technique. The analysis is followed by a full-text review of several pieces of literature while adopting manual content analysis to answer the RQs proposed for this study. To answer RQ 1, a co-word analysis and network analysis of the extant literature were performed to gain insights into the present status of research in this

field. To get the answers to RQ 2, the thematic map and thematic evolution of the research field are portrayed to gain an insightful understanding. Also, the full-text review of the selected literature helped us to realize the contexts and the prevalent themes in this research field. Based on the full-text review analysis, we were able to answer RQ 3, where our finding offers a significant contribution to the existing body of knowledge and opines the future discourse in the research field of traditional knowledge. Moreover, the manual content analysis strengthens the present study by identifying the emergent themes and the methodologies adopted while conducting the research. The findings of this study help propose future research avenues in this research domain, such as broadening the scope of TK research, exploring alternate conservation techniques and deliberating on legal and policy measures to enhance conservation.

Limitations and future scope of research

This review contains some limitations. Firstly, the study was limited by methodological limitations, which may be addressed by future research. The authors have presented the analysis based on the literature from a single database, Scopus. Further studies may be carried out by utilization of one or more databases. The study was designed and executed using bibliometric review and literature review. Other review methodologies, such as narrative review and scoping review, may be performed to gain insight into the same field of research. The body of knowledge residing in sources other than academic journals, such as books and conference proceedings, was excluded from the scope of the study. The study focused only on the evolution of the research field in India. At the primary stage, a brief analysis of literature production across different Asian countries was carried out. Among the above-listed limitations, the selection of keywords is a limitation of this study since the present study resorts to the prominent keywords associated with the field of traditional knowledge. However, broader keywords may be utilized while conducting a bibliometric analysis for this research. Though this study possesses these limitations, it still offers valuable in-depth insights to the researchers who may work on these limitations and pursue the potential agendas put in this study.

Supplementary Data

Supplementary data associated with this article is available in the electronic form at https://nopr.niscpr.res.in/jinfo/ijtk/IJTK_24(3)(2025)275-287_SupplData.pdf

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None

Conflict of Interest

The authors declare no competing or conflict of interest.

Author Contributions

SA - Conceptualization; Formal analysis; Resources; Software; Writing - original draft; Writing - review & editing. RMS- Conceptualization; Formal analysis; Supervision; Writing - review & editing. KJ- Conceptualization; Formal analysis; Supervision; Writing - review & editing.

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Data Availability

The supporting data are provided in the appendices.

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