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A Bibliometric Analysis on the Health Belief Model in Healthcare Workers: Key Insights and Future Directions, an Indian Context

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ABSTRACT

The Health Belief Model (HBM) has served as a fundamental paradigm in health behavior research for more than seventy years, examining the reasons individuals choose or reject preventive health behaviors. This bibliometric analysis investigates the development, trends, and influence of HBM research among healthcare workers, particularly within the Indian context. Data from Dimensions.ai were utilized to investigate 106 pertinent publications from 2004 to 2024, evaluating research growth, citation impact, and multidisciplinary applications. The research indicates a consistent increase in publications, especially in health sciences and biomedical domains, accompanied by a notable gain in citations beyond 2020, signifying enhanced significance in public health and behavioural research. The restricted utilization of HBM in domains including education, environmental sciences, and digital health indicates research deficiencies. The research underscores the necessity of broadening the Health Belief Model to include socio-cultural and economic elements specific to India, including traditional beliefs, familial influence, and healthcare accessibility. Network analysis reveals moderate collaboration among scholars, indicating potential for enhanced interdisciplinary relationships. This study highlights the need for context-specific modifications of the Health Belief Model to improve its efficacy in public health interventions. Enhancing cooperation, incorporating digital health techniques, and overcoming cultural obstacles might elevate healthcare outcomes and policy execution in India.

Introduction

The Health Belief Model (HBM) has served as a foundational paradigm in health behavior research for more than seventy years, offering a systematic method for comprehending why individuals participate in or neglect preventative health actions. Formulated in the 1950s by social psychologists within the U.S. Public Health Service, the Health Belief Model (HBM) was originally intended to elucidate the insufficient engagement in illness prevention and detection initiatives. Over time, it has expanded to include a broader spectrum

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of health-related behaviors, such as symptom reactions and compliance with treatment regimens (Glanz, Rimer, & Viswanath, 2008). The beginnings of the Health Belief Model (HBM) can be traced to early psychological theories aimed at elucidating human behavior, particularly inspired by Stimulus-Response (S-R) Theory and Cognitive Theory, which highlighted individuals' subjective interpretations and expectancies (Rosenstock, 1974). The integration of various theoretical viewpoints resulted in the formulation of the Health Belief Model (HBM), which asserts that individuals' health-related behaviours are predominantly influenced by their beliefs of health risks and the anticipated advantages of engaging in preventive measures.

The HBM consists of six core constructs that influence an individual's decision to engage in health-promoting behaviors: (a) perceived susceptibility, which refers to an individual's belief about the likelihood of contracting a disease or health condition; (b) perceived severity, which deals with an individual's perception of the seriousness of a health condition and its potential consequences; (c) perceived benefits, which pertain to the belief in the effectiveness of an advised health action in reducing the risk or severity of a disease; (d) perceived barriers, which include financial costs, time constraints, inconvenience, or fear of side effects that prevent an individual from adopting a health-related behaviour; (e) cues to action, which are external or internal triggers that prompt health-related behaviors, such as media campaigns or healthcare provider reminders; and (f) self-efficacy, which was added to the model in the 1980s and refers to an individual's confidence in their ability to successfully perform a behavior (Champion & Skinner, 2008). The Health Belief Model (HBM) has been extensively utilized in multiple health areas, encompassing chronic disease prevention, immunization initiatives, screening programs, and risk mitigation activities. This framework has been essential in elucidating breast cancer screening behaviors, since perceived susceptibility, severity, benefits, and barriers markedly affect women's choices regarding mammograms (Janz & Becker, 1984). In the realm of HIV/AIDS prevention, the model has been employed to evaluate determinants influencing condom utilization and testing practices (Becker, 1974). Furthermore, the Health Belief Model (HBM) has been integrated into intervention techniques designed to facilitate health behavior modification, including public health campaigns utilizing HBM constructs to formulate educational messages that emphasize hazards, underscore the advantages of preventative measures, and tackle prevalent obstacles. Notwithstanding its widespread application, the HBM possesses certain restrictions. A notable criticism is its primary emphasis on cognitive views, neglecting emotional and social influences on behavior. The influence of signals to action is still inadequately examined, as numerous research finds it challenging to measure their effects. Future research may incorporate more extensive behavioral theories, such as the Social Cognitive Theory, to fill these gaps (Glanz et al., 2008). The Health Belief Model is fundamental in health behavior research and public health initiatives. By comprehending the psychological determinants that affect individuals' health choices, researchers and practitioners can formulate more efficacious strategies to promote preventative behaviors. As health education progresses, the Health Belief Model (HBM) remains a significant source of understanding human behavior, establishing a robust basis for future developments in health promotion and illness prevention.

Health Belief Model in the Indian Context

India presents a complex landscape for health behavior due to its cultural diversity, socioeconomic disparities, and varied health challenges. Traditional beliefs, family dynamics, and economic conditions play significant roles in shaping health behaviors. Understanding these unique factors is crucial for the effective application of health behavior models like the Health Belief Model (HBM) in the Indian context.

Public health challenges in India include a high burden of both communicable and non-communicable diseases, maternal and child health issues, and limited access to healthcare services. Communicable diseases such as tuberculosis, malaria, and HIV/AIDS continue to be significant health concerns, especially in rural and economically disadvantaged areas. Non-communicable diseases like diabetes, hypertension, and cardiovascular diseases are also on the rise, driven by changing lifestyles and urbanization (Patel et al., 2011). Maternal and child health issues remain critical, with high rates of maternal mortality and under-five mortality, despite improvements in healthcare infrastructure and services (Kumar & Dansereau, 2014).

Cultural beliefs and social norms significantly influence health behaviors in India. Traditional medicine systems such as Ayurveda, Siddha, Unani, and homeopathy are widely practiced alongside modern medicine. These systems are deeply rooted in the cultural fabric of Indian society and are often preferred for their holistic approach and perceived safety (Patwardhan, Bodeker, & Smith, 2005). Family dynamics also play a critical role in health behaviors, with decisions often made collectively rather than individually. The influence of elders and male members of the family can be particularly strong, especially in rural areas (Chatterjee & Mishra, 2019).

The HBM has been applied in various Indian health studies, but these applications often overlook the intricate cultural and social dynamics. For example, a study on cervical cancer screening among Indian women found that perceived barriers, such as fear of diagnosis and lack of knowledge, were significant predictors of screening behavior. However, the study did not fully account for the role of cultural beliefs and family influence, which could have provided a more comprehensive understanding of the barriers (Basu et al.,

2019).

Interventions designed without considering local beliefs and practices may face resistance, reducing their effectiveness. For instance, health campaigns promoting immunization or family planning often encounter resistance due to misconceptions, cultural beliefs, and lack of trust in modern healthcare systems (Mathew et al., 2019). Hence, there is a need to expand the HBM to better address these unique factors and improve the design and implementation of health interventions in India.

Expanding the HBM to incorporate additional constructs such as cultural beliefs and values, social support and family influence, economic factors and accessibility, and traditional health practices can make the model more applicable in the Indian context. For example, incorporating the role of traditional healers and community leaders in health interventions can enhance their acceptance and effectiveness. Recognizing the economic constraints faced by many Indian families and addressing these barriers through subsidized healthcare services and financial incentives can also improve health behaviors (Barik & Thorat, 2015).

Additionally, gender roles and expectations must be considered in the expanded model. Gender norms in India affect health behaviors, particularly for women, who often have limited autonomy in health-related decisions. Designing gender-sensitive health interventions that empower women and involve men in supportive roles can lead to better health outcomes (Singh et al., 2015).

In conclusion, while the HBM provides a useful framework for understanding health behaviors, its application in the Indian context requires expansion to incorporate cultural, social, and economic factors. By addressing these unique factors, health interventions can be more effective and widely accepted, ultimately improving public health outcomes in India.

Methodology and Corpus

This section outlines the procedures undertaken to acquire the dataset of articles pertaining to the Health Belief Model among Health Workers. We are employing a methodology akin to that outlined in quantitative research of a certain domain. This study conducted a query utilizing the terms "Health Belief Model," "HBM," and "health behavior." The chosen timeframe spans from 2004 until 2024. The data originates from Dimensions.ai, a connected research information system offered by Digital Science (https://www.dimensions.ai). This system was selected due to its extensive data provision, including citation counts per article, as well as its API that enables searches through a specific Domain Specific Language (DSL). The query parameters are: • Date range: 2004 to 2024. Only publications classified as "articles" are utilized. • The inquiry was conducted on February 24, 2025. The resultant query is as follows: Retrieve articles in full data for the terms "("Health Belief Model", "HBM", "health behavior")" throughout the years 2004 to 2024, of type "article," and return all publications along with their citation counts. A collection of 106 documents was obtained. The search exclusively considered the phrases "HBM," "Health Behaviour," or "Health Belief Model." Expanding the search to encompass the broader term "HBM" increases the document count from 106 to 196,562, which includes references to book chapters, edited volumes, and monographs.

Results and quantitative analysis

This section provides a descriptive analysis of the data obtained from Dimension. The attached photos were also generated by the software. Dimension. AI also integrates with VOS viewer software, which illustrates the connections among researchers, citations, and related elements.

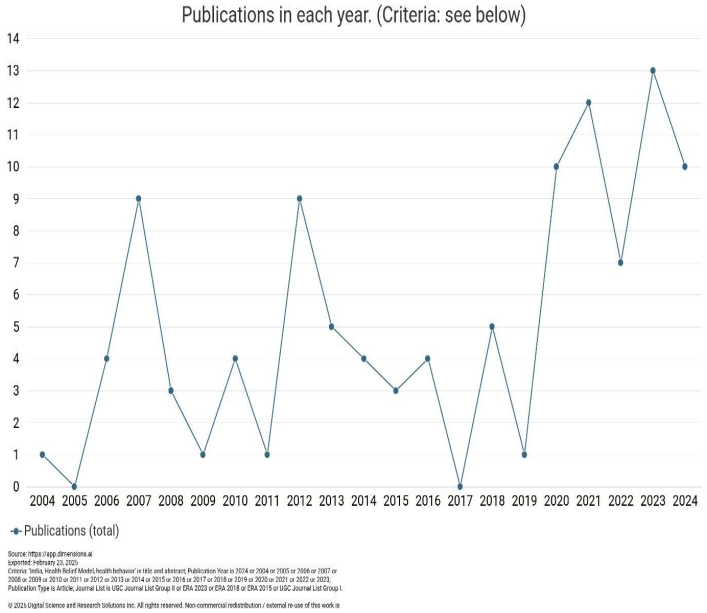

Fig.1 **Number of papers published by year during the 2004-2024 period**

In Fig.1 The data illustrates the quantity of publications in India from 2004 to 2024. The peak number of publications was in 2023, totalling approximately 13, while the lowest number was in 2005, with none recorded. Figure 1 illustrates a significant rise in the number of publications from 2012 to 2023, indicating a prior scarcity of research in this setting within India. **In fig.2 Key Observations:** The "Health Sciences" category leads in publication volume with 57, followed by "Biomedical and Clinical Sciences" with 42. This signifies that investigations concerning the Health Belief Model (HBM) in India predominantly concentrate on health-related fields.

Moderate Representation: Commerce, Management, Tourism and Services" and "Psychology" both have 7 publications each. "Human Society" has 5 publications.

"Information and Computing Sciences" has 3 publications. These categories suggest some interdisciplinary interest in HBM, including business, psychological perspectives, and computational applications.

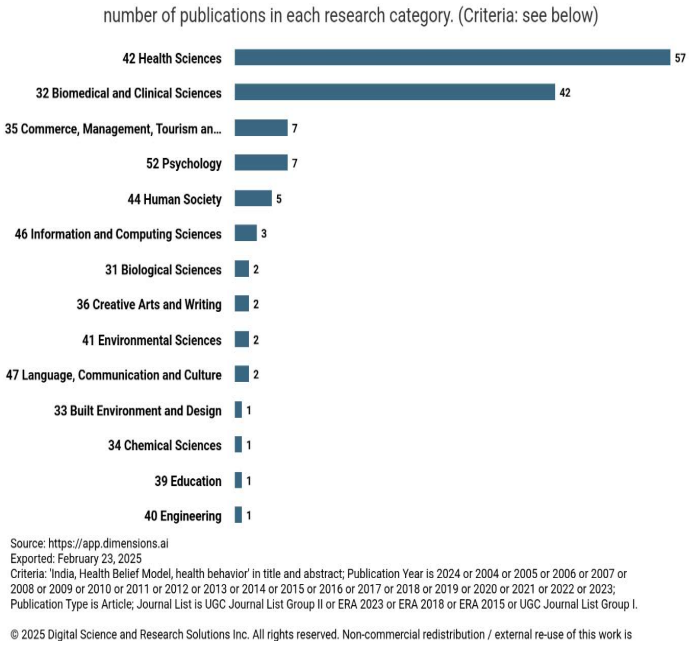

Fig.2 **Number of publication in research category 2004-2024 period**

Limited Representation in Other Fields: Numerous study fields exhibit a paucity of publications (1-2), including "Biological Sciences," "Creative Arts and Writing," "Environmental Sciences," "Language, Communication and Culture," "Built Environment and Design," "Chemical Sciences," "Education," and "Engineering." This indicates that the utilization of HBM in these domains is either nascent or insufficiently investigated.

Discussion

Health and Biomedical Focus: The pre-eminence of Health Sciences and Biomedical disciplines corresponds with expectations, as the Health Belief Model is chiefly employed to comprehend health habits, illness prevention, and medical decision-making.

Interdisciplinary Applications: The existence of study in Psychology (7 papers) indicates a behavioral and cognitive dimension of health decision-making, which is essential for comprehending patient adherence, mental health, and lifestyle choices. The presence of Commerce and Management (7 publications) suggests that certain studies may concentrate on healthcare marketing, policy execution, or health services administration.

Limited Use in Technical Fields: The minimal figures in Engineering, Environmental Sciences, and Chemical Sciences indicate that these disciplines seldom utilize the Health Belief Model. Nevertheless, nascent fields such as environmental health, occupational safety, and technology-enhanced healthcare solutions may gain from the incorporation of HBM ideas.

Potential Research Gaps: The scarcity of substantial publications in Education (only one) is remarkable, considering that health education programs frequently employ behavioural models such as HBM to formulate interventions. The limited output in Information and Computing Sciences (3 articles) indicates a possible deficiency in research pertaining to digital health applications, AI-driven health therapies, or e-health literacy.

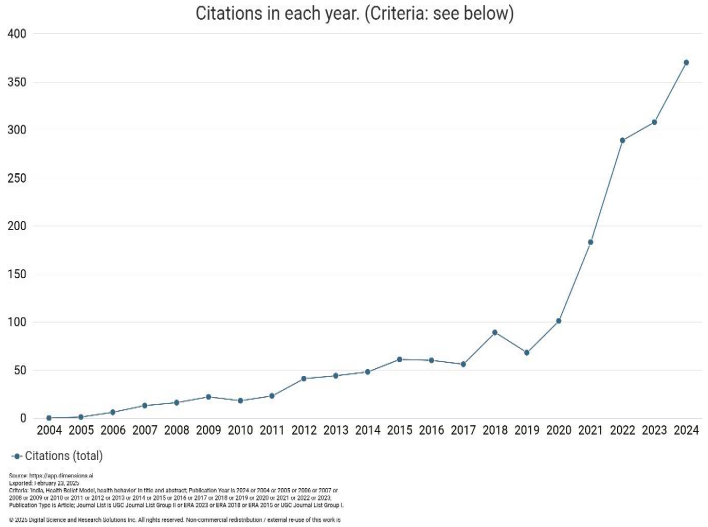

Fig.3 **Number of citations 2004-2024 period**

In fig.3 Key Observations:

Incremental Development (2004–2018): Between 2004 until about 2018, the citation count remained consistently low, exhibiting only marginal increases throughout the years. Minor variations are evident, signifying a gradual although consistent interest in the research subject.

Initial Increase (2018–2020): Approximately in 2018, there was a significant surge in citations, indicating an increasing acknowledgment of research pertaining to the Health Belief Model (HBM) in India. Nonetheless, the rise remained modest in comparison to subsequent years.

Rapid Surge (2020–2024): A notable escalation of citations commenced circa 2020, followed by a pronounced surge in the ensuing years. The citations surged significantly in 2021 and continued to escalate through 2022, 2023, and 2024. By 2024, the citation count surpassed 350, indicating a robust increasing trajectory.

Discussion:

Rising Interest in Health-Related Research: The significant rise in citations after 2020 indicates that research on HBM in India has garnered substantial attention in recent years. Potential contributory variables encompass the COVID-19 pandemic, which presumably heightened interest in health behavior, public health initiatives, and health psychology.

Delayed Impact of Older Publications: Research typically requires time to garner citations; so, previous articles (2004–2015) may have been seminal yet initially earned fewer citations. The abrupt increase in citations after 2020 indicates that current studies or meta-analyses have revitalized interest in earlier research.

Possible Influence of Digital and Policy Shifts: The proliferation of digital health interventions, telemedicine, and policy initiatives may have contributed to the heightened significance of HBM research. The rise in citations may be attributed to government health initiatives, heightened public health awareness, and an emphasis on behavioural models in healthcare interventions.

Future Implications: Should the tendency persist, it indicates that research on HBM in India will continue to exert significant influence in health sciences, public health, and behavioural studies. Subsequent multidisciplinary research may develop, incorporating technology, AI-based health behavior analysis, and policy-oriented health solutions.

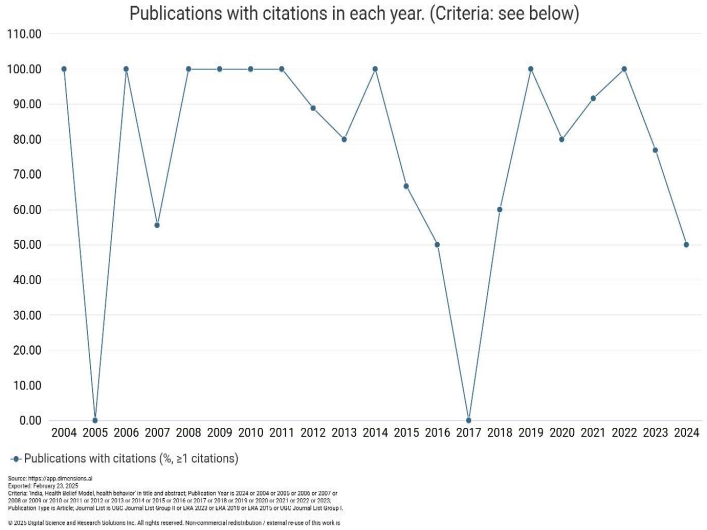

Fig.4 **Number publication during 2004-2024 period**

In fig.4 Key Observations:

Fluctuations in Citation Percentage: The proportion of publications with citations exhibits considerable variability, with certain years attaining 100% and others experiencing substantial declines. This signifies that the influence of research fluctuates significantly from year to year.

Low Citation Years (2005, 2017): In 2005, the proportion of cited publications declined to nearly 0%, indicating that either a minimal number of papers were published that year or the published works garnered scant attention. A comparable decline occurred in 2017, when the percentage of referenced publications once more attained a low.

Years with High Citation Rates: Specific years, including 2004, 2008–2014, and 2015, exhibit 100% citation rates, signifying that every article from these years garnered at least one citation. This indicates that the research released during these years was more influential or garnered greater attention.

Recent Trends (2020–2024): After some fluctuations, the percentage of cited publications remains relatively high in recent years, though it starts to decline in 2024. This could mean that some newer papers have not yet had enough time to accumulate citations.

Discussion:

Impact of Research Over Time: The fluctuating citation percentages indicate that certain years yielded more impactful research than others. Factors such as topic relevance, journal quality, and global interest in health behavior research may have affected citation rates.

Possible Reasons for Citation Dips: Years with diminished citation percentages may result from a reduced number of publications or the diminished prominence of those research. It may also signify deficiencies in research distribution or a redirection of emphasis toward alternative subjects.

Long-Term Relevance of Older Studies: The years where all publications received citations suggest that older studies have continued to be relevant and referenced in newer research.

Implications for Future Research: To enhance citation impact, researchers should prioritize publishing in high-impact journals, cooperating with prominent authors, and aligning their work with contemporary trends. The current decrease in citation proportion in 2024 may enhance over time as newer articles receive acknowledgment.

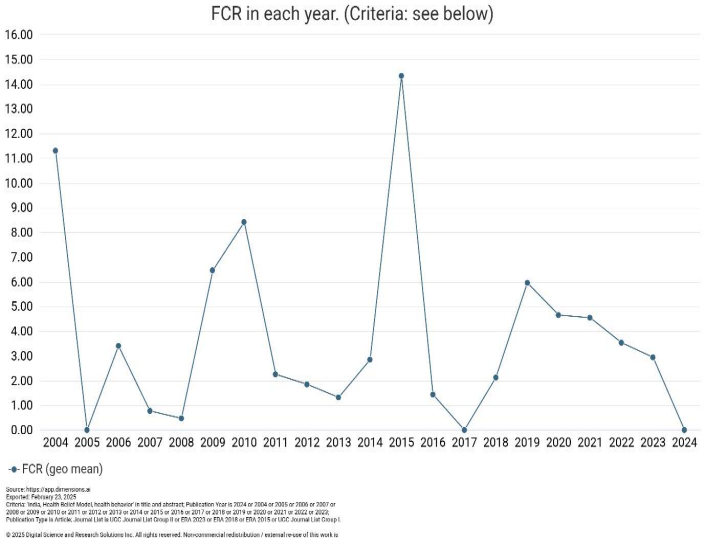

Fig.5 **Number of Field Citation Ratio (FCR) 2004-2024 period**

In fig.5 The Field Citation Ratio (FCR) indicates the relative citation performance of a publication when compared to similarly-aged articles in its subject area. A value of more than 1.0-1.5 indicates higher than average citation, when defined by FoR subject code, and publication year. The FCR is calculated for all publications in Dimensions which are at least 2 years old and were published in 2000 or later.

Key Observations:

High Variability in FCR: The FCR exhibits considerable variability over the years, with notable peaks in 2004, 2015, and 2019. The most significant peak occurs in 2015, with an FCR of 15, signifying an extraordinarily strong citation effect for that year.

Periods of Low FCR: Years including 2006, 2012, 2013, 2017,

and 2024 exhibit notably low FCR levels. Significantly, the years 2017 and 2024 exhibit citation count approaching zero, indicating that publications from these years had minimal or negligible impact within the discipline.

Gradual Decline in Recent Years: Following their peak in 2019, FCR values have exhibited a declining tendency from 2020 forward. The decline in 2024 may be attributed to the recentness of articles, which may not have had sufficient time to garner citations.

Discussion and Interpretation

Impact of Research Over Time: Peaks in 2004, 2015, and 2019 signify years in which publications exerted substantial influence within their domain. The elevated FCR in 2015 indicates that research from that year was exceptionally well-received, likely addressing rising trends or urgent health concerns.

Possible Reasons for Low FCR Years

2017-2024 are of particular concern due to their near-zero FCR values.

This could be due to Lower research output in those years, Lower relevance or visibility of published papers, A delay in citation accumulation for recent years like 2024.

Recent Decline in FCR (2020–2024):

While **2019 showed a resurgence in citation impact**, the steady decline afterward suggests that recent research is not performing as well in citation metrics.

This may be due to, Increased competition in the field, Shift in research focus, Need for better dissemination strategies.

Comparing with Total Citations:

Although overall citations have risen over time, the FCR trend does not exhibit a similar trajectory. This indicates that while the number of cited publications is increasing, their relative influence in comparison to another research in the field is not necessarily enhancing.

In fig.6 The Relative Citation Ratio (RCR) measures a publication's citation performance relative to other papers within its study domain. A value exceeding 1.0 indicates a citation rate that is above normal. The research domain of the article is delineated by the citations accompanying it. The RCR is computed for all PubMed publications that are a minimum of 2 years old.

Key Observations:

Fluctuating Citation Impact: The RCR values vary annually, exhibiting both peaks and troughs. The most notable rise occurs in 2015, when the RCR exceeds 3.0, signifying that research from this year was cited substantially more than the field average.

Periods of Low RCR: The lowest points occur in 2013, 2017, and 2024, where RCR values are near zero. This suggests that publications from these years received significantly fewer citations compared to the expected field standard.

Recent Trends (2020–2024): A trend emerged in 2020 and 2021, culminating in a minor peak. Nevertheless, a decrease occurs in 2023 and 2024, with 2024 nearing zero. The diminished RCR in 2024 may result from recent articles lacking sufficient citations.

Discussion and Interpretation:

Impact of Research Over Time: The 2015 peak corresponds

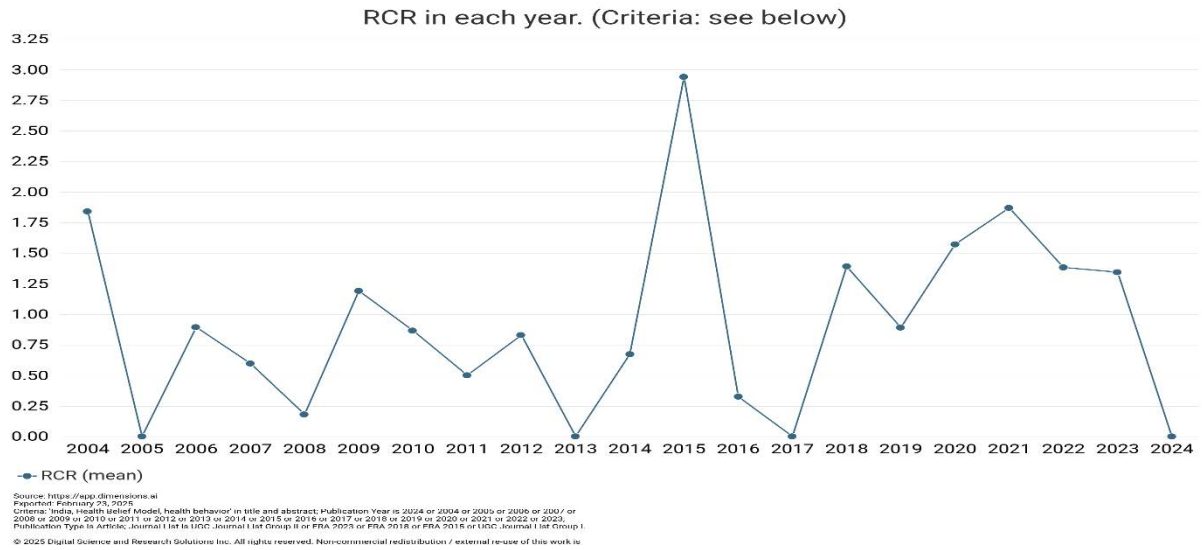

Fig.6 **Number of Relative Citation Ratio (RCR) 2004-2024 period**

with trends shown in the FCR graph, substantiating that research from this year exerted significant citation impact. The comparatively elevated RCR in 2020 and 2021 indicates that research conducted during these years was more pertinent and garnered greater citation impact.

Possible Reasons for Low RCR Years (2013, 2017, 2024): Limited research output in those years, Publications not aligning with major trends or interest areas, Delayed recognition or lesser visibility of research, for 2024, it is likely that the recency of the research is affecting citation accumulation.

Comparison with FCR (Field-Weighted Citation Ratio): Both FCR and RCR exhibit a pronounced surge in 2015, underscoring the significance of research conducted during that year. The decline in 2024 is apparent in both figures, indicating a widespread delay in citation accumulation for recent publications.

Implications for Future Research Strategies: Determining the factors contributing to the peaks, such as in 2015, might facilitate the replication of successful research trends. The recent fall (2023–2024) indicates a necessity for enhanced visibility, collaboration, and dissemination initiatives. Researchers ought to concentrate on prestigious publications and subjects that correspond with contemporary academic and societal concerns.

Researcher Collaboration Network (VO Sviewer Analysis)

Network Overview: The network consists of **13 researchers**, forming **6 clusters** with **39 citation links** and **39 total citations**. The network suggests a moderate level of collaboration among researchers.

Key Researchers and Their Roles: Romate John and Rajkumar Eslavath emerge as pivotal individuals with several affiliations. Researchers such Zaman Kamran, Sumit Suresh Aggarwal, and Himanshu Kumar Chaturvedi own distinct sub-clusters.

Cluster Distribution: The presence of six clusters indicates that the researchers have multiple focal areas within their domain. Some researchers have stronger connectivity, while others are isolated or have fewer collaborative links.

Collaboration Insights:

The highly interconnected researchers likely play a leading role in shaping the research agenda, The presence of distinct clusters could indicate specialization in different subfields, strengthening inter-cluster collaboration could enhance research impact and citation influence.

In fig.8 Overview of the Data

The graphics illustrate a co-authorship network analy-

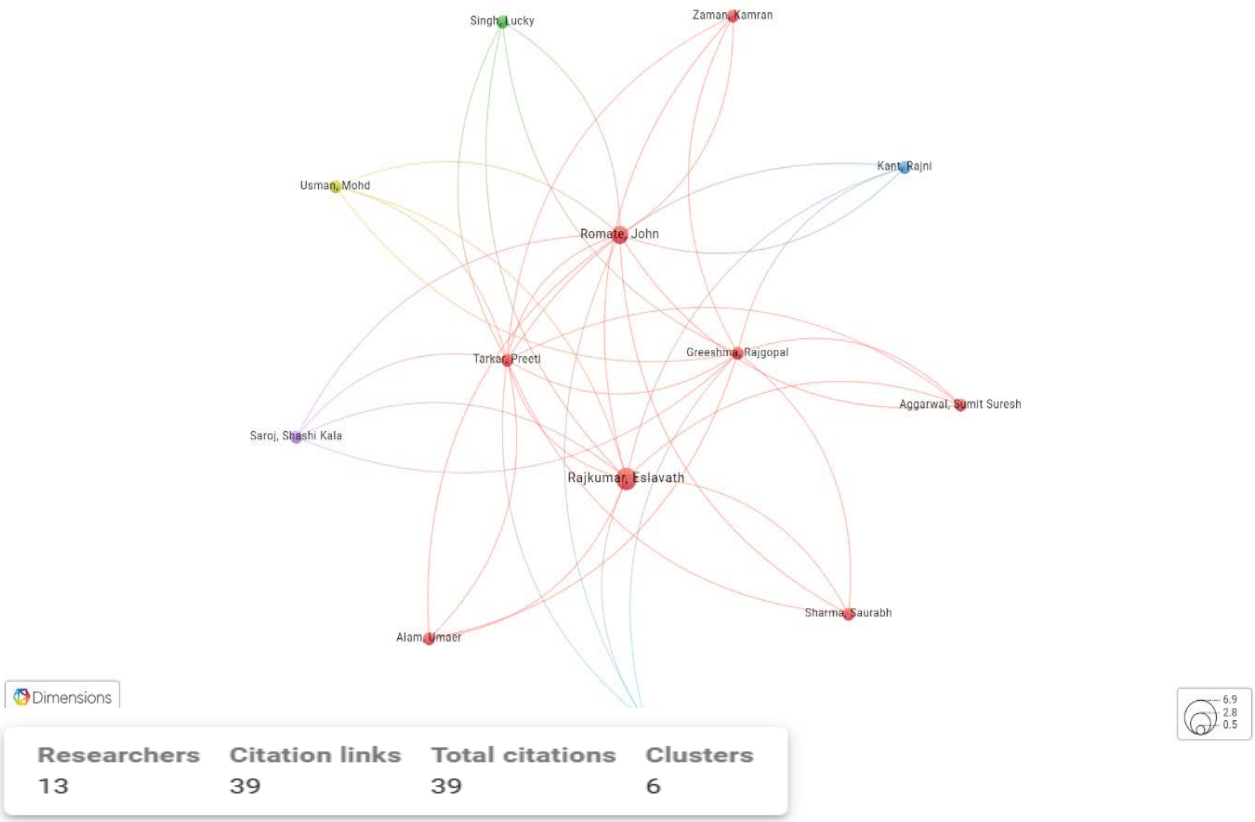

Fig.7 **Citation Analysis VOS Viewer Image 2004-2024 period**

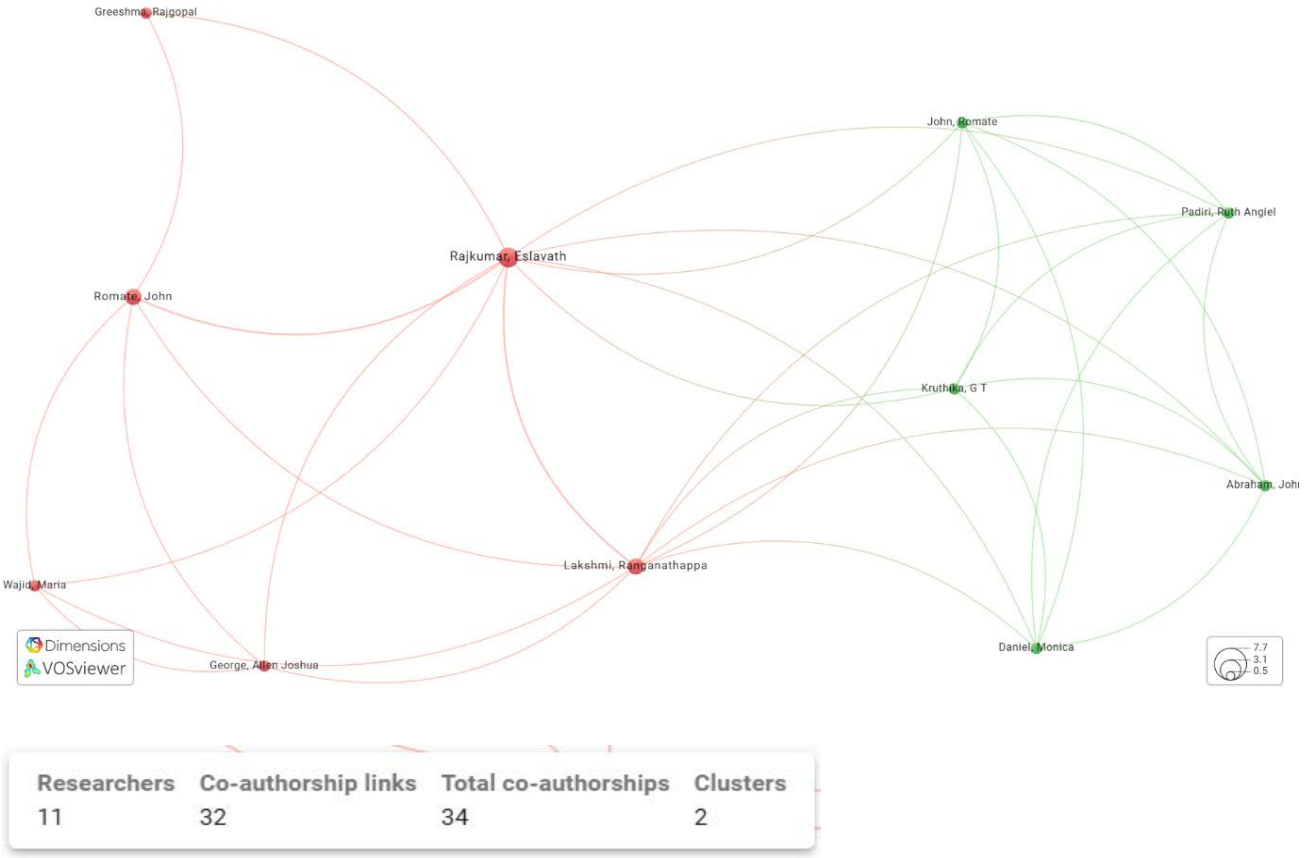

Fig.8 **Co-Authorship Analysis VOS Viewer Image 2004-2024 period**

sis performed with VOS viewer. The initial graphic displays essential facts regarding co-authorship, whereas the subsequent image illustrates the connections among researchers.

Key Observations:

Number of Researchers & Links:
The network comprises 11 researchers. The network comprises 32 co-authorship links, indicating 32 ties among collaborating researchers. The aggregate number of co-authorships is 34, indicating that certain scholars have engaged in many collaborations.
Clusters: The network is divided into **two clusters**, shown in **red and green**. Each cluster represents a group of researchers who collaborate more closely with one another.
Prominent Researchers: Researchers Rajkumar Eslavath and Romate John occupy significant roles within the network, signifying extensive collaboration with numerous peers. Lakshmi Ranganathappa possesses robust connections to numerous researchers within the red cluster.
Inter-Cluster Collaboration: Although the two clusters are separate, there exist some tenuous inter-cluster links. Rajkumar Eslavath appears to function as a conduit between the two factions.
Potential Implications: The two clusters indicate specific research groups within the wider field. Bridging scholars, such as Rajkumar Eslavath, are essential in fostering collaboration among diverse groups.

Conclusions

This bibliometric analysis of the Health Belief Model (HBM) among healthcare workers offers significant insights into the changing research trends, multidisciplinary uses, and citation impact of the model within the Indian setting. The results demonstrate a consistent rise in publications and citations over the last twenty years, underscoring the increasing significance of HBM in comprehending health behaviors, especially within public health, biological sciences, and psychology. The restricted representation in domains including education, environmental sciences, and engineering indicates possible deficiencies and prospects for additional investigation. The research reveals notable variations in citation impact, with surges in particular years indicating the significance of pivotal works. The heightened emphasis on HBM-related research since 2020 corresponds with global health issues, especially in reaction to public health emergencies such as the COVID-19 pandemic. The examination of co-authorship and cooperation networks indicates that, although research clusters are present, enhanced multidisciplinary collaboration could amplify

the effect and scope of HBM investigations. Considering India's distinctive cultural, social, and economic elements, broadening the HBM framework to include dimensions like traditional health beliefs, social norms, and economic obstacles may enhance its relevance in formulating successful health interventions. Future research should concentrate on utilizing digital health technology and policy-oriented strategies to incorporate behavioural models into public health initiatives. Enhancing research collaborations and publishing in prestigious publications can amplify the impact of HBM research on healthcare policies and interventions.

In conclusion, although the Health Belief Model is a fundamental paradigm in health behavior research, its application in the Indian setting necessitates a more sophisticated approach. Addressing research deficiencies, promoting interdisciplinary collaborations, and contextualizing the model to incorporate socio-cultural aspects will augment its effectiveness in enhancing healthcare outcomes for Indian healthcare personnel and the wider public.

Limitation

The limitation of this study is that the data is only taken from the Dimension.ai and Google Scholar. For future research, the researcher can take data from several sources, for example, Scopus database, Web of Science, Connected Papers, Open Knowledge Maps.

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