Bibliometric Analysis of the Health Belief Model in Healthcare Workers: Trends, Insights, and Future Directions

Aini Muzayyana [1*], Qurratul Aini [1]

Abstract

Background: The Health Belief Model (HBM) is a pivotal framework in understanding health-related behaviors and decision-making processes among individuals, particularly healthcare workers. Developed in the 1950s, the HBM emphasizes the role of perceived susceptibility, severity, benefits, barriers, cues to action, and individual characteristics in shaping health behaviors. It has been extensively applied to explore preventive health behaviors among healthcare professionals worldwide. Methods: This study employs a qualitative methodology combined with a systematic literature review approach using the Scopus database. The search criteria included articles published from January 2014 to December 2023, focusing on the application of the HBM in healthcare workers. A total of 940 articles were initially identified, with final inclusion based on relevance to the fields of Medicine and Health Professions, resulting in 690 documents. Data analysis utilized VOSviewer software for bibliometric visualization and analysis of keyword trends. Results: Between 2014 and 2023, scholarly interest in the HBM among healthcare workers has steadily increased, with a peak in publications noted in 2021 amidst the COVID-19 pandemic. Key topics explored include vaccine acceptance, infection control practices, and health screening behaviors. The United States emerged as the leading country in HBM research output, followed by Iran and China. Notable authors contributing to this body of literature include Wong, L.P., and Guidry, J.P.D., among others. Conclusion: This bibliometric analysis underscored the growing relevance of the Health Belief Model in understanding health behaviors among healthcare workers globally.

Keywords: Health Belief Model, healthcare workers, bibliometric analysis, research trends, preventive health behaviors

1. Introduction

One of the most prominent models for examining the relationship between health behavior and the utilization of healthcare services is the Health Belief Model (HBM). Theoretical models are essential for elucidating the determinants of decision-making processes, as they assess the incentives and obstacles impacting individuals' adoption of health-related behaviors. The HBM seeks to identify and clarify preventive health behavior through the examination of distinct behavioral indicators. Its fundamental tenet posits that individuals are inclined to act when they perceive potential harm to their well-being and when the benefits of engaging in health-promoting behaviors outweigh the risks. The model's core principle emphasizes preventive healthcare and health promotion.

The HBM comprises six primary elements: (a) perceived susceptibility, (b) perceived severity, (c) perceived benefits, (d) perceived barriers, (e) cues to action, and (f) individual characteristics. These elements, which include demographic,

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Significance | Provides a comprehensive analysis of HBM research trends among healthcare workers, highlighting gaps and informing future research and policy.

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psychosocial, knowledge, and structural variables, influence perceptions of health-related behaviors (I. H. Chen et al., 2019; Shmueli, 2021; Tarkang & Zotor, 2015).

The HBM is frequently used to clarify intrapersonal decision-making processes related to various health behaviors, such as vaccination and screening among healthcare workers. Multiple studies have shown that healthcare workers are likely to accept vaccines according to the HBM constructs (I. H. Chen et al., 2019; De Waure et al., 2022). Previous research indicates that this theory has been used to investigate the motivation behind cervical cancer screening among female healthcare professionals (Nyaaba & Akurugu, 2023). Additionally, the HBM has been employed to assess healthcare professionals' adherence to standard precautions for infection control (Amini et al., 2021; Sadeghi et al., 2018; Zeigheimat et al., 2016).

Healthcare workers play a vital role in enhancing the provision of comprehensive healthcare services by increasing awareness, motivation, and capacity to maintain good health (Aini, 2021, Md. Halimuzzaman et al. 2024, Zulfa et al. 2024, Qurratul Aini et al. 2024, Aini et al. 2024, Faris et al. 2024). Studies investigating the HBM in healthcare workers demonstrate that educational interventions based on HBM theory, focusing on hand hygiene behavior and adherence to standard infection control precautions, result in significant changes in all HBM constructs (Amini et al., 2021; Kouhi et al., 2023; Ramlan et al., 2020; Sadeghi et al., 2018; Zeigheimat et al., 2016). Research by Nyaaba & Akurugu (2023) showed that health workers identified insufficient knowledge and low participation in cervical cancer screening due to various barriers, including limited awareness, high screening costs, discomfort, pain during screening, and the gender of the screener. A cross-sectional study by Alhalaseh (2020) found significant differences in healthcare workers' intentions to receive vaccines, particularly regarding the perceived benefits measured by HBM constructs.

Previous research has extensively examined the HBM in the context of preventive health behaviors among health workers, focusing on infection control, vaccination, and health screening. The aimed of this study is to perform a bibliometric analysis to identify research trends related to the HBM in healthcare workers and track the development of studies associated with HBM theory. This article examines the growth of publications, especially in core journals, and the contributions of authors. It also investigates the number of cited publications and their geographic distribution by country. Additionally, it analyzes research topics by examining keywords and applies network visualization using bibliometric analysis tools like VOSViewer. The study aimed to conclude the current state of HBM research among healthcare workers and provide recommendations for future research.

2. Literature Review

2.1. An Overview of the Health Belief Model Theory

The Health Belief Model (HBM) was developed by social psychologists at the U.S. Public Health Service in the 1950s to address the widespread lack of participation in illness prevention and detection programs. The HBM has significantly advanced behavioral research, particularly in understanding health-related behaviors, disease prevention, sick role behaviors, and health education interventions. Its principal aim is to elucidate and predict individuals' health beliefs and the relationship between these beliefs and their behaviors. Theoretical frameworks that analyze health beliefs and risk perception are vital for comprehending the factors that drive or hinder individuals from adopting health-related activities, thereby influencing decision-making (I. H. Chen et al., 2019; Karen Glanz et al., 1990; Shmueli, 2021).

The HBM encompasses six socio-behavioral dimensions: perceived benefits, perceived barriers, perceived susceptibility, perceived severity, cues to action, and self-efficacy. These concepts influence health behavior and frequently interact with other factors such as age, gender, and health literacy (Lau et al., 2020). An individual's perception of illness or disorder as a potential threat is shaped by four factors: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. When perceived benefits outweigh perceived barriers, it is more likely that individuals will engage in health-seeking behaviors. Conversely, if perceived barriers outweigh perceived benefits, individuals are less likely to change their health behavior. The likelihood of participating in a recommended health intervention depends on the balance between perceived advantages and obstacles associated with it (I. H. Chen et al., 2019).

Perceived Susceptibility refers to an individual's perception of the likelihood of contracting a disease or suffering an unhealthy condition due to certain actions (Janz et al., 1984; Glanz et al., 1990; Lewis et al., 2009; Sim et al., 2014). This belief is crucial in motivating individuals to adopt positive health behaviors. People who perceive a higher risk of a negative health outcome are more likely to engage in actions that mitigate that risk (Orji et al., 2012).

Perceived Severity involves an individual's assessment of the potential consequences associated with the onset of a health condition (Al-Metwali et al., 2021; Tarkang & Zotor, 2015). It includes the perceived seriousness of the disease and its potential impact on one's life. If individuals do not view the health threat as significantly harmful, even if they recognize a risk, they may not be motivated to take preventive action. Medical knowledge and personal beliefs about the disease's impact can shape this perception (Orji et al., 2012).

Perceived Benefits are the individual's beliefs about the effectiveness of taking a specific action to reduce the risk or severity of a health

condition. For behavior change to occur, individuals must believe that the action will lead to positive outcomes. Recognizing substantial benefits from the behavior increases their confidence and motivation to act, aiming to avoid negative health outcomes (Tarkang & Zotor, 2015; Orji et al., 2012).

Perceived Barriers refer to an individual's evaluation of the obstacles preventing them from adopting a health-promoting behavior (Devi, 2021; Orji et al., 2012). These barriers can include costs, difficulty, discomfort, lack of knowledge, or dissatisfaction with health services. If the perceived barriers outweigh the benefits, individuals are less likely to engage in the desired health behavior, despite recognizing its effectiveness in reducing a health threat (Nyaaba & Akurugu, 2023; Orji et al., 2012).

Cues to Action are triggers that prompt individuals to adopt health behaviors. Even when individuals recognize susceptibility and benefits, specific events or stimuli, such as media campaigns, social influences, or internal changes like experiencing symptoms, are often needed to spur action (Glanz et al., 1990; Orji et al., 2012).

Self-Efficacy is the individual's confidence in their ability to perform a particular behavior. People are less likely to attempt a new behavior if they doubt their ability to succeed. High self-efficacy enhances the likelihood of adopting and maintaining new health behaviors (Glanz et al., 1990; Orji et al., 2012). If individuals believe in the benefits of a new behavior but lack confidence in their ability to execute it, they may avoid adopting the behavior (Orji et al., 2012).

Research on health-related behaviors and their determinants demonstrates the impact of these behaviors across different social groups (Table 1). Al-Metwali et al. (2021) highlighted the importance of COVID-19 vaccine adoption by analyzing factors such as planning, preventive measures, perceived vulnerability, severity, benefits, barriers, and cues to action among healthcare staff and the general community. Carico et al. (2021) promoted COVID-19 transmission prevention activities among pharmacists, emphasizing characteristics like perceived susceptibility, severity, threat, benefits, hurdles, and self-efficacy. Restivo et al. (2023) investigated vaccination beliefs and the reasons for lack of immunization among physicians, medical residents, students, and other healthcare workers.

Powers et al. (2016) focused on nurse adherence to standard precautions, examining knowledge, vulnerability, severity, benefits, and barriers. Sadeghi et al. (2018) implemented an educational intervention for emergency center nurses, considering factors like perceived vulnerability, severity, advantages, barriers, cues to action, and self-efficacy. Cheung et al. (2015) studied nursing students' adherence to standard precautions, analyzing perceived vulnerability, severity, knowledge, barriers, benefits, training adequacy, management support, and the influence of nursing staff and year of study.

These studies provide valuable insights into understanding and improving health-related behaviors in various settings, emphasizing the need to address specific factors to enhance health outcomes.

3. Methods

This study employs a qualitative methodology combined with a literature review approach. Data was sourced from the Scopus database using the keywords "health belief model" AND "health workers" within the period of the last 10 years (January 2014 - December 2023), resulting in an initial finding of 940 articles. The scope was then restricted to the fields of Medicine and Health Professions, selecting only articles in their final publication stage from journal sources, and exclusively in English, narrowing the total to 690 documents. Data collection methods followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, as presented in Figure 1.

Researchers used VOSviewer software to visualize the progression of research on the Health Belief Model. This involved generating a keyword map by exporting search results from the Scopus database in CSV format and importing the data into VOSviewer. A map chart displayed the distribution of publications by country. VOSviewer facilitated data analysis through Network Visualization, Overlay Visualization, and Density Visualization. The unit of data analysis in the Visualization network represents concepts in the study, while visualization overlays chart the study's progression. Density visualization observes study density and identifies emerging themes or keywords not yet extensively discussed.

The research strategy aimed to retrieve 640 publications from the Scopus database using the search query: TITLE-ABS-KEY ("health belief model") AND TITLE-ABS-KEY ("health care") AND PUBYEAR > 2013 AND PUBYEAR < 2024 AND (LIMIT-TO (PUBSTAGE, "final") AND LIMIT-TO (DOCTYPE, "ar") AND (LIMIT-TO (SUBJAREA, "MEDI") OR LIMIT-TO (SUBJAREA, "HEAL")) AND LIMIT-TO (LANGUAGE, "English") AND LIMIT-TO (SRCTYPE, "j")). Identification based on the PRISMA flowchart is shown in Figure 1.

4. Results

4.1. General Information and Annual Publication Output

Between 2014 and 2023, 940 articles on the Health Belief Model (HBM) were indexed in the Scopus database, indicating a growing trend in academic research on this topic. Initially, few documents were published, mostly conceptual in nature. However, since 2014, there has been a noticeable increase in scientific production, with fluctuations in publication numbers. The peak occurred in 2021, with 107 articles published, marking the highest annual total within the period studied.

The surge in 2021 publications extensively explored the HBM in the context of COVID-19 vaccine acceptance among healthcare workers and the general public. Key studies from this year include those by Al-Metwali et al., H. Chen et al., Jose et al., Maraqa et al., Patwary et al., Rosental & Shmueli, M. C. S. Wong et al., and Yu et al., highlighting the model's relevance in understanding vaccine uptake during the pandemic.

From 2022 to 2023, research on the HBM among healthcare professionals continued to grow significantly. This period expanded the discussion beyond COVID-19 acceptance to include topics such as vaccine hesitancy (Riad et al., 2022), compliance with infection prevention and control measures (Salwa et al., 2022), factors influencing protective behaviors (Hwang et al., 2022), perceptions of the Monkeypox vaccine (Riad et al., 2023), and factors associated with lack of immunization (Restivo et al., 2023). This increasing trend underscores the model's importance in addressing various health behaviors and challenges in the healthcare sector.

4.2. Distribution of publication by Country

Figure 3 shows the distribution of citations across various countries, shedding light on the geographical spread of knowledge about the Health Belief Model (HBM) as applied to health workers. A total of ten countries are represented, with the United States leading in global citations, boasting 281 publications. Research from the United States primarily focuses on the HBM in the context of vaccine acceptance among health workers, particularly for COVID-19 vaccines (Al-Metwali et al., 2021; Askarian et al., 2022) and COVID-19 vaccination hesitancy (Toth-Manikowski et al., 2022; Guidry et al., 2022).

Following the United States, Iran and China also contribute significantly to the body of literature. Despite producing fewer documents, the United Kingdom has made a substantial impact with its publications. Conversely, countries like Canada and Hong Kong, which publish a relatively higher number of documents, receive fewer citations. This distribution highlights the varying influence and recognition of research across different nations, reflecting both the quantity and impact of their scholarly contributions.

4.3. Analysis Authors

According to the data presented in Figure 4, Wong, L.P. stands out as the most prolific author with six publications. Wong's work explores the application of the Health Belief Model (HBM) in early screening and attitudes towards vaccines for diseases such as COVID-19, HPV, and Zika (Lin, Hu, et al., 2020; Lin, Lin, et al., 2020; L. P. Wong et al., 2014, 2017, 2020, 2022). Other active authors include Alias, H. (Lin, Hu, et al., 2020; Lin, Lin, et al., 2020; L. P. Wong et al., 2017, 2020, 2022), Casuccio, A. (Minutolo et al., 2022; Restivo, Costantino, Fazio, et al., 2018; Restivo, Costantino, Marras, et al., 2018; Restivo et al., 2020, 2023), Guidry, J.P.D.

(Guidry et al., 2020, 2021, 2022; Guidry & Benotsch, 2019; Laestadius et al., 2022), Lau, J.T.F. (Fang et al., 2019; Mo & Lau, 2014; Wang et al., 2018; M. C. S. Wong et al., 2021; Yu et al., 2021), Restivo, V. (Minutolo et al., 2022; Restivo, Costantino, Fazio, et al., 2018; Restivo, Costantino, Marras, et al., 2018; Restivo et al., 2020, 2023), Rosberger, Z. (Krawczyk, Knäuper, et al., 2015; Krawczyk, Perez, et al., 2015; Shapiro et al., 2017, 2018; Zhu et al., 2023), and Zimet, G.D. (Fan et al., 2018; Lin, Lin, et al., 2020; Shapiro et al., 2017, 2018; L. P. Wong et al., 2022). Authors Dempsey, A.F. (Cunningham-Erve et al., 2023; Dempsey et al., 2014, 2016; Gilkey et al., 2014) and Grandal, M. (Grandahl et al., 2015, 2016, 2017, 2019) follow closely with four publications each.

Significant studies employing the Health Belief Model to investigate health workers' behaviors, particularly in relation to COVID-19 and routine precautions, are summarized in Table 2. De Waure et al. (2022) examined COVID-19 vaccine acceptance among healthcare workers in Eastern Ethiopia, highlighting factors influencing vaccine acceptability. Ardakani et al. (2019) evaluated an educational program based on the HBM for healthcare personnel's adherence to standard precautions. Ramlan et al. (2020) implemented an HBM intervention to enhance standard precautions among primary healthcare professionals in Malaysia. Sadeghi et al. (2018) assessed the effectiveness of an HBM-based educational intervention on adherence to standard precautions among emergency center nurses in Sirjan, Iran. Finally, Hines et al. (2022) explored Malian health workers' perceptions of respiratory protection using the HBM.

These studies significantly contribute to our understanding of health workers' behaviors and interventions in various healthcare settings through the application of the Health Belief Model.

4.4. Linkage and Clustering of themes in health belief model in the health workers

The visualization depicted in Figure 5 presents co-occurrence patterns, illustrating the integration of bibliometric and cluster analysis. Each cluster is represented by distinct colors, with circle size and color intensity reflecting the strength of integration, and line length indicating the intensity of relationships. Five clusters emerge: the first includes terms such as the health belief model, disease severity, educational level, health promotion, and health service; the second comprises perception, education, knowledge, and health status; the third relates to attitudes to health, health knowledge, patient acceptance, self-efficacy, risk factors, and prevention; the fourth involves health care delivery, health behavior, motivation, and social support; and the fifth centers on healthcare personnel and procedures.

Analysis indicates that commonly searched terms related to health belief models include perception, acceptance, prevention, and knowledge. Al-Metwali's research in 2021 on COVID-19 vaccine acceptance among healthcare personnel revealed higher willingness

to vaccinate compared to the general public. This inclination can be attributed to perceived severity of illness, heightened exposure risk from direct contact with COVID-19 patients, or increased medical

Table 1. Review of Existing User Acceptance Models for Health Belief Model in the Health Workers

| Author/ Year	Theory/Model	Variables or Key Concepts	Target	Sample population
Al-Metwali, et al., 2021 (Al-Metwali et al., 2021)	Health Belief Model	Perceived susceptibility Perceived severity Perceived benefit Perceived barriers Cue to action	Acceptance of COVID-19 vaccine	Healthcare workers and the general population
Carico et al., 2021 (Carico et al., 2021)	Health Belief Model	Modifying factors Perceived susceptibility, Perceived severity, and perceived threat Perceived benefits Perceived barriers Perceived self-efficacy. Cues to action	Communication guide for encouraging patients to adopt behaviors that will reduce the transmission of COVID-19	Pharmacist
Restivo et al., 2023 (Restivo et al., 2023)	Health Belief Model	Perceived susceptibility Perceived severity Perceived barriers Perceived benefits Vaccination Beliefs	Factors Associated with Lack of Immunization	Physician, Medical resident, Medical student, Other Health Care Workers
Powers et al., 2016 (Powers et al., 2016)	Health Belief Model	Knowledge Susceptibility Severity Benefits Barriers	Compliance with Standard Precautions	Nurses
Sadeghi et al., 2018 (Sadeghi et al., 2018)	Health Belief Model	perceived susceptibility, perceived severity, perceived benefits and barriers, cues to action and self-efficacy	The impact of an educational intervention based on the on the behavior of nurses in emergency centers regarding observing Standard Precaution	Nurses
Cheung et al., 2015 (Cheung et al., 2015)	Health Belief Model	Perceived susceptibility Perceived seriousness Knowledge of SPs Perceived barriers Perceived benefits Perceived adequate of training Perceived management support Perceived influence of nursing staff Year of study Perceived influence of nursing staff x year of study	The frequency of standard precautions (SPs) compliance and the factors affecting the compliance among nursing students (NSs)	Nursing students
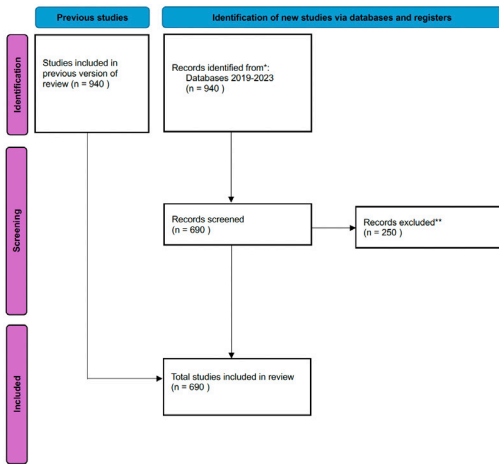
Figure 1. Flowchart Prisma
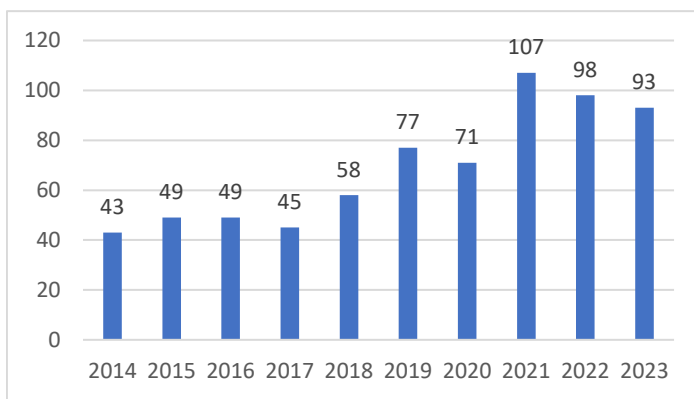
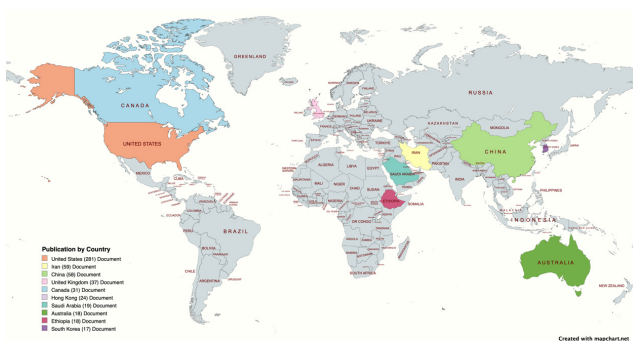**Figure 2.** Global trends in publications on health belief model in the health workers (from 2013-2023)

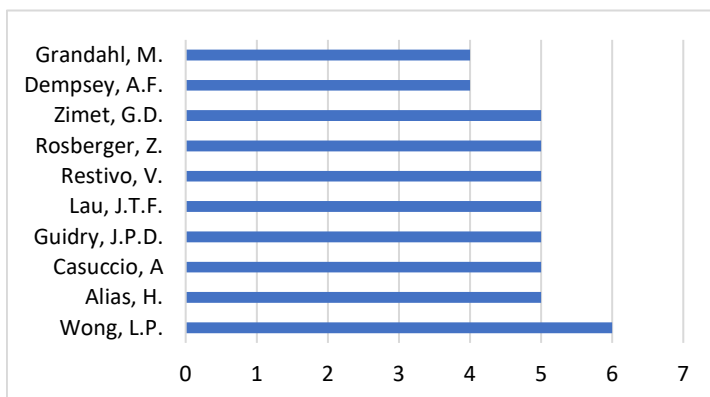

Figure 3. Publication by Country

Figure 4. The top 10 most active authors

**Table 2.** Most relevant publications in health belief model in the health workers

Author	Title	Source	Year	Total Citation
Waure et al., 2022 (De Waure et al., 2022)	Acceptance of COVID-19 vaccine and associated factors among health care workers at public hospitals in Eastern Ethiopia using the health belief model	Frontiers in Public Health	2022	6
Ardakani et al., 2019 (Ardakani et al., 2019)	Evaluation of educational intervention on standard precautions among healthcare provider based on health belief model	Prensa Medica Argentina	2019	3
Ramlan et al., 2020 (Ramlan et al., 2020)	Health belief model-based intervention on knowledge and practice of standard precautions among primary healthcare workers in a state of malaysia	Southeast Asian Journal of Tropical Medicine and Public Health	2020	0
Sadeghi et al., 2018 (Sadeghi et al., 2018)	The impact of educational intervention based on the health belief model on observing standard precautions among emergency center nurses in Sirjan, Iran	Health Education Research	2018	14
Hines et al., 2022 (Hines et al., 2022)	Respiratory Protection Perceptions among Malian Health Workers: Insights from the Health Belief Model	International Journal of Environmental Research and Public Health	2022	0
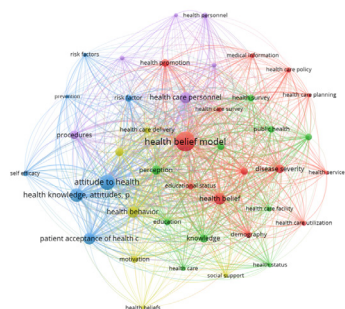
Figure 5. Network Visualization
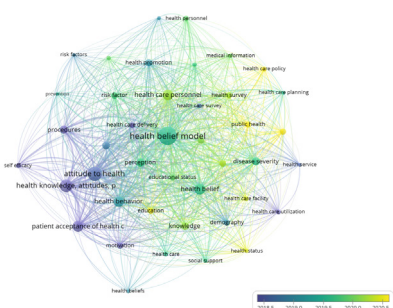
Figure 6. Overlay Visualization
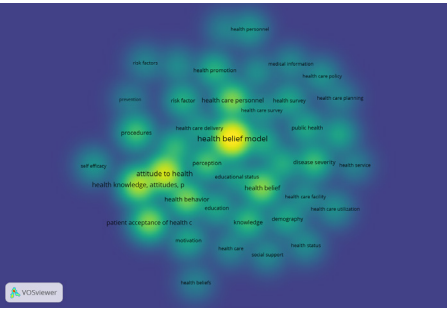
Figure 7. Density Visualization

knowledge. The Health Belief Model (HBM) has proven instrumental in uncovering how factors like perceived benefits, cues to action, and subjective norms positively correlate with vaccine acceptance. Conversely, significant perceived barriers were linked to vaccine hesitancy (Al-Metwali et al., 2021).

Additionally, terms such as health care delivery, health behavior, motivation, and social support are frequently noted. Spinewine et al. (2021) utilized the health belief model theory to explore COVID-19 vaccine hesitancy among hospital workers, emphasizing the need for tailored communication strategies. Primary reasons for hesitancy included concerns about potential adverse effects and beliefs regarding the rapid development of vaccines. Key influencers in decision-making included evidence of vaccine efficacy, safety, and successful vaccination experiences among peers (Spinewine et al., 2021).

4.5. Overlay Visualization themes in the development of health belief model in health workers Studies.

The visualization presented in Figure 6 highlights that the Health Belief Model (HBM) theory in healthcare workers garnered significant attention, particularly in mid-2019. During this period, discussions centered on perception, educational status, health behavior, disease severity, and risk factors. Ardakani's study in 2019 underscored the effectiveness of educational interventions targeting standard precautions in preventing and reducing high-risk behaviors among healthcare providers, utilizing principles from the Health Belief Model (Ardakani et al., 2019).

In 2018, extensive discourse revolved around health knowledge, motivation, attitudes towards health, self-efficacy, and patient acceptance of healthcare. More recently, discussions among health workers have expanded to encompass various facets of the Health Belief Model, including health status, education, public health, knowledge dissemination, healthcare personnel, and healthcare policy. These discussions reflect ongoing efforts to apply HBM principles to understand and improve healthcare practices and policies (Ardakani et al., 2019).

4.6. Visualization for Future Research in the study of health belief model in health workers

The density of research subjects related to the Health Belief Model (HBM) in health workers, analyzed through keywords indexed in Scopus between 2014 and 2023, is depicted in Figure 8 using VOSviewer. The density map highlights the extent to which various keywords have been explored in the literature. Keywords with a higher density are represented in yellow, indicating a greater number of studies focusing on those specific aspects. Conversely, keywords with a lower density in yellow suggest that they have received less attention and may represent areas ripe for further research.

The visualization reveals that extensive research has been conducted on perception, disease severity, educational status, attitudes towards health, and health knowledge within the context of the Health Belief Model in health workers. However, keywords related to health policy, healthcare planning, healthcare utilization, and prevention show limited research activity. These less explored areas present opportunities for future studies to expand the understanding of how the Health Belief Model can be applied to improve health policies and healthcare delivery for health workers (Ardakani et al., 2019).

5. Conclusion

This study provides a comprehensive review of the Health Belief Model (HBM) as applied in research on healthcare workers, offering insights into its evolution over time. Between 2014 and 2023, a substantial number of articles indexed in the Scopus database reflect a significant rise in scholarly investigations concerning the health belief model. This decade-long period underscores the novelty and increasing interest in this subject matter. The research spans across 10 different countries, with a notable emphasis on the United States, which emerges as the most frequently referenced country globally.

The analysis categorizes elements relevant to health attitudes and behaviors into five distinct clusters, visually illustrating their interrelationships. These clusters depict the interconnectedness of factors such as perceptions, attitudes, knowledge, and support systems in shaping health outcomes and healthcare service delivery. However, the literature review reveals a gap in the application of the Health Belief Model in critical areas such as health policy, healthcare planning, utilization, and prevention among health workers. This gap presents an opportunity for future research to explore these underrepresented areas further, thereby enhancing our understanding and potentially influencing policy and practice. While current research focus is commendable, there remains ample room for deeper exploration and investigation into less-explored facets of the health belief model within the context of health workers.

6. Limitation

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

Administration program which always supports and facilitates the author to conduct research.

Competing financial interests
The authors have no conflict of interest.

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