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HEALTH COMMUNICATION AND PROMOTION THROUGH DIGITAL MEDIA: A BIBLIOMETRIC APPROACH TO IDENTIFY TRENDS AND CHALLENGES

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Abstract

Health communication has experienced a significant transformation with the rise of digital media, reshaping how health information is disseminated and how public health promotion is conducted. This study uses bibliometric analysis to map trends and challenges in health communication through digital media, aiming to identify gaps and emerging patterns in research across global contexts. By analyzing a dataset of 168 scholarly articles published between 2006 and 2025, this research explores the evolving role of digital media in health promotion, the challenges of adapting health messages to diverse social and cultural contexts, and the disparities in digital access and technology literacy between developed and developing countries. The study highlights the increasing relevance of digital platforms, particularly social media, in health communication and promotion, while also emphasizing the need for tailored communication strategies that consider demographic factors such as age, gender, and socio-cultural background. The findings underscore the importance of cross-disciplinary collaboration and the integration of technology, behavior, and cultural factors in advancing more inclusive and effective health communication strategies. The results provide valuable insights for researchers and policymakers aiming to improve the global reach and impact of health promotion efforts in the digital age.

Keywords**:** Health Communication, Promotion Through, Digital Media, Bibliometric

INTRODUCTION

Health communication has undergone a significant transformation with the advancement of digital media, which allows broader and more direct access to health information for the public [1]. In the digital era, health promotion is no longer carried out solely through traditional channels like posters or seminars but also utilizes increasingly evolving digital platforms, including social media and technology-based health applications [2]. Digital media offers the opportunity to reach a larger audience, allows for two-way interaction, and provides more affordable and accessible information [3]. With the use of digital media, health promotion efforts become more efficient and adaptable to the changing needs of society [4, 5].

However, despite numerous studies highlighting the potential of digital media in health promotion, there are still gaps in the application of communication strategies that are appropriate for different social and cultural contexts. For instance, research by Mutlu et al. (2025) shows that while digital media increases engagement in health campaigns, significant challenges remain regarding the effectiveness of message delivery among less educated communities or those with limited access to digital technology [6]. Another study by Mpambije & Ndimbo (2025) also indicates that there are substantial differences in the effectiveness of health promotion in developed and developing countries, which are more influenced by digital infrastructure factors and technology literacy [7].

It is important to note that although research on digital health communication has grown rapidly, most studies still focus on the effectiveness of social media or health applications in developed countries [8,9]. There is little attention given to the application of digital media in developing countries, where access to digital technology is still limited, and local cultural factors significantly influence the reception of health messages [6]. This creates a significant gap in the existing literature that needs to be filled with research considering these factors.

This study presents a novel approach by offering a bibliometric analysis of trends in health communication research through digital media across various global contexts. This mapping will include the use of various complementary digital platforms, as well as explore gaps in research related to

technology access and message adaptation in different social and cultural backgrounds. The study also focuses on analyzing studies that are not limited to a single type of media but encompass the use of various digital platforms in health promotion.

The main objective of this study is to identify and analyze trends in health communication research through digital media, as well as map the latest developments in this field. Furthermore, this study aims to explore gaps in the application of digital media for health promotion in various regions, with a focus on public acceptance and access to technology.

The primary argument to be made is that while digital media holds great potential to advance health promotion, its application must be tailored to different social, cultural, and digital infrastructure contexts. This study is expected to provide new insights into the future direction of more inclusive and adaptive health communication research that is responsive to diverse global conditions, and offer practical recommendations for health policy managers.

2. RESEARCH METHODOLOGY

2.1 Research Design

This study uses bibliometric analysis to examine trends, gaps, and future directions in health communication and health promotion research through digital media. Bibliometric analysis is a systematic approach used to map the structure of knowledge domains, identify shifting trends, and explore gaps and future directions of research through mapping relationships between documents, keywords, and researchers. This approach focuses on the quantitative and visual representation of the literature to understand how the research field evolves conceptually, intellectually, and socially [10],[11]. Specifically, science mapping provides a framework for assessing the evolution of the research field, identifying thematic clusters, and directing future research focus through techniques such as co-word analysis, co-citation, and collaboration network analysis [10]. The synergy between science mapping techniques and the analytical software that supports longitudinal analysis allows researchers to monitor the dynamics of health research through digital media over time [10,12].

In the context of health communication and health promotion through digital media, the literature shows that topics such as online health information-seeking behavior, the impact of digital media on health behavior, and health promotion through digital campaigns have grown rapidly. These topics can be traced using bibliometric methodology to identify key trends and research gaps that need to be addressed [12,13]. This section proposes a bibliometric analytical framework that integrates science mapping techniques, content analysis, as well as traditional and alternative data sources to analyze trends, gaps, and future directions in the field [13]. The analysis process begins with data extraction from the Scopus database on December 23, 2025, using predefined keywords in accordance with the inclusion criteria set. The following are the details of the research methodology used:

2.2 Keywords

Data extraction was performed using the following combination of keywords:

- Health Communication
- Health Promotion
- Public Health
- Health Education

The combination of keywords used for the search is: “health communication OR health promotion OR public health OR health education AND communication AND digital media”

2.3 Research Limitations (Inclusion Criteria)

The inclusion criteria used in this study are as follows :

Table 1. Inclusion Criteria

Inclusion Criteria	Description
Time Range (2006-2025)	Articles published between 2006 and 2025.
Subject Area: Medicine	Research is limited to the subject area of Medicine to ensure relevance to the topic of health communication.
Document Type: Article	Only scholarly articles are selected as data to ensure the quality and validity of the information.
Initial Document Count	Before the search restrictions, a total of 357 documents were retrieved.
Documents After Restriction	After applying the inclusion criteria, the number of eligible documents decreased to 168.

2.3 Data Extraction

After applying the inclusion criteria, 168 documents relevant to the topics of health communication, health promotion, and the use of digital media in health contexts were successfully retrieved. All of these documents consist of scholarly articles published within the specified time range.

2.4 Analysis Process

The data obtained will be analyzed using bibliometric techniques to map research trends, identify gaps in the literature [14], and uncover future research directions in the field of health communication through digital media. The analysis process begins with mapping research trends, aiming to analyze the number of publications per year and observe the development of research on this topic [15]. Next, research gaps will be identified to assess areas that have been underexplored in previous studies, such as the disparity in digital access between developed and developing countries [16]. Collaboration analysis between authors and institutions will also be conducted to identify dominant collaboration patterns in this research. Additionally, analysis of themes and issues commonly discussed in selected articles will be carried out, focusing on how the use of digital media plays a role in health promotion. Through this method, the study aims to provide a clear picture of the current developments in the field of health communication and digital health promotion, as well as identify further research opportunities that need to be explored [17].

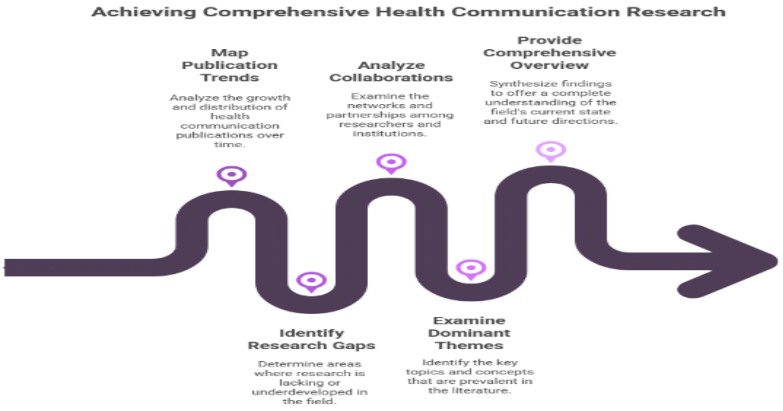

Figure 1. Research flowchart

3. RESEARCH FINDINGS AND DISCUSSION

In this section of the research findings, a comprehensive analysis will be presented regarding publication trends, collaboration among researchers, and dominant themes in the literature on health communication through digital media. This study aims to provide a clear picture of the developments and future directions in this field. By mapping publication trends, we can observe how the volume of research on this topic has evolved over time. Collaboration analysis will help identify the relationships between researchers and institutions that play a role in driving this research forward. Furthermore, exploring dominant themes will provide an understanding of the key topics that dominate the discussions in the existing literature. Finally, this study will also identify gaps in health communication research, directing focus to areas that are still underexplored or need further attention in the future.

3.1 Analysis of the Growth and Distribution of Health Communication Publications Over Time

The attached graph illustrates the trend in the number of publications on health communication and health promotion through digital media from 2006 to 2025 (see Figure 2). The data shows a significant increase in the number of publications, especially since 2021. In the early period (2006-2010), the number of publications was still very low, with only 1 to 2 articles published each year. Subsequently, during the 2011-2015 period, the number of publications slightly increased, reaching 3 to 4 articles per year.

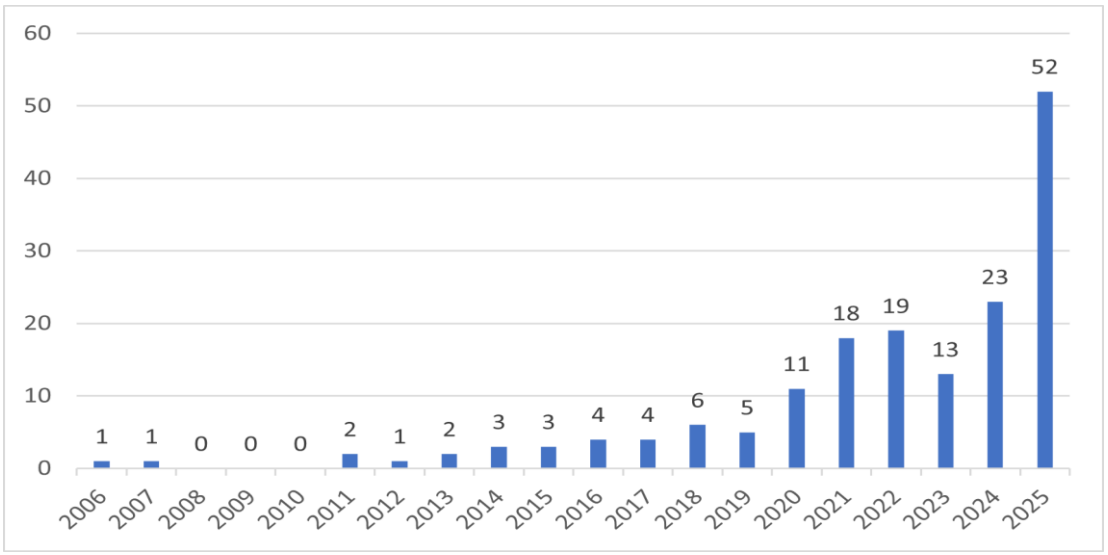

Figure 2. Report on document production related to the topic throughout the year

A more significant increase began to appear during the 2016-2020 period, with an average of 5 to 6 articles published annually. However, a substantial surge occurred in 2021, when the number of publications rose to 11 articles. This number continued to grow rapidly, reaching 18 articles in 2022, 19 articles in 2023, and 23 articles in 2024. The peak occurred in 2025, with 52 articles published, reflecting a greater focus on this topic as the role of digital media in health communication and promotion became increasingly important, particularly during the COVID-19 pandemic and the use of digital platforms for public health campaigns.

This trend indicates that research in the field of health communication through digital media is growing rapidly, in line with the fast-paced development of digital technology, which allows for faster and broader dissemination of health information to the public.

3.2 Identify areas where research is lacking or underdeveloped in the field

he graph in Figure 3 illustrates the mapping of key themes in health communication research, grouped based on two dimensions: relevance degree (centrality) and development degree (density). The relevance degree reflects the importance of the theme in research, while the development degree indicates how much these themes have evolved in the existing literature.

Themes in the top-right quadrant, such as "human," "article," and "humans," are classified as motor themes, meaning they are highly relevant and have developed rapidly. These themes are related to core topics in global health research, such as human behavior in the health context and the role of scholarly articles in disseminating health information.

On the other hand, themes like "betacoronavirus," "coronavirus infection," and "coronavirus infections" are located in the bottom-left quadrant, indicating high relevance at the beginning of the COVID-19 pandemic, but their development has slowed down as interest decreased after the peak of the pandemic.

Other themes, such as "public health," "coronavirus disease 2019," and "health care personnel," remain relevant but have not shown a significant surge in development in recent years. Themes like "female," "male," and "adult" demonstrate ongoing relevance, although with more limited development.

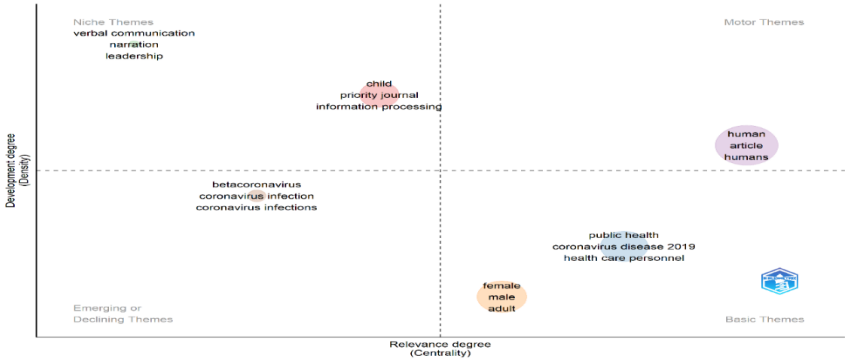

Figure 3. Research gap

This report identifies several research gaps, particularly regarding topics that have shown high relevance but have underdeveloped, such as:

a. *Beta Coronavirus and Coronavirus Infections: Although this theme remains relevant, the decline in development after the peak of the pandemic shows that further research, especially in the post-pandemic context, is still very much needed.*
b. *Role of Digital Media in Health Promotion: Many studies still lack exploration of the application of digital media in developing countries, which often face challenges in digital access and technology literacy. This opens up opportunities for research that considers local, social, and cultural factors.*
c. *Social Engagement in Health Promotion: Although there is research on verbal communication and leadership in the health context, this topic remains niche. Further research is needed to explore the impact of communication styles in health contexts across different social groups.*

Overall, this report highlights gaps that can serve as a focus for future research, particularly concerning the application of broader themes, including the context of developing countries and social factors influencing health promotion through digital media.

3.3 Researcher and Institution Networks and Partnerships

This report continues the analysis using VOSviewer to map the collaboration network of researchers in the field of health communication, as shown in Figure 4. In this analysis, a total of 962 entities were found; however, after applying the restriction criteria of a minimum of two documents per author and a minimum of eight citations per document, the results narrowed down to 17 meeting threshold points. This mapping provides an overview of more relevant collaborations among researchers that contribute to the development of this research. The emerging network illustrates the relationships between researchers who frequently collaborate, with several clusters indicating groups of researchers connected thematically. This analysis helps to better understand the dynamics of research in this field and the potential for increasing cooperation in digital health research.

The attached image shows a visual map of the results from this analysis, where larger nodes represent researchers with more publications and citations, while the connections between nodes reflect the collaborations between researchers. This mapping not only provides insight into influential researchers but also identifies thematic clusters that could serve as focal points for further research.

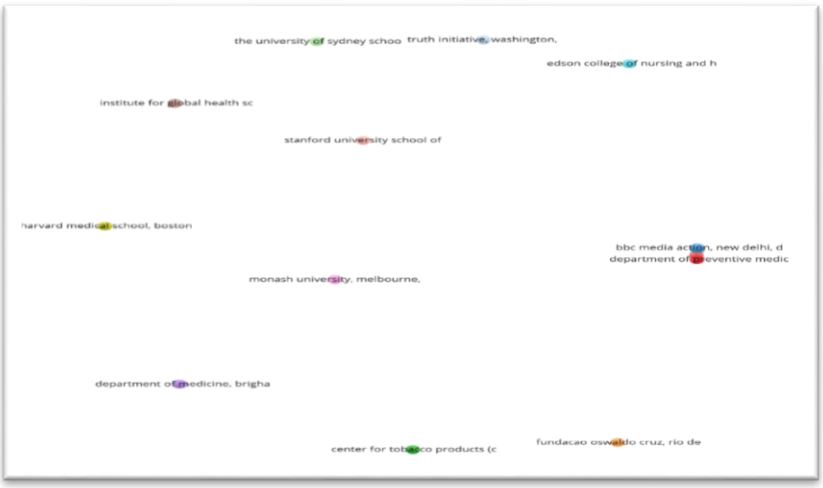

Figure 4. Collaboration Network Map Among Researchers

The results of the collaboration analysis among researchers in the field of health communication using VOSviewer, as shown in the bibliometric visualization in Figure 4, reveal various groups of researchers with different levels of collaboration. In the red cluster, researchers such as Viroj Tangchareonsathien, Jennifer B. Unger, Praveen Angyan, Katja Reuter, and Elsi M. Kaiser are involved in very close collaboration. This indicates that they are working together on core topics in health communication, such as the influence of digital media on health behavior and the relationship between technology and public health. This group reflects a productive collaboration that has significantly contributed to the development of the field.

In the green cluster, researchers like Laurel Erin Curry, Janine C. Delahanty, Mollie Ganz, and Shreya Tulsiani, although having more limited collaboration, are still connected in certain subtopics. They focus on specific areas of health communication, such as the impact of digital media on health behavior in different social groups. While their collaboration is not as intensive as the first group, their contributions remain relevant in advancing research in this field.

The blue cluster shows researchers like Sara Chamberlain and Amnesty Elizabeth Lefevre, who have limited collaboration with other researchers. Their more isolated collaboration may reflect that their research is more independent or still in the early stages of development, with a more specific topic that has not yet involved many other researchers.

The yellow cluster, which includes researchers Shreya Tulsiani, Donna M. Vallone, and Elizabeth C. Hair, shows smaller but important connections in specific subtopics. Their collaboration reflects a focus on more specific areas of health communication, though their connection with other research groups is still limited. This may indicate that the topics they are studying are still in the development stage or have not yet engaged in broader collaborations.

Researcher Viroj Tangchareonsathien appears as an isolated individual on this map, with few connections to other researchers. This suggests that, although their contributions are significant, this researcher focuses more on independent research and has not yet formed widespread collaborations in similar topics.

Overall, this collaboration map illustrates how researchers in health communication collaborate in different groups, with some researchers working within larger networks while others focus on narrower subtopics. Identified research gaps include limited collaboration in developing countries, the application of digital media in specific subtopics, and research on social engagement and leadership in health promotion. These gaps present opportunities for further development and expanding collaboration in less connected areas, which can fill gaps in the existing literature and drive progress in health communication research.

Figure 5. Organization Collaboration Network

This report continues the analysis of organization collaboration in the field of health communication using VOSviewer, focusing on mapping the relationships between various institutions involved in this research (see Figure 5). Based on bibliometric analysis, a

total of 628 organizations were found to be involved in relevant publications. However, after applying the restriction criteria of a minimum of two documents per organization and a minimum of seven citations per document, the results narrowed down to 18 meeting threshold points that met these criteria.

The attached map shows the collaboration network among organizations, displaying various institutions collaborating in health communication research. In this map, major organizations such as Harvard Medical School, Stanford University School of Medicine, and Monash University are seen to have strong collaborative ties. This indicates that these organizations play a significant role in advancing research in the field of health communication, with many publications produced and numerous citations received.

Additionally, organizations such as BBC Media Action, Fundacao Oswaldo Cruz, and the Center for Tobacco Products also show significant collaboration, although they may be more focused on specific subtopics within health communication research. This map helps identify closely collaborating groups of organizations and provides insights into the existing collaborative networks between these institutions.

Overall, this analysis shows that, although many organizations contribute to health communication research, more intensive collaboration between major organizations could strengthen the impact of this research. This mapping also offers a view of potential opportunities to expand collaboration networks, especially in more specific areas of health communication.

3.4 Identification of Key Topics and Concepts Commonly Found in the Literature

The next part of the report presents the results of further bibliometric analysis focusing on the emergence and development of terms in health communication research through digital media. The analyzed data shows the frequency distribution of term occurrences and their publication time spans, represented through the initial quartile (Q1), median, and final quartile (Q3). This approach allows for tracking the temporal dynamics of a theme, from its early emergence to the period when the theme reaches its peak intensity of use in the literature.

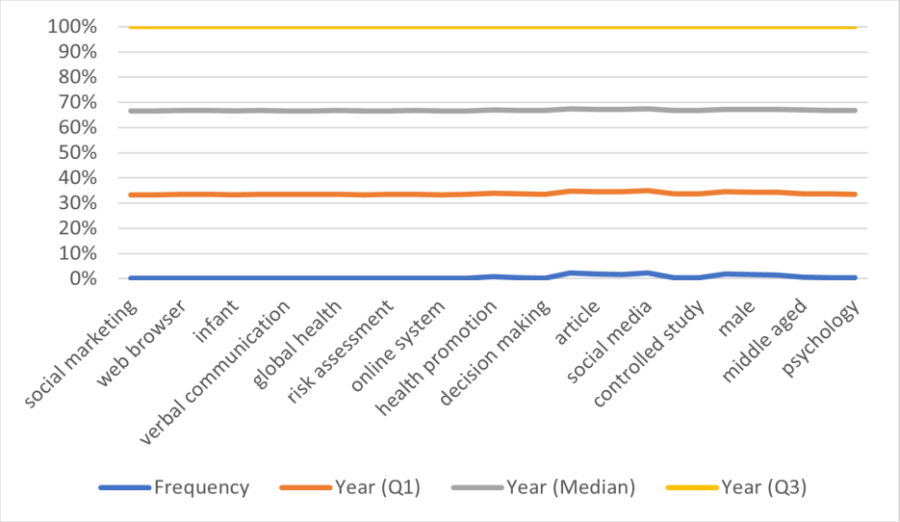

Figure 6. Topic Trends

The results of the analysis in Figure 6 show that a number of key terms in health communication research through digital media began to emerge in the early 2010s and developed gradually. Terms such as "social marketing" and "web browser" appeared earlier with relatively limited frequency, reflecting the early phase of digital media utilization, which still functioned as a supportive tool in health communication. In contrast, terms like "priority journal" and "demography" showed higher frequency occurrences over a longer temporal span, marked by median and final quartile values that fall into more recent periods. This pattern indicates increasing researcher attention to the quality of scientific dissemination and the use of population-based approaches.

The distribution of median values and the third quartile, which mostly fall within the 2016–2020 period, suggests a phase of research consolidation. During this period, digital health communication topics began to mature conceptually and became part of the mainstream literature. The research focus shifted from early exploration of digital media to strengthening more strategic approaches, based on demographic data and oriented toward communication effectiveness and the quality of scientific publications.

In terms of frequency, the occurrence of terms is generally at a relatively low and stable level, indicating the absence of dominance by a single theme across the entire literature corpus. This suggests diversity in the focus of studies within the field of digital health communication. However, some terms like "article," "social media," "male," and "controlled study" show slightly higher frequencies, indicating their role as common methodological frameworks and analytical contexts in research.

Overall, the temporal pattern and distribution of terms indicate that the development of digital health communication research has been gradual and sustained, without thematic spikes that are transient. Terms related to technology evolve alongside terms representing methodological approaches and population characteristics, emphasizing that this field is not only focused on communication mediums but also integrates methodological and demographic dimensions simultaneously. Thus, these findings provide an overview that the future direction of research is likely to be multidimensional, linking aspects of technology, behavior, and population in an interconnected analytical framework, opening space for the development of further, more contextual and applied themes.

Figure 7. Word Cloud

As shown in the word cloud visualization in Figure 7, research on health communication through digital media is dominated by several key terms representing the main thematic focuses in the literature. The term social media appears as the most prominent word, emphasizing the central role of social media as the primary medium for delivering information, education, and health promotion. The dominance of this term indicates that social media has become a strategic space for shaping public health perceptions, attitudes, and behaviors in the digital age.

In addition, terms such as human, humans, male, female, and adult also appear prominently, indicating the strong research focus on human subjects with an emphasis on demographic characteristics. The presence of these terms reflects researchers' attention to variations in response based on gender and age groups in the context of health communication. This shows that a demographic approach is an important aspect of understanding the effectiveness of health messages delivered through digital media.

Other terms such as health education, health promotion, and public health occupy a fairly dominant position, showing that the primary focus of research remains on educational and promotional efforts in public health. The emergence of terms like interpersonal communication, questionnaire, and controlled study suggests that research in this field is not only descriptive but also employs systematic methodological approaches to measure the impact of health communication on knowledge, attitudes, and behaviors of individuals.

The context of the pandemic is also reflected through the emergence of terms like coronavirus disease 2019, COVID-19, and vaccination, signaling that global health issues have become a key catalyst in the development of digital health communication research. The appearance of terms such as misinformation, health literacy, and internet further emphasizes researchers' attention to the challenges of health information dissemination in the digital space, particularly concerning health literacy and the spread of inaccurate information.

Overall, this visualization shows that digital health communication research is developing across a broad but interconnected spectrum of themes, with a focus on social media, human characteristics as research subjects, educational and promotional approaches, and responses to global health issues. These findings affirm the multidisciplinary and multidimensional nature of the field of digital health communication, while also demonstrating that research is increasingly integrated between technology, human behavior, and public health interests.

DISCUSSION

The bibliometric analysis shows that research in health communication and health promotion through digital media has undergone significant and consistent development over the past two decades. The surge in publication numbers since 2021 marks a strong acceleration in research, driven by the growing need for fast, widespread, and adaptive health communication, particularly in the context of the global pandemic. Digital media, especially social media, has emerged as the dominant medium representing the shift in the health communication paradigm from a one-way approach to an interactive and participatory model [18]. This condition confirms that digital media is no longer a supplementary tool but has become a core infrastructure in modern health promotion strategies [19].

As seen in other studies with similar contexts, bibliometric methods have been employed to map trends and progress in the field. Wang et al., in their study of advancements in Natural Language Processing in the medical field, found that the number of publications in this area had increased significantly since 2012, with an annual growth rate nearing 300 articles [20]. Furthermore, analysis by Yang et al. on digital health literacy shows that research in this area has grown alongside the increasing use of the internet and social media [21]. This aligns with the estimate that more readers and researchers are now interested in exploring how digital literacy affects public understanding of health.

Research findings indicate that the primary focus of current research is concentrated on fundamental and cross-context issues such as social media, health education, health promotion, and public health, all of which are linked to humans as the main subject of analysis. The dominance of terms reflecting demographic characteristics, such as gender and age groups, indicates that the effectiveness of health communication is increasingly understood as a contextual

process dependent on social, psychological, and demographic factors. This reflects a shift toward research approaches that are more sensitive to differences in the reception of health messages in the digital space.

Several studies also emphasize the importance of tailoring messages based on demographic characteristics. For instance, Hunt and Linos (2022) highlight the need for messages tailored to specific population groups, such as age and gender, to build trust and ensure cultural relevance [22]. Similarly, a study by Ghare et al. (2023) emphasizes the use of social media and mass marketing to improve vaccine acceptance, with an approach tailored to the specific needs and concerns of each target group [23].

This discussion reveals imbalances in the development of health communication research topics. Some themes that were highly relevant, such as coronavirus infections, have seen a decline in development after the peak of the pandemic, while fundamental topics like public health and health personnel remain stable but have not seen significant conceptual innovation.

This suggests that much of the research is still responsive to global health crises and has not yet fully transitioned to the development of more sustainable theoretical frameworks and communication strategies, especially in the post-pandemic context and future health preparedness.

One major challenge emerging alongside the growth of digital communication is the phenomenon of misinformation, which has become more relevant with the increased use of social media. Findings by Mejova and Kalimeri (2020) in their study noted that during the COVID-19 pandemic, the infodemic phenomenon demonstrated how inaccurate information on social media could disrupt public understanding of health [24]. Therefore, it is important for public health practitioners to develop messages that are not only informative but also counteract myths and misunderstandings that spread among the public.

Moreover, health communication strategies must adapt to rapid changes in the digital space. A study by Al-Dmour et al. (2022) shows that mass media plays a significant role in increasing health knowledge and changing behavior, but it must be tailored to the diverse characteristics of different communities [25]. Other studies, such as those by Alragheb et al. (2025) and Alghamdi et al. (2024), reveal that responses to health messages vary depending on demographic factors like age and gender [26,27]. This emphasizes that health communication must be adapted to more detailed audience segmentation to improve its effectiveness in reaching and influencing different target groups.

Research collaboration networks between researchers and organizations indicate that knowledge production in this field is still dominated by institutions and researchers from developed countries, with relatively fragmented collaboration patterns. Although there are some strong collaboration clusters, many researchers and institutions still work relatively in isolation, especially on specific subtopics. This limitation in cross-regional networking points to structural gaps in knowledge production, where perspectives from developing countries and local contexts have not been optimally integrated into the mainstream global research.

Furthermore, the emergence of terms such as misinformation, health literacy, and decision making emphasizes that the main challenges in digital health communication lie not only in technology access but also in the quality of understanding, health literacy, and people's ability to process complex information [28]. This strengthens the argument that the effectiveness of health promotion in the digital age heavily depends on the integration of technology, educational approaches, and communication strategies that consider socio-cultural dynamics and information vulnerability [18].

Based on these findings, the future direction of digital health communication research needs to move toward more inclusive, collaborative, and contextual approaches. Future research should not only focus on evaluating the effectiveness of specific digital platforms but also on developing adaptive health communication models that account for social, cultural, and digital literacy differences. Additionally, strengthening cross-country and cross-disciplinary collaboration will be crucial to ensuring that digital health communication innovations can reach and remain relevant to broader populations, particularly in regions with limited digital infrastructure.

Overall, this discussion affirms that the field of digital health communication and promotion has entered an early phase of maturation, but still holds ample room for conceptual and empirical development. By integrating technology, human behavior, and social context dimensions simultaneously, future research has great potential to contribute significantly to the strengthening of more responsive, equitable, and sustainable public health systems. Thus, to build a better understanding, authorities must collaborate with various sectors to ensure that health information is delivered in ways that meet community needs. As emphasized by Ojeda et al. (2025), community engagement is crucial in building trust and enhancing the effectiveness of health messages [29, 30].

CONCLUSION

This bibliometric analysis of health communication and promotion through digital media highlights the significant growth of research in this field, especially since 2021. The increasing prevalence of digital platforms such as social media has transformed the paradigm of health communication, shifting from traditional, one-way dissemination to interactive, participatory models. Key research themes emerging from the analysis include mental health, the impact of social media, and the effects of the COVID-19 pandemic on health behavior. Despite substantial progress, gaps remain, particularly in the application of digital health strategies in developing countries and the adaptation of health messages to various socio-cultural contexts. The study also identifies areas underexplored in the literature, such as the role of gender-specific health concerns and regional health disparities. Furthermore, the research emphasizes the need for future studies to consider demographic factors in the effectiveness of health communication. The analysis also reveals that collaboration among researchers, especially across institutions and regions, plays a crucial role in advancing the field. Therefore, fostering cross-disciplinary and cross-national collaborations will be essential for bridging the gaps and enhancing the impact of digital health communication. This

study provides a comprehensive overview of the evolving landscape of health communication in the digital age and suggests multiple avenues for future research, particularly in ensuring inclusivity, adaptability, and equity in health communication strategies globally.

DECLARATIONS

Competing Interests

The no competing interests .

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