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The Impact of the Digital Revolution on Health Research: A Bibliometric Review

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ABSTRACT

The digital revolution has had a significant impact on health research. The digital revolution in health refers to the fundamental transformation in the utilization of digital technology to improve aspects of health and medical services. This study aims to evaluate the impact of digital revolution changes on health research with a focus on bibliometric analysis. Another objective was to identify research trends, collaboration patterns, and changes in research methodologies associated with digital technology. The research method involved a bibliometric analysis of the number of health publications related to digital terms such as big data, machine learning, and telemedicine over a period of time. Bibliometric data, such as the number of publications, collaboration between researchers, research topics, and method development, were analyzed quantitatively. The results showed a significant increase in digital health-related publications, as well as cross-disciplinary collaboration and the use of technologies such as big data, machine learning, and image analysis have become dominant trends in research methodologies. The study concluded that the digital revolution has changed the landscape of health research, broadened the scope of research, and accelerated innovations in diagnosis, treatment, and health management. Thus, understanding the impact of this digital revolution is important for health researchers and stakeholders in health policy development. This bibliometric study provides valuable insights into the evolution and implications of the impact of the digital revolution in health research, providing a foundation for further development in this domain.

Keywords: *Bibliometric Review, Digital Revolution, Health*

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INTRODUCTION

The digital revolution has changed almost every aspect of life, including the world of healthcare (Jabali et al., 2022). With the advent of advanced technology, new concepts and innovations have swept through the healthcare industry, changing the way health is diagnosed, treated and managed (Tran et al., 2019). In this era of digital revolution, medical information can be easily accessed, patient data can be securely stored, and emerging health technologies are continuously improving disease prognosis and aiding more effective health monitoring (Yeung et al., 2022). In this regard, the digital revolution is not only having an impact on healthcare, but also bringing significant changes in the approach to disease, health management, and patient experience (Ivanov et al., 2019). In fact, the digital revolution has supported a paradigm shift, allowing stakeholders in the healthcare sector to implement more efficient solutions (Dastane & Haba, 2023), affordable, and responsive to patient needs.

The digital revolution has changed the landscape of health research. Developments in information and communication technology have enabled researchers to access information and resources quickly and efficiently (Kaplan, 2020). In addition, the digitization of medical data and the ability to analyze data on a larger scale has opened up new opportunities in health research. A bibliometric review can help understand how this digital revolution has influenced research trends, collaboration between researchers, and the overall development of health science (Bran et al., 2021). In this context, a bibliometric review of the impact of the digital revolution on health research becomes increasingly relevant (Vaquero-Álvarez et al., 2020). Through bibliometric analysis, it is possible to see how scientific publications on health research have evolved in the era of the digital revolution, including changes in the types of publications, collaborations between researchers, and research topics that increasingly dominate (Sott et al., 2021). As such, a bibliometric review can provide a deeper understanding of how technological change has affected the way health research is conducted (Epizitone et al., 2022). A bibliometric review can also help identify trends in health research that could be a key focus for researchers in the future (Sriwannawit & Sandström, 2015). By understanding emerging research trends, researchers can direct their efforts to address the most pressing health challenges. Furthermore, by understanding how the digital revolution has affected the health research landscape, we can design more appropriate policies and strategies to support the development of health research in the future.

The digital revolution has a very important role to play in the world of health (Shabrina, 2019). First, digital technology allows healthcare to be more accessible, especially for those who live in remote areas or do not have access to conventional healthcare facilities. Telemedicine and health apps make remote consultations and monitoring of health conditions more affordable (Bokolo Anthony Jnr., 2020). Both digitally collected and analyzed health data enable better personalization of care. With data analytics and artificial intelligence tools, diagnosis can be faster and more

accurate, enabling more timely and efficient treatment (Esteva et al., 2019). The three digital revolutions have opened the door for innovation in drug and therapy development. With big data analysis, drug research can be streamlined, accelerating the process of new drug discovery (Boshuizen et al., 1995). Fourth, accurate and reliable health information can be accessed more easily through digital platforms. This helps people understand their health conditions, promote healthy lifestyles, and obtain reliable sources of medical information. Fifth, digital technology enables more efficient and secure health data management. This data, if properly managed, can provide valuable insights for research, decision-making, and overall health system improvement. As such, the digital revolution in health is not only changing the way we care for ourselves or our patients, but it is also affecting the way health systems operate, providing great potential to improve quality of life and health outcomes for society as a whole.

Within the digital revolution, there are some specific aspects to note in a bibliometric review of its impact on health research (Phoobane, 2023). First, it is important to identify how medical data digitization has impacted health research. Digitization of medical data has allowed researchers to access and analyze patient data on a larger scale, which can help in the discovery of new patterns in various health conditions. Bibliometric analysis can help understand the extent to which medical data digitization has influenced scientific publication trends in health research. In addition, collaboration between researchers is also an important aspect of the digital revolution. Information and communication technologies have enabled researchers to work together more efficiently, both on a local and global scale. A bibliometric review can help us identify patterns of collaboration between researchers in health research, including the extent to which the digital revolution has expanded collaboration networks between researchers.

Changes in the types of scientific publications are also one of the impacts of the digital revolution that need to be considered in bibliometric reviews. Technology has changed the way scientific publications are produced, distributed and consumed. From publications in printed journals to electronic publications, the digital revolution has expanded accessibility to scientific information (McCoy & Auret, 2019). Bibliometric analysis can help us understand how these changes have affected the distribution of health research in scientific publications (Ghobakhloo et al., 2021). As such, a bibliometric review of the impact of the digital revolution on health research has the potential to provide valuable insights that can help understand how technology has changed the health research landscape (Sutherland, 2020). Through bibliometric analysis, it is possible to identify trends, collaboration patterns and changes in scientific publications that reflect the role of the digital revolution in the development of health science. With a deeper understanding of the impact of the digital revolution, we can better prepare for the challenges and opportunities in health research in the future.

Not only that, but the digital revolution has also triggered the emergence of health apps, wearable devices, and telemedicine solutions that provide easy access to healthcare anywhere and anytime. Patients can monitor their own health conditions in real-time and actively participate in their health management. However, while offering great potential, this revolution also brings challenges, such as concerns over data privacy, health information security standards, accessibility of technology to all walks of life, and paradigm shifts in clinical practice that require rapid adaptation from healthcare professionals. With this ongoing transformation, it is important to delve deeper into the impact it has on healthcare, patient quality of life, healthcare costs, and how healthcare professionals can optimize the application of these technologies to provide better and equitable care for all. Therefore, in-depth research and a holistic review of the digital revolution in healthcare is crucial (Petrillo et al., 2018). Some of the key objectives include firstly better access. Providing easier and faster access to health services for the wider community, especially in remote or hard-to-reach areas. Second, increased efficiency. Optimizing administrative processes, medical data management, and workflows in hospitals or clinics to save time and money. Third, better data management. Enables more effective and secure collection, storage, and exchange of patient data, so that health information can be accessed more quickly and accurately by service providers. Fourth, improved diagnostics and treatment. Utilizing technologies such as artificial intelligence (AI) and data analytics to support more precise diagnoses and more personalized care according to individual conditions and needs. Fifth, telemedicine (Batsis et al., 2019). Providing remote health services (online doctor consultation, remote monitoring, etc.) that allow patients to receive treatment without having to visit a medical facility in person. Lastly, health technology innovation and development. Encourage the development and adoption of new technologies, such as wearable sensors (e.g. smartwatches), health apps, etc (Adunlin et al., 2015), or advanced medical devices, which can improve health monitoring and management.

There are several research opinions on the digital revolution in healthcare. The first research according to Fachrurazi et al., (2023), with the research title Business Revolution in the Digital Age: Strategies and Impacts of Technology Process Transformation on Competitive Advantage and Organizational Growth. The results of his research state that startups navigating the digital landscape gain an edge in competitive markets, offering actionable insights for practitioners, policymakers, and academics interested in driving innovation and sustainable growth. The second research according to Situmorang et al., (2023), with the research title Bibliometric Analysis of Research Trends in the Field of Agricultural and Fisheries Business Conflict Resolution in Realizing Sustainable Development in the Disruptive Era. The results of his research state that the number of publications has increased fluctuatively and most were published in 2017. The results of the Vos Viewer visualization show that the development map of agricultural and fisheries conflict resolution research is divided into 17 clusters consisting of 171 keywords, 67 of which are related to the

field of agricultural and fisheries conflict resolution in the context of sustainable development. The third research according to Samsara, (2022), with the research title Collaborative governance publication trends a bibliometric analysis. The results of his research state that collaborative governance is widely practiced globally. Various stakeholders need to collaborate to solve existing challenges. 2021 is the most productive year with 700 publications.

The research conducted by the previous researcher is different from the research that the researcher conducted. Meanwhile, the research that the researchers conducted was entitled The Impact of the Digital Revolution on Health Research: A Bibliometric Review. The results of this research indicate that there is a significant increase in publications related to digital health, as well as cross-disciplinary collaboration and the use of technologies such as big data, machine learning, and image analysis have become dominant trends in research methodology.

RESEARCH METHODOLOGY

This research method on the impact of the digital revolution on health research, which uses bibliometric review, requires systematic and structured steps. A bibliometric review is an evaluation method that utilizes quantitative analysis of information contained in scientific publications or specific sources (Bambang Niko Pasla et al., 2022). This approach focuses on the quantification of publications, citation patterns, prolific authors, trends in research topics, and other aspects of the scientific literature (Zupic & Čater, 2015). The aim is to provide an in-depth understanding of the evolution of research in a particular field or topic, highlighting trends, influences and developments in the scientific literature. Bibliometric analysis is often used to compile a summary or review of the state of knowledge in a discipline or research topic.

The following is a description of the research methods that can be conducted for this bibliometric review (Luo et al., 2022). First, bibliographic data collection will be the initial stage in this research. This step involves using health literature databases, such as PubMed, Web of Science, or Scopus, to identify health-related scientific publications published within a certain period of time that are relevant to the theme of digital revolution in health (Radanliev & De Roure, 2023). Selection of representative keywords, such as "digital health", "telemedicine", "big data", "machine learning", and "health informatics", will help in identifying relevant publications. Second, after data collection, a bibliometric analysis will be conducted to evaluate the impact of the digital revolution on health research. This analysis involves using specialized software to extract bibliometric information, such as the number of publications per year, country of publication, the most prolific institutions or journals in publishing articles related to the digital revolution in health, as well as mapping the most used keywords in the titles and abstracts of the articles. In addition, citation analysis can also be conducted to determine the extent to which publications on the digital revolution in health have been cited in other scientific literature, which can show their impact on

the development of health research.

Third, bibliometric network analysis can enable researchers to build visual models that show the relationships between keywords, authors, institutions, and research topics within the framework of the digital revolution in health. This can provide deep insights into collaboration networks between researchers, emerging research trends, and the direction of development of health research related to the digital revolution. Furthermore, in applying this research method, it is important to consider the quality of the data used. This includes ensuring the validity and accuracy of the information obtained from the literature databases used. In addition, the bibliometric analysis software chosen should be able to provide reliable results that are relevant to the research objectives. In addition, awareness of the limitations of bibliometric methods is also important. These methods tend to ignore the specific context of each article, such as the research methodology or substantial findings, which may provide deeper insights into the impact of the digital revolution in health research. Therefore, interpretation of data from these bibliometric reviews should be done with caution and always accompanied by a strong understanding of the broader context of health research.

In this study, the researcher also needs to consider the scope limitation in terms of time, place, and subject in data collection and analysis. This will help in designing the right strategy for data collection and bibliometric analysis so that the results can be representative and relevant to the research objectives. Finally, the ethical aspects of using bibliometric data also need to be considered (Drachsler et al., 2015). Researchers must ensure that the use of data complies with publisher and copyright policies, and treat the information obtained with care and integrity. By using structured research methods and paying attention to various important aspects, a bibliometric review of the impact of the digital revolution on health research can provide valuable insights into the development and direction of research in the context of digital health.

RESULT AND DISCUSSION

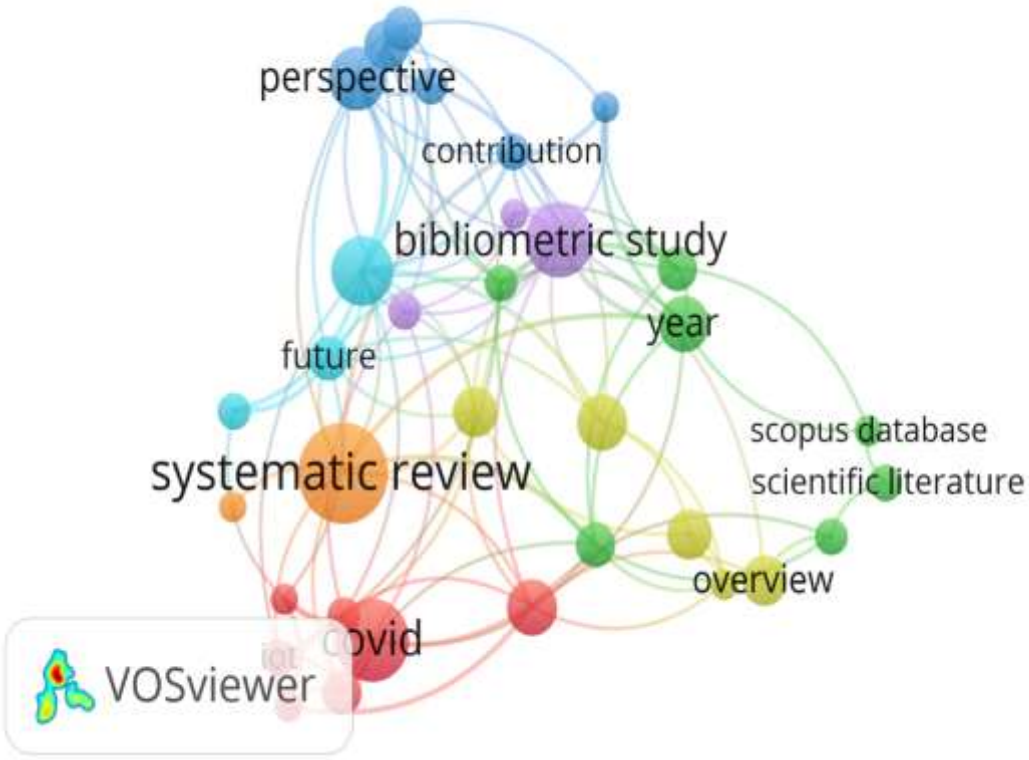
The digital revolution in healthcare has led to rapid and far-reaching transformations in the field. In order to understand its impact and recent developments, bibliometric reviews are important and relevant. Here are some reasons why bibliometric reviews are indispensable in the context of the digital revolution in healthcare. First, it identifies trends and developments. Bibliometric analysis enables the identification of key trends in health research affected by the digital revolution. These can include trends in the use of health technologies such as artificial intelligence, big data, or telemedicine, as well as shifts in research focus caused by new technologies. Secondly, evaluate the impact of publications. Through bibliometric reviews, we can evaluate the impact of scientific publications related to the digital revolution in health. This includes measuring the number of citations, citations by other researchers, and dissemination of information from research conducted in this field. Third, mapping researcher collaborations and networks. Bibliometric analysis enables the identification of

collaboration networks between researchers in the digital revolution in health. This helps in understanding the dynamics of inter-field cooperation and promoting more effective collaboration in the future.

Furthermore, the fourth one recognizes challenges and opportunities. By looking at existing publications and research, a bibliometric review can assist in identifying key challenges faced by the healthcare community in adopting digital technologies as well as potential opportunities for further research and development. Fifth, directing future research plans Bibliometric analysis provides a clear view of the areas where further research is urgently needed. This helps researchers and stakeholders plan and direct the focus of future research in line with recent developments. Sixth, it highlights methodological developments. The digital revolution has also brought about changes in the research methods used in healthcare. A bibliometric review can identify the development of new emerging methods and the extent to which these methods have been applied in health research. Thus, bibliometric reviews play a key role in providing an in-depth understanding of the evolution, impact, and direction taken by the digital revolution in healthcare, helping to direct the next steps in research and development in this area.

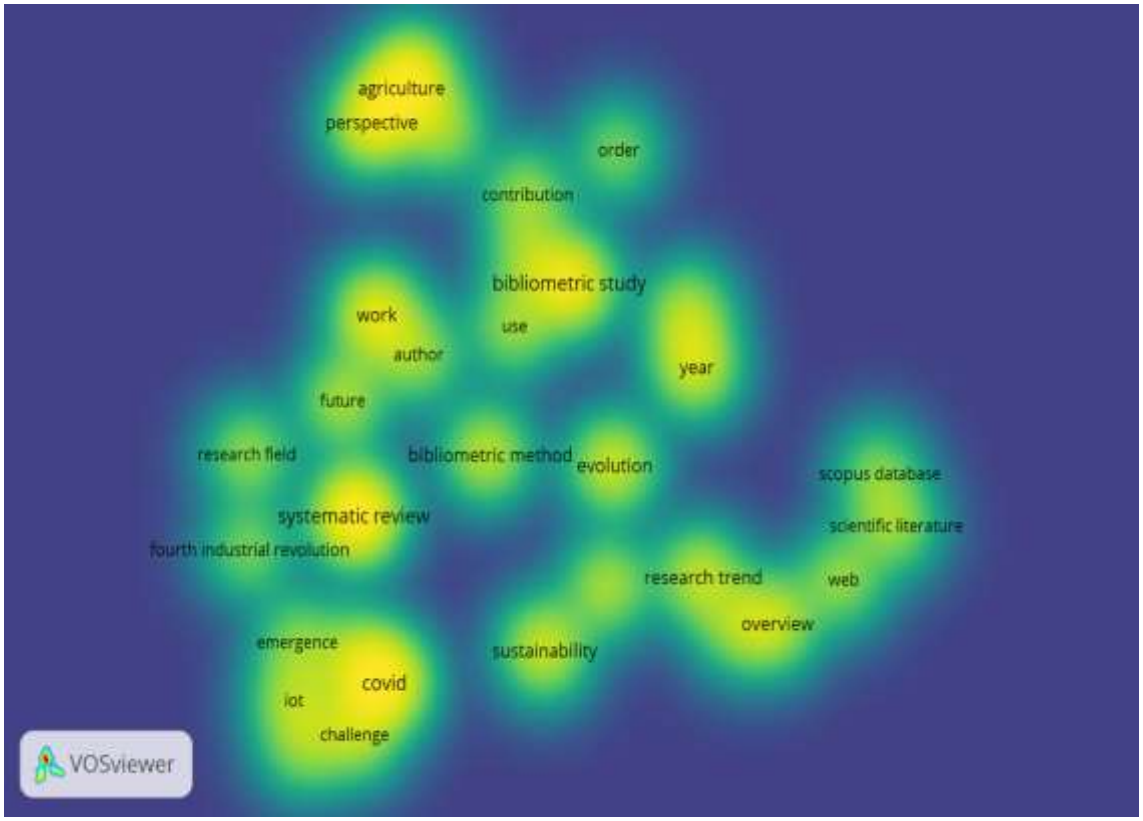
Some of the key aspects of the digital revolution in healthcare are firstly diagnostic and treatment technologies. Encouraging remote consultations and patient care via telephone, video calls, or online platforms, enables wider access to healthcare, especially in hard-to-reach areas. The use of wearable devices and sensors connected to health apps enables real-time monitoring of individual health conditions, such as heart rate, activity levels, or blood glucose levels. Second, Health Information Management Systems. Electronic Health Records (EHR): The use of EHRs allows the storage of patient data in a digital format that facilitates easier access and sharing of information among different healthcare services. Data Analytics and Artificial Intelligence: Utilizing big data in EHRs for predictive analytics and artificial intelligence (AI) to support diagnosis, treatment planning, and the development of more personalized therapies. Third, drug development and health research. Use of computer and simulation technology in drug development, accelerating clinical research and reducing costs and risks. Rapid and inexpensive genomic analysis has opened the door to the development of therapies tailored to individual genetics. Fourth, education and training. The use of technology in medical education for simulation, distance teaching, and access to a wider range of educational resources. Fifth, health system management and planning. The use of technology to manage inventory, schedules, and other administrative processes in the health system, increasing efficiency and reducing operational costs. The development of these technologies also brings challenges such as patient data privacy, health information security, equal access to technology, and increasing health disparities. The digital revolution in healthcare promises great advances in delivering better care, reducing costs, and enabling wider access to healthcare. However, its implementation also requires strict regulations, strong data protection, and a sustainable approach to improve the effectiveness and acceptance of these technologies in the health system.

Figure 1: Network Visualization



In Figure 1 above is a network visualization image of the data obtained by Google Scholar. The data obtained is then analyzed. The data were taken from reputable and relevant journals. The amount of journal data studied was 200 papers with the keywords digital revolution, health, bibliometric review. Researchers took journals published in the latest year, 2018-2022. Network visualization can describe the main elements in the digital revolution in the health sector, such as iot, covid, systematic review, overview, bibliometric study, scopus database, science literature. The use of network visualization can help in analyzing the relationship between scientific publications in the domain of digital revolution and health. Through this technique, it is possible to understand how technological developments in the digital revolution specifically affect advances in health, as well as their impact in the context of scientific research.

Figure 2: Density Visualization



The image above is a density visualization image with the keywords digital revolution, health, bibliometric review. Density visualization technique is a useful visualization method to illustrate the density or distribution of a particular entity or phenomenon. Density visualization can be used to map where digital technology is especially influential in the health sector. This technique can help map where health technology innovation or development occurs most densely, helping in understanding the spread and adoption of innovation in this sector. The figure shows that digital technology revolutions are most dense in emergence, iot, challenge, and covid.

The benefit of the digital revolution in healthcare lies in the accessibility of care. Telemedicine and digital health platforms allow patients to access healthcare remotely, reducing geographical barriers and increasing accessibility for hard-to-reach populations. Then there is the Electronic Health Record (EHR). The use of EHRs enables digital storage of patient data, facilitates information exchange among healthcare providers and enables more informed decision-making. Connected health monitoring is next. Wearable devices and connected sensors collect real-time health data of individuals, allowing continuous monitoring of health conditions. Easy data analysis and AI. The use of big data and artificial intelligence helps in analyzing large and complex information to predict diseases, plan more efficient treatments, and identify health patterns. Technology facilitates faster clinical research, the development of more personalized therapies, and the use of genetic technologies to understand and treat diseases. The digital revolution is also impacting medical education, introducing innovative learning methods and enabling access to a wider range of educational resources. The digital revolution in healthcare is not just about the use

of technology, but also changing the way we understand, diagnose and manage health as a whole.

The digital revolution has had a huge impact in the world of healthcare, bringing many benefits but also posing a number of challenges that need to be addressed. One of the challenges faced in the digital health revolution is the protection of health data. With more and more health data being stored and digitally exchanged, it is important to ensure the security and privacy of such data. Health data leakage can have serious consequences, including the misuse of personal information, identity, and even patient safety. To address this challenge, strict data security measures must be implemented, such as strong encryption, strict access authorization, and the implementation of sophisticated intrusion detection systems. In addition, one of the other challenges is the access gap. Although the digital revolution has brought advancements in access to healthcare, there are still many people around the world who do not have adequate access to health technology. This can be due to infrastructure limitations, lack of technological expertise, or economic limitations. To address this challenge, efforts are needed to increase the accessibility of health technology, both through public education on the benefits of health technology and through investment in health technology infrastructure in marginalized areas

Another challenge is the issue of regulation and compliance. The digital revolution has created various innovations in healthcare, including health apps, digital medical devices, and technologies that support clinical practice. However, the challenge in this regard is to ensure that these innovations comply with regulations and applicable health standards. This involves coordination between regulatory authorities, technology developers and healthcare providers to ensure that innovations are safe, effective and compliant. In addition, rising costs are also one of the main challenges in the digital health revolution. While health technology can bring efficiencies in diagnosis and treatment, the cost of developing, implementing, and maintaining such technology can also be an additional burden to the health system. To overcome this challenge, there is a need for innovative strategies to manage the cost of health technology implementation, such as partnerships between the public and private sectors, financial support from the authorities, and the development of the digital health revolution sustainable business models for health technology. The last challenge is the acceptance and adoption of health technology. While the digital revolution has brought many promising innovations, there are still many challenges when it comes to the adoption of health technology by healthcare workers and the general public. Some of the factors affecting the adoption of health technology include concerns over data security, lack of technical training, and resistance to change in established health practices. Overcoming these challenges requires a holistic approach that includes education, training, technical support, and active involvement of health workers and communities in the development and implementation of health technologies.

By recognizing the challenges faced in the digital health revolution, concrete steps can be taken to overcome these challenges. First, it is important to implement strict data security policies and ensure compliance with applicable regulations. This involves investment in advanced security technologies and training for healthcare professionals to understand the implications of data security in clinical practice. Secondly, the accessibility of health technology needs to be improved through investment in technology infrastructure in remote areas, public education on the benefits of technology health, and subsidy programs for the underprivileged. This can help reduce the access gap and ensure that the benefits of the digital health revolution can be enjoyed by everyone, regardless of their economic background. Third, it is important to pay attention to compliance with health regulations and standards in developing and implementing health technologies. This requires collaboration between regulatory authorities, technology developers, and healthcare providers to ensure that innovations in health technology meet established safety, effectiveness, and quality requirements. Fourth, there is a need for innovative strategies to manage the cost of health technology implementation, such as partnerships between the public and private sectors, financial support from authorities, and the development of sustainable business models for health technology. This can help lower the cost burden of adopting health technologies and ensure that they are accessible to more people. Finally, to increase the adoption of health technologies, there is a need for education, training, technical support, and active involvement of health workers and communities in the development and implementation of health technologies. This can help overcome apprehension, lack of knowledge, and resistance to change in established health practices, so that health technologies can be used effectively in improving the quality of health care.

CONCLUSION

Based on the results and discussion above, it can be concluded that the digital revolution has changed the landscape of health research, broadened the scope of research, and accelerated innovations in diagnosis, treatment, and health management. Thus, understanding the impact of this digital revolution is important for health researchers and stakeholders in health policy development. This bibliometric study provides valuable insights into the evolution and implications of the impact of the digital revolution in health research, providing a foundation for further development in this domain. The digital revolution has had a profound impact in the world of health, bringing great benefits but also posing a number of challenges that need to be addressed. Through concerted efforts between technologists, regulators, healthcare providers, and the public, we can overcome these challenges and ensure that the digital health revolution can bring maximum benefits to the overall health of society.

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