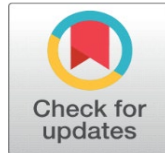
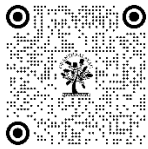


# A BIBLIOMETRIC STUDY ON MHEALTH AND ARTIFICIAL INTELLIGENCE

Priyadarsini P.G.<sup>1</sup>✉, Dr. K. Poorna<sup>2</sup>✉

<sup>1</sup> Research Scholar, PSG College of Arts and Science, Coimbatore, Tamil Nadu, India

<sup>2</sup> Assistant Professor, PSG College of Arts and Science, Coimbatore, Tamil Nadu, India



## Corresponding Author

Priyadarsini P.G.,  
[pgpsresearch.cbe@gmail.com](mailto:pgpsresearch.cbe@gmail.com)

## DOI

[10.29121/shodhkosh.v5.i7.2024.1854](https://doi.org/10.29121/shodhkosh.v5.i7.2024.1854)

**Funding:** This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

**Copyright:** © 2024 The Author(s). This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

With the license CC-BY, authors retain the copyright, allowing anyone to download, reuse, re-print, modify, distribute, and/or copy their contribution. The work must be properly attributed to its author.

## ABSTRACT

Mobile health is defined as medical and public health practices supported with the help of mobile devices. In India, there is a huge growth in mobile phone usage and Internet usage, which can be beneficial to expand mobile health usage. It has several advantages, including minimizing the spread of infection, saving time, and being very convenient to use. mHealth usability and personalization should be considered while updating or developing an mHealth app, as they are very important features. There's a pause in the association between sufficient income and higher usability scores. Among emphasis app users in Egypt and Saudi Arabia (Arafa et al., 2022). mHealth apps, or mobile health apps, are the software used in mobile devices such as smartphones or tablets to provide health-related services, information, and support. These apps can cover a wide range of health-related functions, such as physical tracking, monitoring the person's health condition in remote areas, and providing educational resources, which can be useful for patients who cannot come to hospitals and stay for a long time. These health apps can help facilitate health records and promote healthy lifestyle behaviours among patients (Haggag et al., 2022). The mHealth apps are mainly used for mental health, chronic disease management, physical fitness, and weight loss, as they are a cost-effective and time-saving method. These apps can be customized according to the air-specific region, considering cultural differences and language preferences, which can be beneficial for mHealth app users. These apps can improve lifestyles, healthcare delivery systems to address the burden of diseases, and much more (Figueiredo & Chunkhare, 2021). Mobile health is a dominant concept closely related to artificial intelligence and genomics. In today's world, artificial intelligence and machine learning are used in health to combine with ICT and other technologies to solve problems that are related to patients and consumers (Fatehi et al., 2020).

**Keywords:** Bibliometric Study, Artificial Intelligence, Technologies, Lifestyles



## 1. INTRODUCTION

The introduction of AI-enabled technologies in mobile health applications can enhance communication between family members and the care team, facilitating better care for the elderly. Many elderly people have faced a lot of issues related to memory problems, such as forgetting about the social events in their neighbourhood, etc. This can be rectified by introducing AI power robots, which can remind the seniors about their social events and encourage them to participate in the social activities. These apps can remind the elderly to have a proper diet to increase their lifespan and remind them about their medication. The AI support system in healthcare devices and applications may help in making real-time clinical decisions by comparing patients' data with the guidelines, which have been updated in recent times. AI in the healthcare support system may help healthcare professionals make accurate decisions about their diagnoses by analyzing vast

amounts of data and providing insights that may not be possible for human practitioners to make on time. The AI can also develop personalized treatment plans for the patients based on their unique characteristics's medical records and based on their responses to previous treatments (Cingolani et al., 2023). Specific aspects of mobile health apps, such as account logging privacy concerns and user requests, were not given much importance by the app developers, which can be rectified in order to improve the satisfaction level of consumers. The motion sensors used by fitness activity tracking apps are not up to par; hence, app developers have to give more concentration while developing these types of apps (Haggag et al., 2022).

In order to achieve the SDG 3 goal, various improvements to analyze the big data that are generated through the healthcare sector have to be identified. The analysis of big data can be done with the help of machine learning and deep learning algorithms. There is a lack of privacy and security because of improper regulations related to the development of technology. In today's world, healthcare professionals are using updated technology, but enterprises are exposed to unreliable worker authentication; hence, healthcare professionals need to be chosen carefully (Nti et al., 2023)



The main aim of the study is to analyze the relationship between mHealth and Artificial Intelligence (AI) AI can be used in healthcare technology to enhance healthcare delivery in unserved locations. Hence the following questions are framed to get a better understanding of the current problem and gaps in the existing literature.

RQ1: What is the annual scientific production, average citations per year, and Bradford law in this field?

RQ2: What is the relationship between authors, their references, and keywords used by authors today in this field?

RQ3: What are the most relevant affiliations and their productions?

RQ4: How the mHealth & AI evolved?

RQ5: What are the most cited countries, most relevant words co-occurrence analysis of keywords and its network?

## 2. METHODOLOGY

In this study, the Scopus database was used to collect all the details regarding mHealth and AI. The documents related to mHealth and AI were retrieved from Scopus as it is the most reliable and updated database. It indexes over 5000 publishers worldwide covering multidisciplinary which helps the researchers to do cross-disciplinary research. It is an excellent tool for conducting bibliometric analysis as it has all the required data for performing the analysis. Scopus is most

compatible and integrated easily with other software which makes it simple to analyze RStudio. RStudio is an open-source software built based on R programming as an integrated development environment which means it has continuous improvement and innovations. RStudio is a very powerful tool for conducting bibliometric analysis as it has different packages such as bibliometrics, citr, and bibliometrixdata. It helps in performing various analyses such as co-citation analysis, bibliometric mapping, author collaboration networks, and much more. The package called bibliometric is used by the tool called biblioshiny in which the below analysis has been conducted.

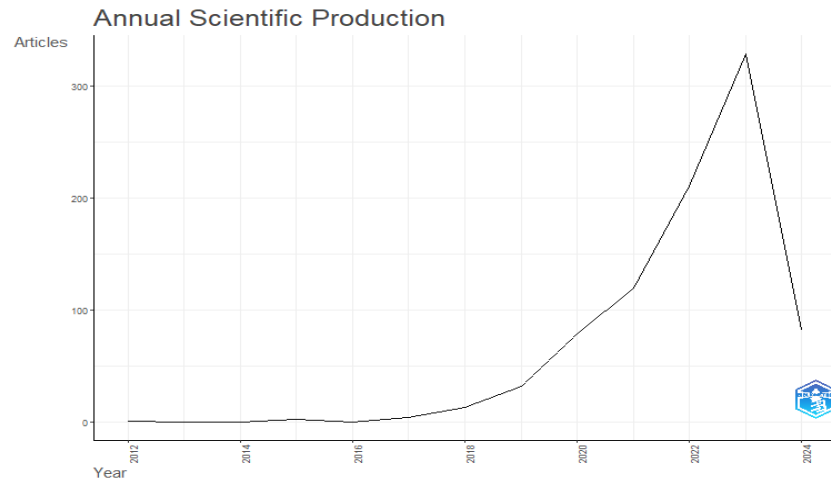
Our article currently uses the "All-fields" option to search "AI" and "mHealth" to retrieve these documents. In Scopus, OR, AND, AND NOT, Pre/and w/operators are used for searching. In this article, we used "AND" as an operator for searching the documents. In total 1549 documents have been retrieved in which various types of documents such as articles, articles in press, book chapters, review articles, and conference proceedings were taken into consideration. Of those documents, only 873 were articles and the remaining are the review articles in the press, etc. We selected the types of sources as "Journal articles" to avoid misunderstanding in conferences and other non-published works. We limited to Journal articles only to avoid dual counting of articles to reduce the bias while retrieving the data.

### 3. RESULTS AND FINDINGS

The Scopus database was searched and got data only from 2012-2024 with 501 sources including Journals, Books, etc. The annual growth rate of the field is considered 44.37% with 1.97 as the document's average age. The average citation per document is 10.84 with keywords more than 4000. The number of authors of the single-authored documents is 75 and with co-authors, it is 5.32 per document.

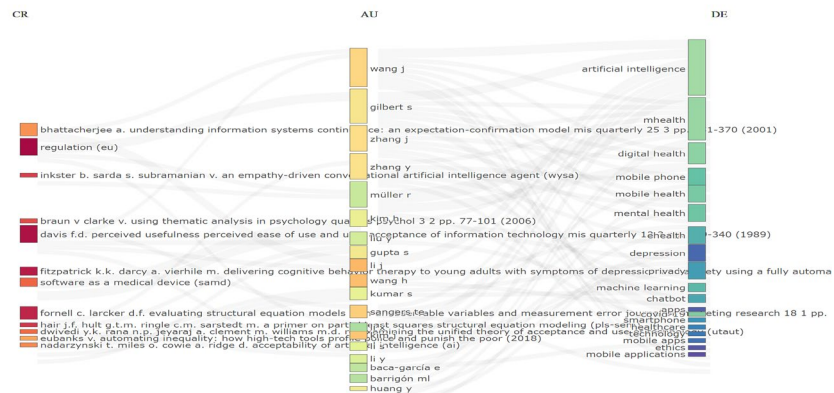
Description	Results
<b>Main Information About Data</b>	
Timespan	2012:2024
Sources (Journals, Books, etc)	501
Documents	873
Annual Growth Rate %	44.37
Document Average Age	1.97
Average citations per doc	10.84
References	59187
<b>DOCUMENT CONTENTS</b>	
Keywords Plus (ID)	4099
Author's Keywords (DE)	2813
<b>AUTHORS</b>	
Authors	4186
Authors of single-authored docs	75
<b>AUTHORS COLLABORATION</b>	
Single-authored docs	78
Co-Authors per Doc	5.32
International co-authorships %	31.73
<b>DOCUMENT TYPES</b>	
Article	873

#### 4. ANNUAL SCIENTIFIC PRODUCTION



The publication in this field has slightly in the year 2017 and it is growing to date. There is a gap of 118 publications between the year 2022-2023. The average citation in a year has been fluctuating during this year. During the years 2019-2021, the citation per year is significantly stable and there is not much deviation in citation. The Journal of Medical Internet Research has published 38 articles which are the most relevant sources in the area followed by JMIR Formative Research with 31 articles and JMIR mHealth and UHealth with 23 articles.

#### 5. THREE-FIELD PLOT

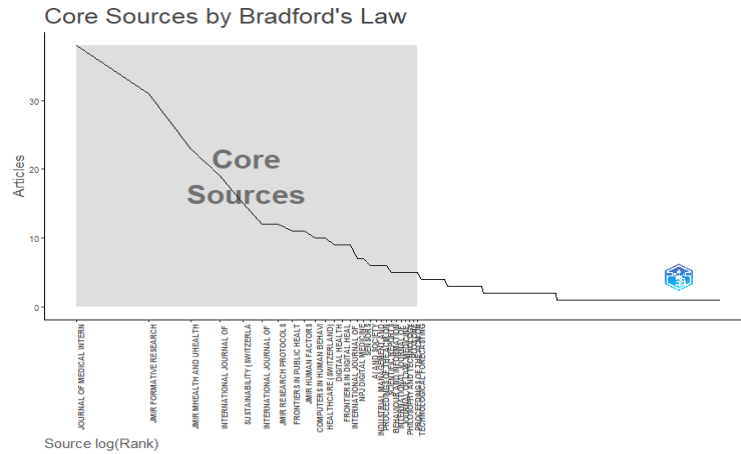


In this section, the relationship between authors, and the references used by them according to their keywords is analyzed. The most used keyword Artificial Intelligence is used by Gilbert by using the reference called regulations (EU) and the second top most used reference Davis F.D. perceived usefulness, perceived ease of use, is utilized by most of the authors to coin the keywords privacy, mHealth, Smartphone, mobile apps, and depression.

#### 6. BRADFORD LAW

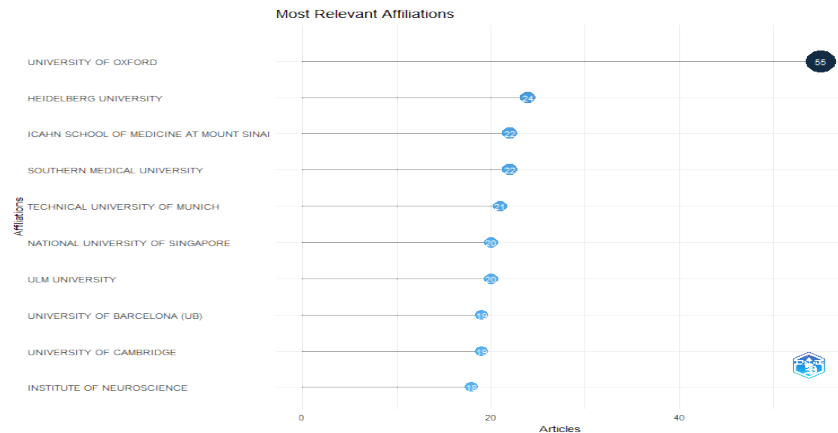
Bradford's law studies about how the documents of respective subjects are scattered and unevenly distributed throughout the publication. Bradfords law is a model found by Samuel.C. Bradford in 1934 this can be used to estimate the

reducing returns of searching for references in journals. This law is based on the investigation conducted during the year 1933. It was first reported by Bradford in the journal "Engineering" in the year 1934 and in his book "Documentation" in the year 1948 (Shaikh et al., 2023).



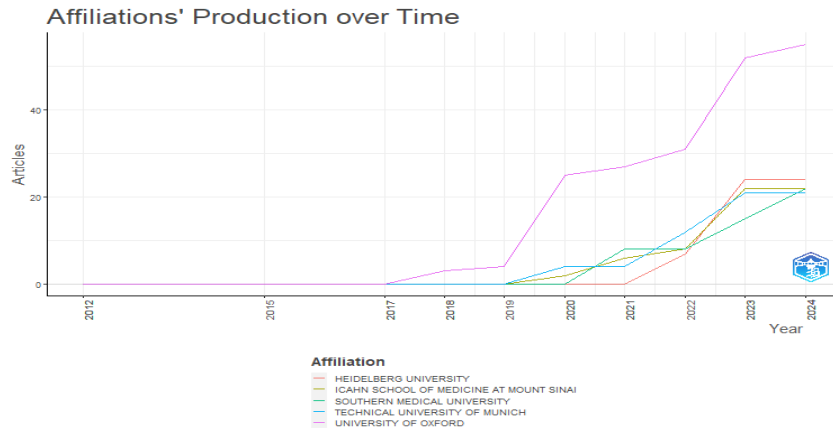
This is the top journal that published 38 articles in the Journal of Medical Internet Research. It is the leading peer-reviewed journal for digital medicine with an impact factor of 7.4 and next comes JMIR Formative Research with an impact factor of 2.2[3],[4].

## 7. MOST RELEVANT AFFILIATION



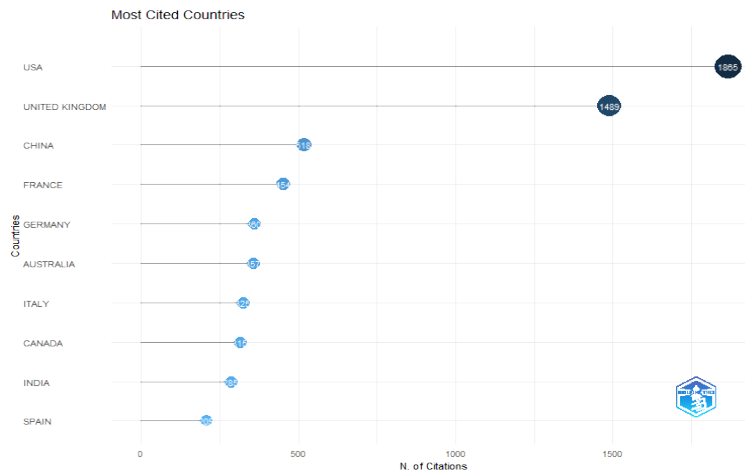
The oldest university in English English-speaking world, the University of Oxford has published most of the documents in this research field. A separate department for AI and its research has been functioning at the University of Oxford with more than 10 professors who are specialists in this research. This may be the reason for the greatest number of productions. Oxford University has been ranked No.1 by Times Higher Education (THE) in the world university ranking for the 8th year running and for its groundbreaking research [1]. They are working on a project that combines both mental health and AI which becomes the main reason for more contributions in mHealth and the AI sector. Followed by Oxford University, Heidelberg University and ICAHN School of Medicine at Mount Sinai plays a major role in the most relevant affiliation for producing the articles.

## 8. AFFILIATION'S PRODUCTION OVERTIME



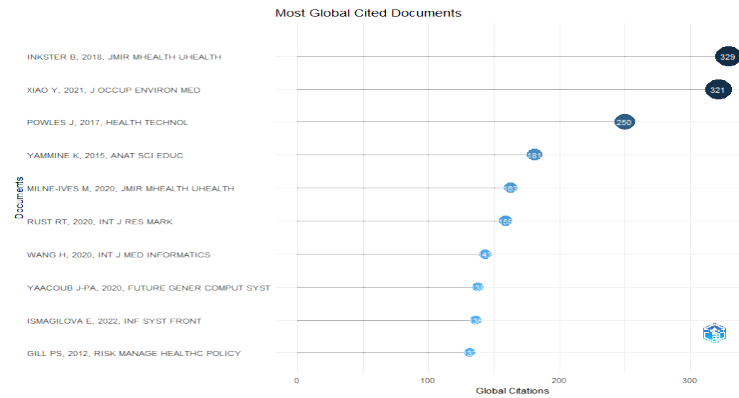
In this section, the University of Oxford started its production of articles in the year 2017 and it is continuously producing articles in the AI field to date. Following that, the Technical University of München started to show their interest in this field from the year 2019. The foundation of TUM (Technical University of München) School of Life Science in the year 2020 has rooted for the School of Management, School of Social Science and Technology in 2021. In 2022 The School of Computation, Information and Technology has paved the way for the development of the research of mHealth and AI altogether [2]. This may be the reason for the sudden increase of articles (i.e. 4 articles in 2021, 12 articles in 2022, 21 articles in 2023)

## 9. MOST CITED COUNTRIES



The USA and UK are the leading countries with citations of 1855 and 1489 respectively. India is in 9th position with 285 citations at an average of 7.5 citations per article. On the other hand, France is in 4th position by producing only 15 articles but a width of 455 citations and 30.3 citations per article. The argumentation behind the surge is because of their almost equal number of multiple-country publications compared to single-country publications.

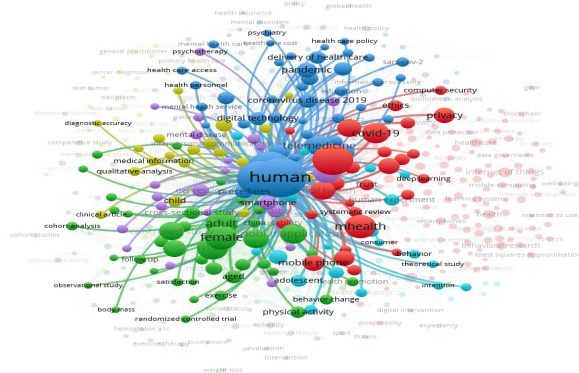
## 10. MOST GLOBALLY CITED DOCUMENT



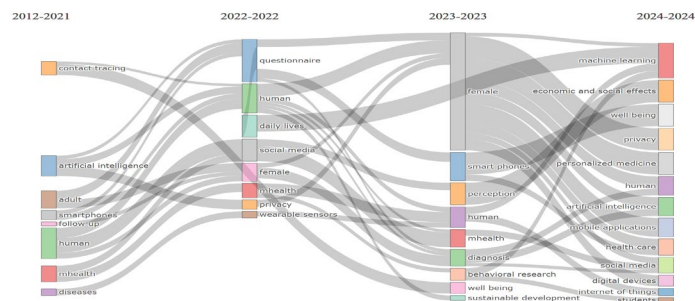
INKSTER B, 2018 and MILNE-IVES M, 2020 These articles which are published in JMIR mHealth UHealth get the most global citations because this journal had been ranked as the top most local impact journal in this research.

## 11. MOST RELEVANT KEYWORD

The most relevant keywords used in this article are human, articles, humans, artificial intelligence, female, adult, etc. The logic behind using human as the most used keyword in many of the documents is because of its connection with other keywords. This connection can be identified with an analysis called a co-occurrence network for keywords. This analysis has been performed with VOS viewer.

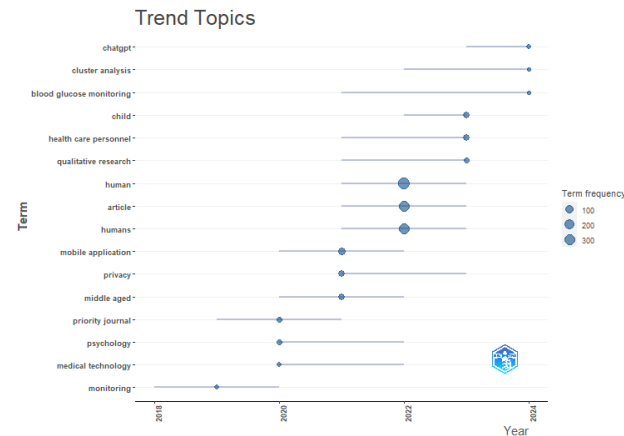


## 12. EVOLUTION OF MHEALTH AND AI OVER TIME



The evolution of mHealth and AI over the years can be understood with the help of the analysis of Thematic evolution. In this section, the term AI has evolved and now the researchers are using that in studies related to females, the term female is connected with many other topics like privacy, mobile applications, IoT, digital devices, and students. On the other side, from 2012 to 2022 mHealth mainly focused on social media but during their period 2023, the focus has been diverted to human and behavioral research. In today's scenario, the researchers of mHealth are interested in understanding machine learning and social media and their influence on students' behavior.

### 13. FUTURE DIRECTIONS



A full-scale empirical study needs to be conducted to address more about obtaining data from other sources like Web of Science, Google Scholar and Pub Med. It can be expanded in future by including books, desertions and conference papers. The study can be used by the beginner researchers to conduct in-depth analysis about machine learning and electronic health records with the digital health AI and deep learning as they are most popular themes in this area (Shaikh et al., 2023). The researchers can concentrate on Chat-GPT, AI in blood glucose monitoring, and their need for privacy as they are trending topics in the current scenario.

### CONFLICT OF INTERESTS

None.

### ACKNOWLEDGMENTS

None.

### REFERENCES

- Aria, M., & Cuccurullo, C. (2017). Bibliometrix: An R-Tool for Comprehensive Science Mapping Analysis. *Journal of Informetrics (Print)*, 11(4), 959–975.
- Arafa, A., Mostafa, Z. M., Sheerah, H. A., Alzahrani, F., Almuzaini, Y., Senosy, S., & Hassan, R. I. A. (2022). MHealth App Barriers, Usability, and Personalization : A Cross-Sectional Study from Egypt and Saudi Arabia. *Journal of Personalized Medicine*, 12(12).
- Cingolani, M., Scendoni, R., Fedeli, P., & Cembrani, F. (2023). Artificial Intelligence and Digital Medicine for Integrated Home Care Services in Italy : Opportunities and limits. *Frontiers in Public Health*, 10.

- Fatehi, F., Samadbeik, M., & Kazemi, A. (2020). What is Digital Health ? Review of Definitions. *Studies in Health Technology and Informatics*, 275, 67–71.
- Figueiredo, D., & Chunkhare, M. (2021). A Bibliometric Analysis of Research Output, Citation Analysis, Author Productivity, Collaborations, and Institutions of Repute in Smartphone Health Applications (spHealth Apps). *Library Philosophy and Practice*, 2021(August 2021), 1–53.
- Haggag, O., Grundy, J., Abdelrazek, M., & Haggag, S. (2022). A Large Scale Analysis of Mhealth App User Reviews. *Empirical Software Engineering*, 27(7).
- Nti, I. K., Adekoya, A. F., Weyori, B. A., & Keyeremeh, F. (2023). A Bibliometric Analysis of Technology in Sustainable Healthcare : Emerging Trends and Future Directions. *Decision Analytics Journal*, 8(May), 100292.
- Shaikh, A. K., Alhashmi, S. M., Khalique, N., Khedr, A. M., Raahemifar, K., & Bukhari, S. (2023). Bibliometric Analysis on the Adoption of Artificial Intelligence Applications in the E-Health Sector. *Digital Health*, 9.