



## Bibliometric Analysis of Health Information System (HIS) Research Development in Developing Countries in Asia

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### Abstract

The recent COVID-19 pandemic prompted massive collaboration in health information exchange, emphasizing the importance of knowledge and information management. Health Information Systems (HIS) are a key element in the success of health organizations. This research analyzes the bibliometric development of HIS in Developing Countries in Asia (2003-2023). HIS, the technological foundation that supports health information management, has made a significant contribution to optimizing health services. This research aims to explore research trends, institutional collaborations, and research focus in the field of HIS. The results show significant indications and trends, and have an impact on COVID-19. Core journals, institutions, and contributing researchers were identified. Co-word analysis provides an overview of the diversity of disciplines involved and specific research focuses. In conclusion, HIS research in Developing Countries reflects dynamic evolution and multidisciplinary engagement.

## Introduction

The recent Covid-19 pandemic has not only had an impact on awareness of the importance of individual health, but also triggered massive collaboration in the exchange of health information. The COVID-19 pandemic has encouraged the increasing use of online information exchange which has resulted in a lot of health information and knowledge generated from online health services. The management of this information is important to improve the efficiency, quality, and safety of health services (Syam, 2019). This knowledge management involves a systematic effort to collect, organize, store, and share information in order to be used effectively in decision-making and the execution of organizational tasks (Walsham, 2020). As various health data tracking and data management systems emerge in response to the pandemic, it is becoming increasingly clear that understanding the history and evolution of the Health Information System (HIS) is crucial. A Health Information System (HIS) is a combination of software and hardware, databases, and knowledge designed to automate various processes occurring in hospitals and healthcare systems. The main task of a health information system is to support the process of patient care, environmental management, communication and cooperation with other health professions (Zhang et al., 2022). HIS, which consists of many specialized modules, helps in the simultaneous solution of diagnostic, therapeutic, managerial, financial, statistical, and other tasks, ultimately contributing to the achievement of the ultimate goal of any healthcare facility as the provision of quality medical services (Soesanto & Handalani, 2023).

HIS as a technological foundation that supports the management of health information, is not a product of a pandemic situation alone. Instead, HIS had formed an integral part of the health

infrastructure long before this outbreak occurred. The development of HIS has contributed significantly in optimizing health service provision, medical record management, and increasing efficiency in the overall health system (Primova et al., 2020). By understanding the history of HIS, we can see how this technology has evolved over time, adapting to the demands of society and the dynamics of change in the world of health. The sustainability of HIS as an integral part of healthcare transformation reflects a commitment to continuously improving and refining the way we collect, store and use health information (Bolsunovskaya et al., 2020).

In the situation of developing countries, the role of health information systems is not only limited to health information management, but also reflects the level of progress and readiness in adopting modern health technologies. The criteria set by the IMF to identify a country as developing involve factors such as per capita income, Human Development Index (HDI), economic growth, poverty rate, and unemployment. According to the IMF, by 2023, there will be 160 developing countries worldwide. Based on IMF projections, the population of developing countries is expected to increase from 6.8 billion in 2023 to 8.6 billion in 2050. With population growth and specific health challenges in developing countries in Asia, it is important to understand how the integration of medical information systems is becoming an integral part of their health systems (Ali et al., 2017).

This study aims to conduct a bibliometric analysis of research developments on similar topics in developing countries, especially in Asia. Previous research entitled "*Health information systems in developing countries: case of African countries*" by Koumamba et al. has investigated health information systems in developing countries. The background of the study reflects the increasing constraints in producing quality data on health information systems (HIS) in these countries. Limited reliable health information makes it difficult to develop effective health policies. This research method uses bibliographic search engines PubMed and Scopus. The inclusion criteria involved articles published between 2005 and 2019, titled with the keywords "*health*," "*information*," "*systems*," "*systems*," "*Africa*," "*developing countries*," "*santé*," "*pays en développement*," "*Afrique*," and addressing organizational and technical issues concerning HIS in African countries. The results included 14 articles out of 2492 found, with 13 (92.9%) being qualitative. All articles address HIS-related issues in 12 African countries. All (100.0%) chose a data *warehouse* approach to improve their HIS, supported by the DHIS2 system to provide reliable data. However, there is a tendency that 11 out of 12 countries (92.0%) experience gaps in their frameworks that are in line with donor funding strategies and deficiencies in this regard (Adrian et al., 2016).

Another relevant study was conducted by Almansoori et al. (2021) entitled "*Adequacy of UTAUT in clinician adoption of health information systems in developing countries: The case of Cameroon*." This study aims to explore the potential of Health Information Systems (HIS) in improving the quality of health delivery services, particularly in the adoption of such systems in developing countries in Asia. The main focus of the study was to investigate the adequacy of the *Unified Theory of Acceptance and Use of Technology* (UTAUT) in determining the factors influencing the adoption of HIS by clinicians in developing countries, with case studies conducted in Cameroon. This study used a paper-based questionnaire method distributed to clinicians in 4 of Cameroon's 7 major public hospitals. The modified UTAUT was tested using structural equation modeling (SEM) methods to identify determinants of the clinician's intention to use HIS. *Self-efficacy* and *cost-effectiveness* are determinants used to extend the original UTAUT (Bawack & Kamdjoug, 2018).

Of the 286 questionnaires, 228 were valid for the study. The original UTAUT underperformed, explaining only 12% of the variation in the clinician's intention to use HIS. Age was the only significant moderation factor, increasing the model by 46%. Self-efficacy and cost-effectiveness did not have a direct significant effect on HIS adoption in the context of this study. In conclusion, the original UTAUT did not adequately identify the factors influencing

the adoption of HIS by clinicians in developing countries. Simplification of the model by using age as the only moderation factor significantly improves the model's ability to predict HIS adoption in this context. Therefore, younger clinicians are more likely and ready to adopt HIS compared to older ones. The use of context-specific also needs to be applied to increase the explanatory power of UTAUT in any given context (Cobo et al., 2011).

Another relevant study titled "*Health information systems in developing countries: some reflections on information for action*" by Walsham (2020), presents some reflections on the role, effectiveness, and challenges of health information systems in developing countries. In the study, it was concluded that health information systems in developing countries need to support the use of information for action, but are often constrained by low-quality data. Research confirms that good data and information and communication technology alone are not enough; Support from knowledgeable individuals and supportive institutions is required. Four key points are relevant: First, information and communication technologies (ICTs) have an important role to play in improving the use of data for effective action in health and should be integrated into a broader approach that includes technological, social, and institutional innovation. Second, education for health workers needs to be expanded to include understanding the use of health information systems for more effective action. Third, the software development approach needs to pay attention to the needs of users who may be less skilled in computerized systems.

Over time, HIS has not only become an effective technological solution, but also a key driver of innovation in health research, disease management, and a deeper understanding of population health (Phan et al., 2022). Therefore, a comprehensive understanding of the history and evolution of HIS not only leads to increased health system capacity, but also provides a solid foundation for facing future challenges in global health services.

Therefore, this study carries a bibliometric method to provide an in-depth understanding of the scientific development of HIS. Using bibliometric analysis, we can detail research trends, inter-research collaboration, and research impact within the HIS domain. Through this approach, it is hoped that the dynamics of HIS evolution can be revealed, including innovations, critical discoveries, and conceptual improvements that may have colored HIS's journey over the years.

Previous studies related to *the Health Information System* (HIS) in developing countries in Asia provide a rich picture of research developments in this field. Furthermore, this study will use bibliometric methods as the main approach to explore and analyze research topics in *the Health Information System* (HIS) particularly in developing countries in Asia in the last two decades. In this context, the research question that arises broadly is: "How is the development of Health Information System research in developing countries in Asia?" This analysis not only covers the quantity of scientific publications, but also aims to explore research trends, collaboration between countries, as well as research focuses that are the main concern of researchers. The results of this research are expected not only to provide the latest insights related to the development of HIS, but also provide a basis for future research directions in this field. By involving bibliometric methods, we can build a strong knowledge foundation to support efforts to strengthen health systems through the development of HIS that is more sophisticated and responsive to community needs.

Bibliometric analysis itself is an analytical approach that examines and groups bibliographic sources by summarizing existing literature representatively (Donthu et al., 2020). Previous studies applied bibliometric techniques to evaluate journal articles (Zhang et al., 2022). In this study, bibliometric analysis is directed at compiling a map of in-depth knowledge on the development and implementation of *Health Information System* (HIS) in developing countries in Asia. These analysis steps involve identifying scientific publications, ranking key contributors, cross-country collaboration networks, as well as an in-depth understanding of key

keywords and concepts in HIS research. According to Donthu et al. (2021), there are two main techniques in bibliometric analysis, namely performance analysis and knowledge mapping. Research mapping techniques include citation analysis, co-citation analysis, bibliographic merging, keyword co-occurrence analysis, and co-authorship analysis (Koumamba et al., 2021).

One very useful software for doing science mapping is VOSviewer, which has grown rapidly in its functionality (Huang & Yuan, 2024). VOSviewer functionality allows presenting extensive bibliometric maps in an easily interpreted manner. By using this approach, it is hoped that the research results can provide valuable insights to understand the dynamics and progress of research in the HIS domain in the context of developing countries. The bibliometric analysis conducted in this study is expected to provide valuable insights in tracking the evolution and shift of research focus in the domain of health information systems in developing countries. By identifying achievements and gaps, this study is expected to provide guidance for policy formulation, practice implementation, and further research to improve access and quality of health services through optimal utilization of information technology in the health sector.

## Methods

This research is a research that uses a quantitative approach with bibliometric methods. The unit of analysis used as a source in this study is a scientific article on Health Information System (HIS) research in Developing Countries in Asia published on the Scopus database. The Scopus database is established with consideration referring to its quality and internationally recognized reputation. In addition, Scopus offers aggregate data showing the degree of influence of journals (journal impact) or universities (institutional impact) on articles in the scientific community. The population in this study is the publication of scientific articles on the Health Information System (HIS) in Developing Countries in Asia indexed by Scopus. There are also types of data obtained from data collection in this study are secondary data (Donthu et al., 2020).

In this study there are limitations that are poured into the research question. The formulation of the research map is carried out in a structured manner by referring to the framework of Population, Intervention, Comparison, Outcomes, and Context or called PICOC. Petticrew and Robert (Adrian et al., 2016) define PICOC as the scope of systematic literature review (Cyr et al., 2019).

The identification of coverage based on the PICOC framework in this study is: Population (P): International publication on Health Information System (HIS) in Developing Countries in Asia. Intervention (I): International publication on Health Information System (HIS) in Developing Countries in Asia between 2003–2023; Comparison (C): Number/percentage of international publications, comparison of institution/author affiliation contribution and author productivity; Outcomes (O): Development of research trends on Health Information Systems (HIS) in Developing Countries in Asia in the period 2003–2023; Context (C): Visualization and mapping of the development of research trends on the Health Information System (HIS) in Developing Countries in Asia in the period 2003–2023.

Based on these identifications, specific questions can be formulated from the research (PP) are: PP1: How is the development of international publications of Health Information System (HIS) studies in developing countries in Asia in the range of 2003-2023? PP2: How to map progress Study Health Information System (HIS) in Developing Countries in Asia during the Covid-19 pandemic (2019-2023)? PP3: What core journals are used in the international publication of Health Information System (HIS) studies in developing countries in Asia between 2003-2023? PP4: How is the contribution of the author's institution/affiliation in the international publication of the Health Information System (HIS) study in Developing Countries in Asia between 2003-2023? PP5: How is the productivity of researchers in international publication

studies Health Information System (HIS) in Developing Countries in Asia in the range 2003-2023? PP6: What is the map of the development of Health Information System (HIS) studies in developing countries in Asia by subject/field? PP7: How is the map of the progress of Health Information System (HIS) studies in developing countries in Asia based on keywords (co-words)?.

## Result and Discussion

### PP1: How is the development of international publications of Health Information System (HIS) studies in developing countries in Asia in the period 2003-2023?

Search results in the Scopus database show fluctuations in the number of Health Information System (HIS) study publications in developing countries in Asia between 2003-2023.

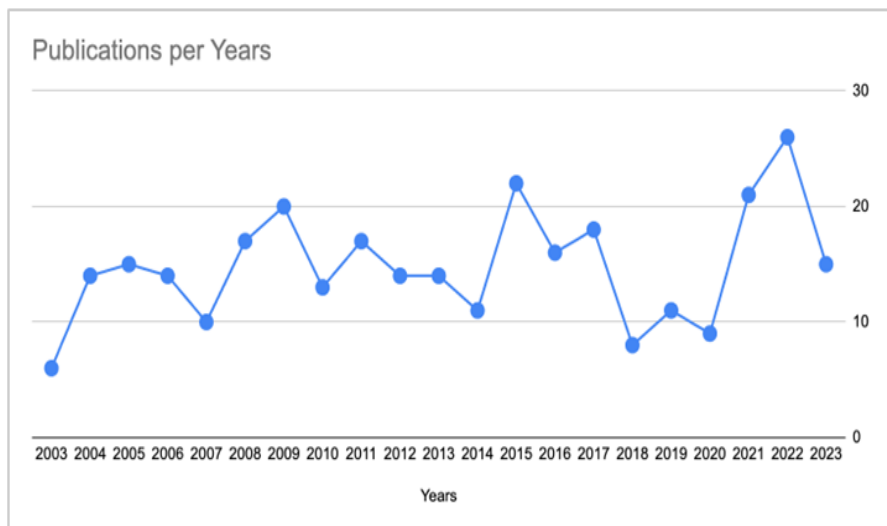


Figure 1. Year and Number of Health Information System (HIS) Study Publications in Developing Countries in Asia

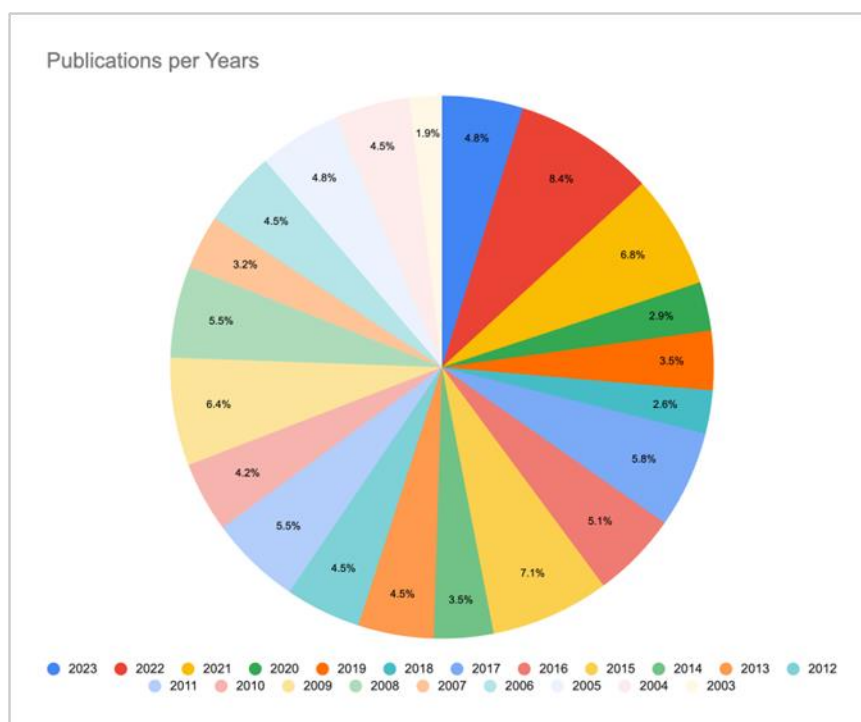


Figure 2. Percentage of Number of Health Information System (HIS) Study Publications in Developing Countries in Asia

Based on the data in Figure 1 and Figure 2, we can break down the number of publications each year from 2003 to 2023. In 2003, there were 6 publications, marking the beginning of an observation period that accounted for 1.9% of the total publications during the year. There was a significant increase in 2004, with 14 publications dominating 4.5% of the total publications. The period from 2005 to 2010 showed relatively steady fluctuations, with the number of publications ranging from 13 to 20 each year. The highest peak occurred in 2009, reaching 20 publications, which accounted for 6.4% of the total publications during the period.

Starting in 2011, we saw a decline until 2014, where the number of publications reached 11, accounting for 3.5% of the total publications at the time. The trend picked up again in 2015, reaching its highest peak during the observation period with 22 publications, which dominated 7.1% of the total. After that, there were fluctuations with the number of publications trending lower, reaching its lowest point in 2020 with 9 publications, which accounted for 2.9% of the total. Analysis of publication presentations per year provides further insight into the dynamics of changes in research activity over the past two decades, with shifting trends reflecting changes in research focus or interest in specific periods.

**PP2: What is the map of the development of the Health Information System (HIS) study in Developing Countries in Asia during the Covid-19 pandemic (2019-2023)?**

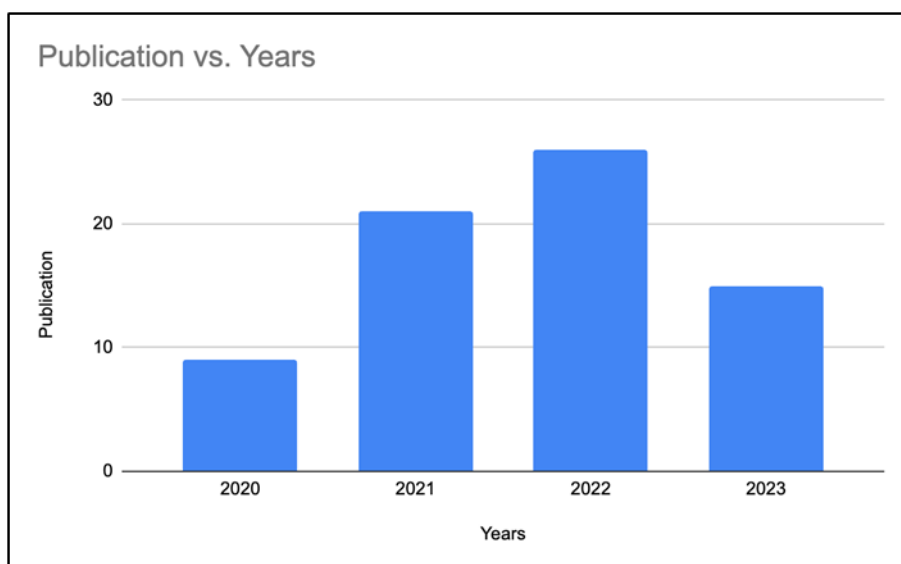


Figure 3. Number of Health Information System (HIS) Study Publications in Developing Countries in Asia in Vulnerable Year 2020-2023

From 2019 to 2022, the world faced major challenges due to the COVID-19 pandemic, which changed the way many sectors operate, including the field of health information systems. The pandemic forced radical changes in the way we collect, manage and disseminate health information. Along with restrictions on movement and physical gatherings, many activities are shifting to online platforms. Technological developments play an important role in supporting this transition, allowing research and information exchange to occur virtually. Adaptation to this pandemic is driving innovation in the way we approach managing health information and communicating in academia.

This change is reflected in the amount of research on health information systems from 2020 to 2023. In this period, there were a total of 112 studies, with significant increases in 2021 and 2022. In 2021, the number of studies reached 21, while in 2022, the number increased to 26, becoming the highest publication figure in the last two decades. The year 2023 shows a slight decline with 15 studies, but this number still reflects consistent interest in health information systems studies amid the pandemic.

Despite fluctuations in the number of publications, this trend indicates the academic community's efforts to continue innovating and maintaining research continuity, despite the challenges caused by the pandemic. The shift to online methods also opens the door to more cross-border collaboration, which could be the basis for a more integrated approach to health information management. Overall, the changes in publication and research patterns during the pandemic period show how the sector has adapted and found new ways to maintain the continuity of research activities and knowledge exchange.

**PP3: What core journals are used in the international publication of *Health Information System (HIS)* studies in developing countries in Asia between 2003-2023?**

During the period 2003 to 2023, there are 161 core journals that publish studies of health information systems in developing countries in Asia. The top ten core journals can be found in Table 1.

Table 1. Core Journal of Health Information System (HIS) Study Publication in Developing Countries in Asia.

<b>Jurnal</b>	<b>Publication</b>
Bulten Of The World Health Organization	14
BMC Public Health	7
BMC Pregnancy And Childbirth	6
Tropical Medicine And International Health	5
Social Science And Medicine	5
BMJ Open	5
Health Policy And Planning	5
Plos One	5
Public Health	4
Science Of The Total Environment	4

Based on the data in table 1, in the top 10 core journals, the "*Bulletin Of The World Health Organization*" dominates with 14 publications. Followed by "*BMC Public Health*" with 7 publications, "*BMC Pregnancy And Childbirth*" with 6 publications, and "*Tropical Medicine And International Health*", "*Social Science And Medicine*", "*Plos One*", "*Health Policy And Planning*", "*BMJ Open*" each with 5 publications. Meanwhile, "*Science Of The Total Environment*" and "*Public Health*" came up with 4 publications. This ranking reflects the significant contribution of a number of core journals in presenting health research and health information systems in the emerging Asian region. This data provides insight into research trends and core journal focus over the past two decades.

**PP4: How is the contribution of the author's institution/affiliation in the international publication of the *Health Information System (HIS)* study in Developing Countries in Asia in the period 2003-2023?**

In order to search the Scopus database, 160 organizations and universities affiliated with the author were identified that contributed significantly to the publication of research on health information systems in developing countries in Asia.

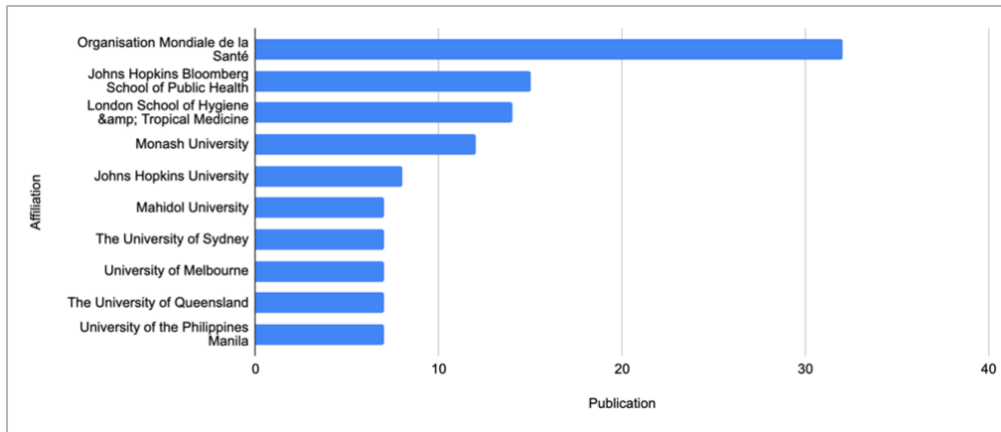


Figure 4. Affiliation of the Author in the Study of Health Information System (HIS) in Developing Countries in Asia

Of these, ten stand out with a consistent number of publications as seen in Figure 3. The Organisation Mondiale de la Santé leads with 32 publications, signifying a substantial contribution in this domain. Followed by Johns Hopkins Bloomberg School of Public Health with 15 publications and London School of Hygiene & Tropical Medicine with 14 publications, shows the important role these institutions play in supporting the development of knowledge in the health sector. Monash University also recorded significant contributions with 12 publications, while Johns Hopkins University, Mahidol University, The University of Sydney, University of Melbourne, The University of Queensland, and University of the Philippines Manila each had 7 publications. Overall, these data reflect the diversity of collaborations and contributions from academic institutions and global health that play an important role in pioneering the development of knowledge about health information systems in the emerging Asian region.

**PP5: How is the productivity of researchers in international publications of Health Information System (HIS) studies in developing countries in Asia in the range of 2003-2023?**

In a study of health information systems in developing countries in Asia, author productivity showed a relative level of uniformity, with 4 publications contributed by authors whose identities were not identified. Although a number of publications are from authors without identity, ten other authors stand out with the highest publication contributions. J. Braa leads with 5 publications, while D. Prabhakaran and A.A. Hyder contribute 4 publications each. Followed by M.G. Shrime, S.D. Shin, K. Shibuya, A. Razzaque, J.E. Lawn, S. Juvekar, and R. Coker, who each contributed with 3 publications.

Table 2. Author Productivity in Health Information Systems Research in Developing Asian Countries

Author	Article Info
Braa, J.	Abstract
Prabhakaran, D.	4
Hyder, A.A.	4
Shrime, M.G.	3
Shin, S.D.	3
Shibuya, K.	3
Razzaque, A.	3
Lawn, J.E.	3
Juvekar, S.	3
Coker, R.	3

**PP6: What is the map of the development of *Health Information System (HIS)* studies in developing countries in Asia by subject/field?**

In the publication of research on Health Information Systems in developing countries in Asia, 26 subjects were identified that reflect the involvement of the disciplines involved in the study. The subjects involve different aspects of science, and the number of publications varies. For example, the subject of *Medicine* came out high with 216 publications, demonstrating the urgency and complexity of implementing health information systems in the medical realm. In addition, social sciences also play an important role with 24 publications, highlighting the linkages between health and social aspects in the context of developing countries.

Within this framework, there are significant contributions from various other disciplines, such as Environmental Science, Biochemistry, Genetics and Molecular Biology, and Engineering. Other subjects such as *Immunology and Microbiology*, and *Computer Science* have also made significant contributions to the understanding of Health Information Systems. These subjects reflect the understanding that the implementation of the Health Information System involves complex environmental, genetic, and technological aspects. This diversity creates complexity and interdisciplinarity in a holistic picture of the role of health information systems in the context of developing countries in Asia, involving perspectives from different fields of science. Details of the number of international publications by subject/field in the *Health Information System (HIS)* study in Developing Countries in Asia can be seen in Table 3.

Table 3. Details of the number of international publications by subject/field in the Health Information System (HIS) study in Developing Countries in Asia

<b>Subject</b>	<b>Publications</b>
Medicine	216
Social Sciences	24
Environmental Science	24
Biochemistry, Genetics and Molecular Biology	24
Immunology and Microbiology	22
Engineering	17
Computer Science	16
Pharmacology, Toxicology and Pharmaceutics	14
Nursing	12
Business, Management and Accounting	11
Agricultural and Biological Sciences	11
Health Professions	9
Multidisciplinary	7
Earth and Planetary Sciences	7
Arts and Humanities	7
Materials Science	5
Energy	5
Economics, Econometrics and Finance	5
Psychology	4
Decision Sciences	Author
Publication	Braa, J.
5	Prabhakaran, D.
4	Hyder, A.A.
4	Shrime, M.G.
3	Shin, S.D.
3	Shibuya, K.

**PP7: How is the map of the progress of *Health Information System (HIS)* studies in developing countries in Asia based on keywords (co-words)?**

A map of the development of Health Information Systems (HIS) in Developing Countries in Asia based on keywords (*co-words*) can be found in Figure 3. This map reflects patterns and trends in *Health Information System (HIS)* research in developing countries in Asia by keyword. The analysis resulted in nine clusters consisting of 254 items in the 2003-2023 range. This cluster mapping provides a visual overview of the relationship between key concepts and trends developing in HIS research in the context of developing Asian countries.

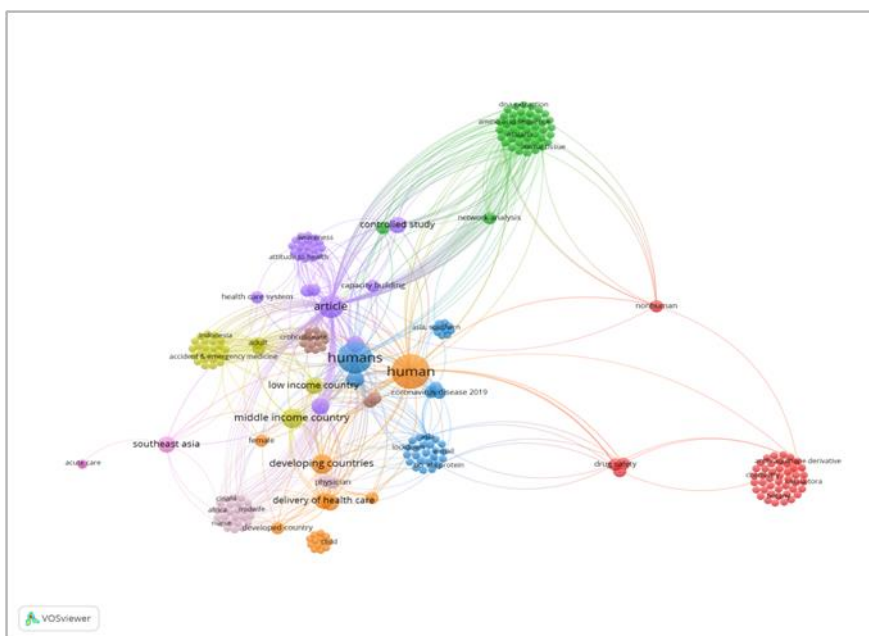


Figure 5. Map of the Development of Health Information System (HIS) Study Publications in Developing Countries in Asia.

Based on the visualization image of keyword co-occurrence in Figure 3, we can examine and evaluate the pattern of relationships and relationships between keywords used in scientific publications in the Health Information System (HIS) study in developing countries in Asia. This visualization provides a clear view of the extent to which certain concepts are related to each other in the HIS-related scientific literature in the developing Asian region. Through this analysis, we can identify keyword clusters that often appear together, helping in understanding the research focus, trends, and evolution of concepts within the field of HIS in the context of those countries.

Cluster analysis shows that the Health Information System (HIS) research progress map in Developing Countries in Asia has nine groups of keywords that are interrelated. Here are the details for each cluster:

Cluster 1 (Red): Includes 48 keywords such as *anthraquinone derivative*, *botany*, *cardiovascular system*, *cassia obtusifolia*, *cassia tora*, *cassiae cement*, *chemistry*, *chinese medicine*, *digestive system*, *drug identification*, *drug isolation*, *drug mechanism*, *drug metabolism*, *drug safety*, *ethnopharmacology*, *eye disease*, *flavone derivative*, *materia medica*, *medicinal plant*, *medicine*, *chinese traditional*, *naphthalene derivative*, *nervous system*, *nonhuman*, *pharmacology*, *phytochemical*, *phytochemicals*, *phytochemistry*, *plant extract*, *plant extracts*, *plant seed*, *plants*, *medicinal*, *polysaccharide*, *pyran derivative*, *quality control*, *review*, *seeds*, *senna*, *senna obtusifolia*, *senna obtusifolia extract*, *senna plant*, *senna tora*, *senna tora extract*, *structure activity relation*, *toxicity testing*, *toxicology*, *traditional medicine*, *traditional uses*, *unclassified drug*.

Cluster 2 (Green): Consists of 45 keywords such as *amino acid sequence, animal, animal model, animal tissue, animals, bioinformatics, blood sampling, bone marrow cell, cell function, chromatography, liquid, dna extraction, down regulation, endocytosis, functional enrichment analysis, gene expression, gene ontology, gene silencing, genetic susceptibility, lipid metabolism, liquid chromatography, liquid chromatography-mass spectrometry, macaca arctoides, machine learning, malaria, Matrix assisted laser desorption ionization time of flight mass spectrometry, nested polymerase chain reaction, network analysis, parasite, parasite identification, parasites, parasitology, polymerase chain reaction, principal component analysis, protein fingerprinting, protein protein interaction, proteomics, receiver operating characteristic, risk factor, RNA sequence, signal transduction, support vector machine, tandem mass spectrometry, thailand, upregulation, veterinary medicine.*

Cluster 3 (Dark Blue): Involves 38 keywords such as *coronavirus disease 2019, covid-19, cytogenetics, databases, factual, e-mail, electronic prescribing, equity, factual database, fluorescence in situ hybridization, asia, asia, southern, bcr abl protein, chronic myeloid leukemia, geography, global surgery, government employee, health service, home delivery, humans, income, lancet commission on global surgery, lockdown, low and middle-income countries, overall survival, pandemic, pandemics, partnership, patient care, patient information, patient safety, prescription, research funding, reverse transcription polymerase chain reaction, scoring system, south and central america, south asia, survival analysis, world health organization health systems building blocks.*

Cluster 4 (Brown): Includes 28 keywords such as *accident & emergency medicine, adult, clinical assessment tool, emergency care, emergency health service, emergency medical services, emergency physician, focus groups, health personnel attitude, indonesia, information processing, international health services, low income country, malaysia, male, medical director, middle aged, middle income country, pakistan, personnel shortage, philippines, prehospital emergency care system Assessment tool, Public Health, Qualitative Analysis, Qualitative Research, Videoconferencing, Viet Nam, Vietnam.*

Cluster 5 (Purple): Consists of 28 keywords such as *article, attitude to health, awareness, capacity building, community program, controlled study, cross-sectional studies, cross-sectional study, drug distribution, drug utilization, envenomation, first aid, health care, health care facility, health care personnel, health care planning, health care system, health education, india, practice guideline, prospective studies, prospective study, questionnaire, retrospective studies, Retrospective study, snake bites, snake venom antiserum, snakebite.*

Cluster 6 (Pink): Involving 27 keywords such as *accreditation, africa, bangladesh, cinahl, continuing professional development (cpd), cpd system development and implementation, education, financial management, government, grey literature, health personnel, leadership, low- and lower-middle income countries, medline, middle east, midwife, narrative, needs assessment, nurse, occupation, physician, physicians, population health, professional development, rapid scoping review, systematic review, web of science.*

Cluster 7 (Orange): Includes 27 keywords such as *child, delivery of health care, developed country, developing countries, female, health care delivery, human, infant, newborn, Imics, maternal health, maternal health service, maternal health services, mobile health, mobile phone, neonatal health, pregnancy, newborn, procedures, technology, telemedicine.*

Cluster 8 (Black): Involves 15 keywords such as *colitis, ulcerative, colon crohn disease, crohn's disease, crohn's and colitis, crohn's disease, developing country, epidemiology, follow up, gross national income, health survey, health systems, inflammatory bowel disease, inflammatory bowel diseases, intestinal tuberculosis, ulcerative colitis.*

Cluster 9 (Light Blue): Only has a few keywords, namely 5 keywords *sacute care, rehabilitation, southeast asia, stroke, systems of care.*



and a better understanding of changing dynamics in health information management in Developing Countries in Asia.

## References

- Adrian, C., Abdullah, R., Atan, R., & Jusoh, Y. Y. (2016). Towards Developing Strategic Assessment Model for Big Data Implementation: A Systematic Literature Review. *Int. J. Adv. Soft Compu. Appl*, 8(3), 173–192.
- Ali, N., Tretiakov, A., Whiddett, D., & Hunter, I. (2017). Knowledge Management Systems Success in Healthcare: Leadership Matters . *International Journal of Medical Informatics*, 97, 331–340. <https://doi.org/10.1016/j.ijmedinf.2016.11.004>
- Almansoori, A., AlShamsi, M., Salloum, S. A., & Shaalan, K. (2021). *Critical Review of Knowledge Management in Healthcare* (pp. 99–119). [https://doi.org/10.1007/978-3-030-47411-9\\_6](https://doi.org/10.1007/978-3-030-47411-9_6)
- Bawack, R. E., & Kamdjoug, J. R. K. (2018). Adequacy of UTAUT in Clinician Adoption of Health Information Systems in Developing Countries: The Case Of Cameroon. *International Journal of Medical Informatics*, 109, 15–22. <https://doi.org/10.1016/j.ijmedinf.2017.10.016>
- Bolsunovskaya, M., Leksashov, A., Gintciak, A., & Shirokova, A. (2020). The Integration of Information Systems in A Medical Facility to Improve The Efficiency of Decision-Making. *E3S Web of Conferences*, 224, 03029. <https://doi.org/10.1051/e3sconf/202022403029>
- Cobo, M. J., López-Herrera, A. G., Herrera-Viedma, E., & Herrera, F. (2011). An Approach for Detecting, Quantifying, and Visualizing The Evolution of a Research Field: A Practical Application to The Fuzzy Sets Theory Field. *Journal of Informetrics*, 5(1), 146–166. <https://doi.org/10.1016/j.joi.2010.10.002>
- Cyr, M. E., Etchin, A. G., Guthrie, B. J., & Benneyan, J. C. (2019). Access to Specialty Healthcare in Urban Versus Rural US Populations: A Systematic Literature Review. *BMC Health Services Research*, 19, 1–17.
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to Conduct a Bibliometric Analysis: An Overview and Guidelines. *Journal of Business Research*, 133, 285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- Donthu, N., Kumar, S., & Pattnaik, D. (2020). Forty-five years of Journal of Business Research: A bibliometric analysis. *Journal of Business Research*, 109, 1–14. <https://doi.org/10.1016/j.jbusres.2019.10.039>
- Huang, Z., & Yuan, L. (2024). Enhancing Learning and Exploratory Search With Concept Semantics in Online Healthcare Knowledge Management Systems: An Interactive Knowledge Visualization Approach. *Expert Systems with Applications*, 237, 121558. <https://doi.org/10.1016/j.eswa.2023.121558>
- Koumamba, A. P., Bisvigou, U. J., Ngoungou, E. B., & Diallo, G. (2021). Health Information Systems in Developing Countries: Case of African Countries. *BMC Medical Informatics and Decision Making*, 21, 1–10.
- Phan, A.-C., Phan, T.-C., & Trieu, T.-N. (2022). A Systematic Approach to Healthcare Knowledge Management Systems in the Era of Big Data and Artificial Intelligence. *Applied Sciences*, 12(9), 4455. <https://doi.org/10.3390/app12094455>
- Primova, H. A., Sakiyev, T. R., & Nabiyeva, S. S. (2020). Development of Medical Information Systems. *Journal of Physics: Conference Series*, 1441(1), 12160. <https://doi.org/10.1088/1742-6596/1441/1/012160>

- Soesanto, H., & Handalani, R. T. (2023). Analisis Bibliometrik Tentang Tren Penelitian Mengenai Manajemen Pengetahuan Berdasarkan Afiliasi Penulis dari Indonesia. *Andragogi: Jurnal Diklat Teknis Pendidikan Dan Keagamaan*, 11(1), 1–10. <https://doi.org/10.36052/andragogi.v11i1.304>
- Syam, A. D. (2019). Manfaat dan Hambatan dalam Pelaksanaan Sistem Informasi Keperawatan. *Jurnal Keperawatan Muhammadiyah*, 156–164. <https://doi.org/10.30651/JKM.V4I2.2203>
- Walsham, G. (2020). Health Information Systems in Developing Countries: Some Reflections on Information for Action. *Information Technology for Development*, 26(1), 194–200. <https://doi.org/10.1080/02681102.2019.1586632>
- Zhang, Y., You, X., Huang, S., Wang, M., & Dong, J. (2022). Knowledge Atlas on the Relationship between Water Management and Constructed Wetlands—A Bibliometric Analysis Based on CiteSpace. *Sustainability*, 14(14), 8288. <https://doi.org/10.3390/su14148288>