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Bibliometric analysis on pharmaceutical care publications in Southeast Asia: prospective research trends

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ABSTRACT: Studies related to bibliometric analysis have been conducted globally to determine the development of pharmaceutical care. However, the prospective trends of scientific research associated with pharmaceutical care in Southeast Asia remain unclear. This study sets out to analyze and compare the results of pharmaceutical care research in Southeast Asian countries in terms of bibliometric indices**.** An investigation on the main electronic database Scopus was conducted for research purposes on pharmacy care in Southeast Asia until August 6, 2023. The analysis derived from the investigation included an evaluation of published document by year; lead author; country or territory, institutional affiliation, document type, subject area analysis; citation and co-citation analysis; journals that published the most articles, and the most researched topics. Microsoft Excel and VOSviewer were utilized to conduct a qualitative analysis on this dataset. This study adopted the co-authorship analysis, co-citation analysis and keyword analysis in order to gain an insight onto the research prospects and trends in pharmaceutical care. A total of 1,261 studies correlating to pharmaceutical care in Southeast Asia met the criteria for qualitative analysis. The top three countries with the highest number of publications were Malaysia, Thailand and Indonesia. Malaysia had the highest citation count (n=4670, 27.45%), followed by Thailand (n=3292, 19.35%), and Vietnam (n=3096, 18.20%). From networks of co-authorship analysis of authors, there were no collaborations found among authors in Southeast Asia. Prospective research analyzing keywords related to the theme of pharmaceutical care includes pharmacy practice, medication adherence, and qualitative research. Bibliometric analysis provides a comprehensive view of the field and status of pharmaceutical care research to develop prospective future trends and collaborations in Southeast Asia. A bibliometric analysis suggests that stronger teamwork among Southeast Asian researchers is crucial for future advancements.

KEYWORDS: Bibliometric analysis; pharmaceutical care; pharmacy services; Southeast Asia.

INTRODUCTION

The fundamentals of pharmaceutical care are based on the idea of good pharmacy practices, a strong focus in addressing the needs of the patient, and a system which adapts to the changing economy. The goal is to provide patients with medication that is reasonable, evidence-based, and advantageous to society [1]. In the past decades, the idea of pharmaceutical care has truly changed & evolved. At present, “medication therapy management," "pharmaceutical assistance," and "pharmacy services" are among the many additional words that seemed to characterize "pharmacist care activities" [2].

Researchers are dedicated to creating innovative pharmaceutical care systems, which are gradually becoming essential in established healthcare systems and improving both economic and health outcomes. The scope of basic pharmaceutical care varies from traditional pharmaceutical care, which involves dispensing, counseling, distribution, storage, and procurement; to enhanced pharmaceutical care, including prescription monitoring, drug utilization review, pharmaceutical care, pharmacovigilance, pharmaco-economics, services at drug information centers, and poison control centers [2].

The development and status of pharmaceutical care research publications in Southeast Asian Nations (ASEAN) need to be explored and analysed. In the framework of ASEAN harmonization and cooperation in the ASEAN context, COVID-19 created opportunities for collaborative strategies and efforts in fighting the pandemic through extensive research and community relations & services. This is in line with ASEAN's commitment to working together to improve the quality of life of people living in the region [3]. In the

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aftermath of the pandemic, research collaboration between faculties of pharmacy colleges in Asian countries can be strengthened to develop problem-solving solutions. The utilization of pharmaceutical research publications in the community in Southeast Asian countries needs to be enhanced [4].

Bibliometric analysis is a useful technique for rapidly identifying the progress and future direction in research under certain circumstances. It has been widely applied in numerous contexts and is now regarded as an interdisciplinary science based on statistical and visual aids. For instance, a bibliometric analysis of studies on multiple criterion decision-making displayed how the field was developing and what areas of research were prioritized at different times [5].

Bibliometric analysis has been used to analyse and provide a comprehensive comparison of the results from differing pharmaceutical care researches in Southeast Asia countries until 6th August 2023. This analysis approach has been used to identify output levels, research focus and influential authors in the region. This year was chosen due to the many publications that have accumulated which are considered great research materials publications. In addition, there have been study cases which analysed the past twenty years in global trends of pharmaceutical care research [6] and Global research trends and hotspots in pharmaceutical care: a bibliometric analysis and visualisation using CiteSpace and VOSviewer [7]. There are also other studies related to the publication area of pharmacy, A bibliometric analysis of pharmacology and pharmacy journals [8], Pharmacist care activities: a bibliometric analysis [9], and Contribution of faculties of pharmacy in Arab countries to pharmacy practice research: a bibliometric analysis (1990–2020) [10]. This study aims to discover research performance from a large amount of bibliometric data to present the state of the intellectual structure and emerging trends of pharmaceutical services research publications in Southeast Asia.

The approach used in this study is the bibliometric analysis of pharmaceutical care. This method has been employed in previous studies, but they were global in scope and publication databases are retrieved from Web of Science Core Collection (WoSCC) [6]. Furthermore, bibliometric studies have a strong focus on Southeast Asian Nations (ASEAN), but their impact is still unknown. We collected publications using the largest scientific database, Scopus [10]. Therefore, this research fills the gap in the literature and provide more recent & up-to-date information for ASEAN Scholars working on pharmaceutical care areas, suggesting prospective pharmaceutical care topic that may have been overlooked. This study enables researchers to identify research topics across countries and high-impact publication related to pharmaceutical care research and practices.

Bibliometric studies are frequently undertaken to dissect the extensive components of research within a particular field, encompassing authors, institutions, countries, and journals. Within the scientific realm, these studies typically aim to unveil the bibliometric framework that delineates the connections among research components, thereby contributing to the intellectual landscape shaped by clusters of relevant themes within the research domain. The scope of such studies should be reasonably broad to justify bibliometric analysis, as this analytical approach is adept at processing substantial volumes of bibliometric data [11].

Researchers can assess the adequacy of the study's scope by examining the quantity of papers available within the targeted research field. If there is a substantial number, such as several hundred (e.g., 500 or more) or even thousands of papers, then the research field can be deemed sufficiently extensive to justify the application of bibliometric analysis. This abundance of literature signals a rich reservoir of data that can be effectively analysed using bibliometric techniques.

▪ MATERIALS AND METHODS

Materials

The data search for bibliometric analysis was conducted to retrieve all relevant articles regarding pharmaceutical care in Southeast Asian countries. Bibliometric publication data were collected from Scopus, recognized as the world's largest multidisciplinary database for recent scholarly literature [8]. Scopus was chosen for its wide subject coverage, high-quality indexing, and advance cititation analysis tools. The systematic search followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines for this study [12]. The primary data utilized were extracted from the citation index of the Scopus database using an advanced search strategy on August 6, 2023. The search terms utilized were derived from titles, abstracts, and keywords and included the following phrases:

((pharmacy AND care)OR(pharmaceutical AND care) OR (pharmaceutical AND service) OR (pharmacy AND service) AND ((philippines) OR (indonesia) OR (malaysia) OR (thailand) OR (cambodia) OR (brunei) OR (singapore) OR (laos) OR (lao AND pdr) OR (vietnam) OR (myanmar) OR (burma) OR (timor-leste) OR (east AND timor) OR (timor)).

Study design

The inclusion criteria for the study proceeded by limiting the research to countries or regions within Southeast Asia [13]. The search strategy utilized AND to filter studies that addressed both pharmacy-related topics and Southeast Asian countries, while OR expanded the scope by including various terms for pharmacy services and listing all relevant nations in the region. In this study, *pharmaceutical care* refers to the direct role of pharmacists in improving medication therapy and patient outcomes, following established definitions in pharmaceutical sciences and healthcare policy literature. Subsequently, the exclusion criteria comprised non-articles and reviews, non-English language publications, and non-journal source types. Finally, studies meeting the inclusion criteria were marked and exported as Full Records and Reference in plain text Excel format (CSV). Data extraction was performed from publicly accessible open-access databases. Therefore, ethical clearance was not required [5].

Bibliometric analysis

Bibliometric performance analysis was conducted using the analysis feature of the Scopus website search results for article publications based on year, authors, institutional affiliations, countries or regions, types, subject areas, and funding sources [14]. The knowledge map tool was visualized using VOSviewer 1.6.19 software to depict knowledge maps of institutions, authors, journals, and keywords [15]. Microsoft Excel for Microsoft 365 was utilized to assess the quality and completeness of available bibliometric data and to conduct analysis on the distribution timeline and citation trends of publications.

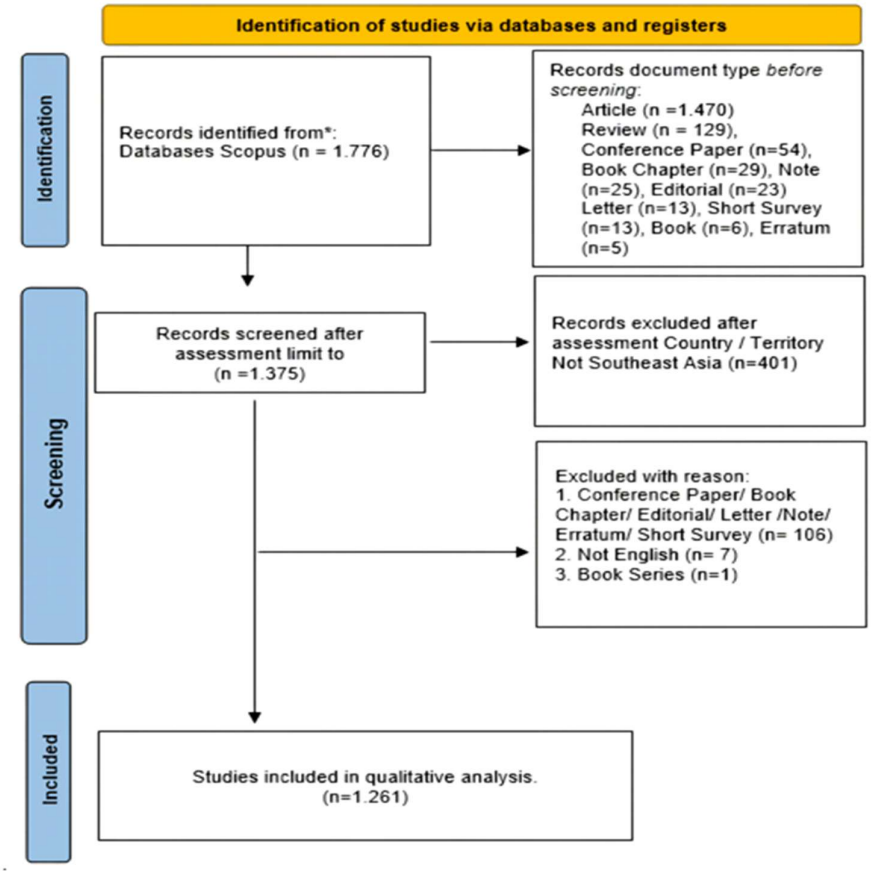


Figure 1. Documentation selection.

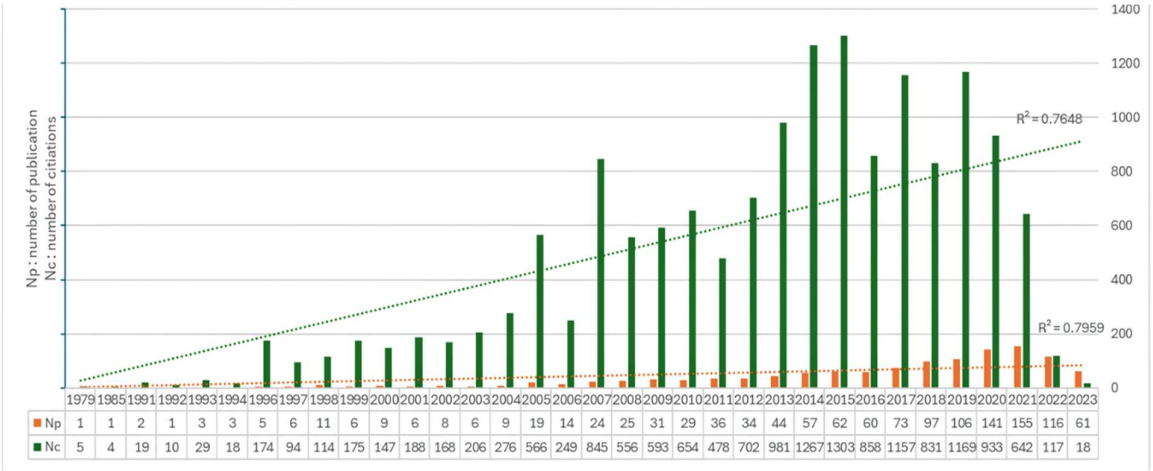
RESULTS

This study obtained a total of 1,776 publications from the initial search strategy, comprising of articles (n=1,470), reviews (n=129), conference papers (n=54), book chapters (n=29), notes (n=25), editorials (n=23), letters (n=13), brief surveys (n=13), books (n=6), and erratum (n=5). Data were filtered based on the inclusion criteria, including only Southeast Asian countries & non-South East Asian nations (n=401), and exclusion criteria, excluding non-articles & reviews (n=106), non-English language publications (n=7), and non-book series (n=1). A total of 515 documents were retained after applying the screening criteria, with 1,261 articles used for analysis (Figure 1.).

An overview of studies pharmaceutical care research publications in Southeast Asia

Based on the process of retrieving documents, the volume of publications (Np) focusing on pharmaceutical care themes, spanning from 1979 to 2023, totalled 1,261, comprising of 1,197 articles and 64 review articles. The total number of citations (Nc) amounted to 15,546, with an average citation rate of 12.32 per publication. Figure 2 illustrates the trends in publications and citations related to pharmaceutical care research over the years.

The annual counts of Np and Nc showed an upward trend over the years, with respective correlation coefficients R2 reaching 0.7645% and 0.7959%. Starting from 2019, the annual Np surpassed 100 articles whilst the annual Nc demonstrated a significant increase each year since 2005. These findings indicate a growing interest in the field of pharmaceutical care.



	1979	1985	1991	1992	1993	1994	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Np	1	1	2	1	3	3	5	6	11	6	9	6	8	6	9	19	14	24	25	31	29	36	34	44	57	62	60	73	97	106	141	155	116	61
Nc	5	4	19	10	29	18	174	94	114	175	147	188	168	206	276	566	249	845	556	593	654	478	702	981	1267	1303	858	1157	831	1169	933	642	117	18

Figure 2. Annual output of publication and cititation in the study of pharmaceutical care form 1979.

Countries contributions to Southeast Asia publication

A total of 10 countries in Southeast Asia published articles in the field of pharmaceutical care. Five countries produced 1,251 articles, which embodied 91.45% of the publications that originated from Southeast Asia. The three most productive countries in terms of Np are Malaysia (n=421, 30.77%), Thailand (n=303, 22.15%), and Indonesia (n=236, 17.77%). In addition, publications from Malaysia had the highest Nc count (n=4670, 27.45%), followed by Thailand (n=3292, 19.35%), and Vietnam (n=3096, 18.20%). Amongst the countries in Southeast Asia, there were 10 ASEAN member states that have publications. Timor-Leste is a Southeast Asian country that does not have any publications. As shown in Table 1, Malaysia is dominating the field of pharmaceutical care with a lead in both Np and Nc compared to other nations. It was also observed that Laos had the highest average citation count per article. This indicates a significant interest surrounding topics related to pharmaceutical care. Additionally, 10 Southeast Asian countries, with at least five documents in co-authored collaboration, were analysed using VOSviewer. Overlay visualization in Figure 3 demonstrate the collaborations that have occurred amongst countries. Indonesia, Myanmar and Brunei darussalam, have emerged in pharmaceutical care research in the last 3 years.

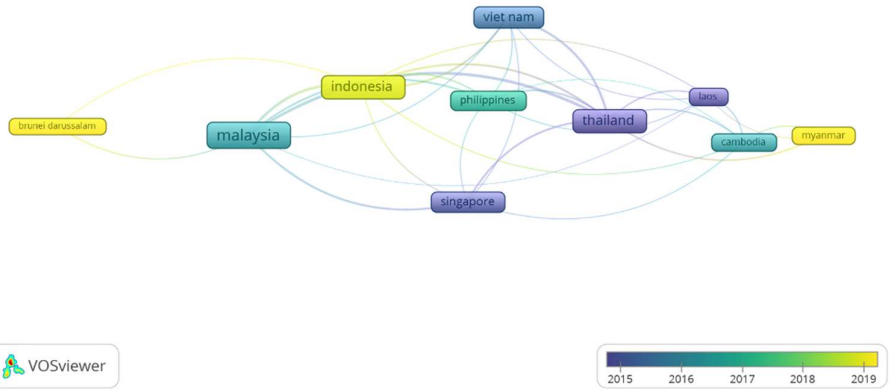


Figure 3. Co-authorship of countries Overlay Visualization with more than 5 publications

Table 1. Number publication, number citiations and average Nc/Np.

Countries	Number publications (Np)	Number citiations (Nc)	Nc/Np
Malaysia	421	4.670	11.09
Thailand	303	3.292	10.86
Viet nam	161	3.096	19.23
Indonesia	236	1.355	5.74
Singapore	130	2.986	22.97
Philipines	47	561	11.94
Laos	33	803	24.33
Myanmar	20	106	5.30
Cambodia	12	129	10.75
Brunei darussalam	5	12	2.40

Analysis of institutions

A total of 3,764 institutions were involved in this field. The top ten institutions with the highest Np and Nc in research on pharmaceutical care are presented in Table 2. Universiti Sains Malaysia (n=31) emerged as the leading institution in terms of Np, followed by University of Malaya (n=26) and National University of Singapore (n=18). Universiti Sains Malaysia (cited 595 times) had the highest recorded Nc, followed by University of Malaya (cited 474 times), and International Medical University (cited 278 times). The cooperative relationships amongst the 28 institutions that have published a minimum of five documents, with only 6 institutions interconnected. These are divided into 2 Cluster groups. In the top group 1, there is Universiti Sains Malaysia. In the top group 2, there is International Medical University, Malaysia.

Table 2. Total Np and Nc of the top 10 institutions.

Organization	Np	Nc	Nc/Np	Country
Universiti Sains Malaysia	31	595	19.19	Malaysia
University of Malaya	26	474	18.23	Malaysia
National University of Singapore	18	191	10.61	Singapore
Universiti Kebangsaan Malaysia	16	124	7.75	Malaysia
International Medical University	15	278	18.53	Malaysia
Mahidol University	13	89	6.85	Thailand
Monash University Malaysia	12	96	8.00	Malaysia
Universitas Airlangga	11	63	5.73	Indonesia
Chulalongkorn University	8	41	5.13	Thailand
Universitas Gadjah Mada	8	27	3.38	Indonesia

Analysis of authors

A total of 1,233 authors contributed to publications in this field from 1979 to 2023. The top ten most productive authors are listed in Table 3. They contributed in the publications of 140 articles, which account for 11.1% of the total publications. Hassali, M.A from Universiti Sains Malaysia had the highest H-index of 67. Author Hassali, M.A also published the most articles (n=60), followed by Shafie, A.A. from Universiti Sains Malaysia (n=24), Saleem, F. from University of Balochistan (n=20), Ibrahim, M.I.M from Qatar University (n=20), and Chaiyakunapruk, N. from University of Utah (n=16). Additional findings indicated that Hassali, M.A to be the most cited author (cited 907 times), followed by Shafie, A.A. (cited 514 times), Chaiyakunapruk (cited 419 times), and Ibrahim, M.IM (cited 410 times). Figure 4 shows that Hassali, M.A, Shafie, A.A., and Chaiyakunapruk are early researchers involved in pharmaceutical care over the past 10 years with significant impact based on their citations. By tracking the specific research areas of these authors and examining their articles, we can quickly gain insights into the field of pharmaceutical care. Hassali, M.A and his colleagues primarily focus on community pharmacy, pharmacy education, medication safety, and patient safety. Shafie, A.A. is more focused on public health, health economics, health technology assessment, health systems, health care management, and economic evaluation. Chaiyakunapruk, N. is more focused on systematic reviews, health economics, pharmacovigilance, and Pharmacoeconomics. Furthermore, no collaboration network was identified amongst the 27 authors who published more than two books. This indicates inadequate collaboration amongst authors in the pharmaceutical care research field.

Table 3. The Top 10 productive author in the field of pharmaceutical care.

Rank	Author	Institution	Np	% of (1.261)	H-Index
1	Mohamed Azmi Hassali	Universiti Sains Malaysia	60	4.8%	67
2	Asrul Akmal Shafie	Universiti Sains Malaysia	24	1.9%	47
3	Fahad Saleem	University of Balochistan, Pakistan	20	1.6%	42
4	M.I.M Ibrahim	Qatar University	20	1.6%	42
5	Nathron Chaiyakunapruk	University of Utah	16	1.3%	57
6	Siew Siang Chua	Taylor University	15	1.2%	22
7	Andi Hermansyah	Universitas Arilangga	15	1.2%	17
8	Goran Tomson	Lao People's Democratic Republic	14	1.1%	65
9	Susi Ari Kristina	Universitas Gadjah Mada	13	1.0%	19
10	Ahmed Awaisu	Qatar University	12	1.0%	38

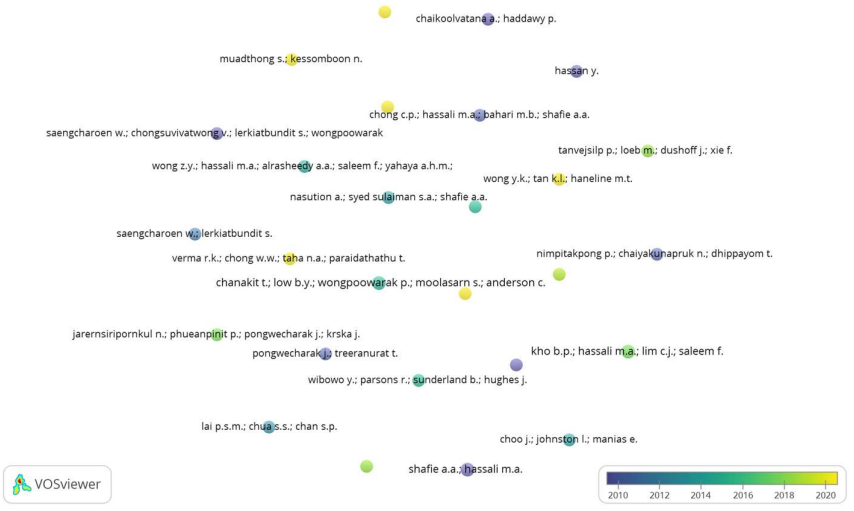


Figure 4. Co-authorship analysis of authors overlays visualization and cooperation among authors with more than 2 publications.

Analysis of journals

All articles were published in 485 academic journals. The top ten most productive journals in the field of pharmaceutical care are shown in Table 4. There were three journals from the UK, one from the United States, and one from the Netherlands. Approximately 160 articles were published in these journals. International

Journal of Clinical Pharmacy (n=42) published the most articles, followed by PLOS One (n=34), Pharmacy Practice (n=32), International Journal of Pharmacy Practice (n=28), and BMC Health Service Research (n=24). At the same time, the International Journal of Clinical Pharmacy has been cited 480 times, followed by PLOS One (cited 284 times), Pharmacy Practice (cited 359 times), International Journal of Pharmacy Practice (cited 312 times), and BMC Health Service Research (cited 255 times). Upon a closer examination of these journals, it was deduced that three journals were indexed in Scopus Q1 and two in Q2. Journal analysis signifies an area of interest in pharmaceutical care. Consistent with the core of pharmaceutical care, pharmaceutical care receives attention from journals specializing in clinical pharmacy, drugs, and pharmacy practice. Additionally, pharmaceutical care receives attention from the field of health policy.

Table 4. The Top 10 Journals in the field of pharmaceutical care.

Rank	Journal	Np	% of (485)	Nc	Nc/Np	Impact Factor	Quartile in Category
1	International Journal of Clinical Pharmacy	42	8.66%	480	11.43	2.4	81% (Q1)
2	Plos One	34	7.01%	384	11.29	3.7	87% (Q1)
3	Pharmacy Practice	32	6.60%	359	11.22	2.4	87% (Q1)
4	International Journal of Pharmacy Practice	28	5.77%	312	11.14	1.8	62% (Q2)
5	Bmc Health Services Research	24	4.95%	255	10.63	2.8	69% (Q2)
6	Journal of the medical association of Thailand	22	4.54%	118	5.36	NA	15% (Q4)
7	Systemactic Reviews in Pharmacy	20	4.12%	29	1.45	NA	NA
8	Journal of Pharmaceutical Policy and Practice	19	3.92%	64	3.37	4.2	90% (Q1)
9	Journal of Clinical Pharmacy and Therapeutics	17	3.51%	292	17.18	2	44% (Q3)
10	Pharmacy Education	17	3.51%	21	1.24	0.5	30% (Q3)

NA= not available, Q = quartile

Analysis of co-cited references

The co-citation analysis aims to identify research themes closely related to a specific field. The retrieved articles cited a total of 37,324 references. The top five references with high co-citations are listed in Table 5. Each reference was cited together more than 5 times. Opportunities and responsibilities driven by pharmaceutical care provided by pharmacists are common topics among them, including national drug policy, public health in community pharmacy, and the performance of retail pharmacies in Asian countries. Figure 5 shows the co-occurrence network of references cited more than 5 times. Of the 19 co-cited references, they are divided into 3 groups, symbolized by different colours. Group 1 (in red) includes 4 references, which generally evaluate the role of self-care and self-medication pharmacy, as well as research methods in pharmacy practice. Group 2 (in green) contains 4 references and generally focuses on clinical pharmacy in pharmaceutical care, public health in community pharmacy, and participation in pharmaceutical care roles and responsibilities. Group 3 (in blue) consists of 3 papers on opportunities and responsibilities in pharmaceutical care services, how to develop national drug policies, and the performance of retail pharmacies.

Analysis of keywords

From a total of 2,985 author keywords in this study, Figure 6 identifies 50 keywords with a threshold of over 9 in the co-occurrence author keyword in network visualization. The top 10 keywords are as follows: Pharmacist (n=116), Community pharmacy (n=105), pharmaceutical care (n=75), pharmacy (n=40), knowledge (n=38), covid-19 (n=37), primary care (n=28), hospital (n=24), patient satisfaction (n=21), and public health (n=20). Seven colors represent different clusters of keywords. Pharmaceutical care is in red, including adverse drug reactions, clinical pharmacy, diabetes mellitus, drug-related problem, hospital, hypertension, medication adherence, medication errors, patient safety, pharmacist, quality of live. Community Pharmacist is in green. This includes adherence, antibiotics, awareness, diabetes, medication, prescription, self-medication, and smoking cessation. The colour blue represents attitude, HIV, knowledge, perception, pharmacy students and practice. Covid-19 corresponded to yellow, which included education, pharmacy practice, primary care, professional practice, and qualitative research. Pharmacy was signified by the colour purple, which included physicians, student, and survey. The colour light blue represented malaria, public health, and tuberculosis. Patient satisfaction and service quality were denoted by the colour orange.

Analysis of keywords in overlay visualization was conducted over time to reveal the evolution trend in pharmaceutical care. In Figure 7, the strength of the top 50 keywords varies from 2013 to 2023. In 2013, the term "medication errors" was developed. Then, other topics emerged such as tuberculosis, patient safety,

hypertension, self-medication, prescription, and malaria. Keywords related to pharmacist and community pharmacy have been popular since 2016-2017. The topic pharmaceutical care had the highest burst strength in 2018, followed by pharmacy, attitude, drug related problem, professional practice, patient satisfaction, service quality, diabetes, and education. In 2019-2020, keywords of interest emerged such as qualitative research, pharmacy practice, clinical pharmacy, and medication adherence. In 2022, the keyword Covid-19 emerged. Overall, keyword analysis can be utilized to obtain the developmental trajectory of pharmaceutical care, including main research areas, current research concerns, and research trends. Before Covid-19, the themes of pharmacy practice, medication adherence and qualitative research emerged from pharmaceutical care. Our study reveals that pharmacy practice, medication adherence and qualitative research-based studies may be an interesting area for future research. From density visualization in Figure 8, pharmacist, pharmaceutical care, and covid-19 was of Hight weight and interconnected.

Table 5. The Top 10 Journals co-cited references in the field of pharmaceutical care.

Rank	Title	Nc	Author	Year	Journal
1	Opportunities and responsibilities in pharmaceutical care	33	Hepler C.D.	1990	American Jurnal of Hospital Pharmacy
2	The lao national drug policy: lessons along the journey	9	Paphassarang C.	1995	Lancet
3	Public health in community pharmacy: a systematic review of pharmacist and consumer views	6	Eades C.R.	2011	BMC Public Health
4	Using thematic analysis in psycholog	6	Braun V.	2006	Qualitative Research in Psychology
5	Performance of retail pharmacies in low- and middle-income asian settings: a systematic review	5	Miller R.	2016	Health Policy and Plannning
6	Consolidated Criteria for Reporting Qualitative Research (coreq): a 32-Item Checklist for Interviews and Focus Groups	4	Tong A.	2007	International Journal for Quality in Health Care
7	Self-prescribing By Way of Pharmacies in Three Asian Developing Countries	4	Tomson G.	1986	Lancet
8	The Quality of Private Pharmacy Services in Low and Middle-income Countries: a Systematic Review	4	Smith F.	2009	Pharmacy World & Science
9	Development of Patient-Reported Outcomes Measure of Pharmaceutical Therapy for Quality of Life (prompt-qol): A Novel Instrument for Medication Management	4	Sakthong P.	2015	Research in Social and Administrative Pharmacy
10	A Workshop on Smoking Cessation for Pharmacy Students	4	Saba M.	2013	American Jurnal of Hospital Pharmacy

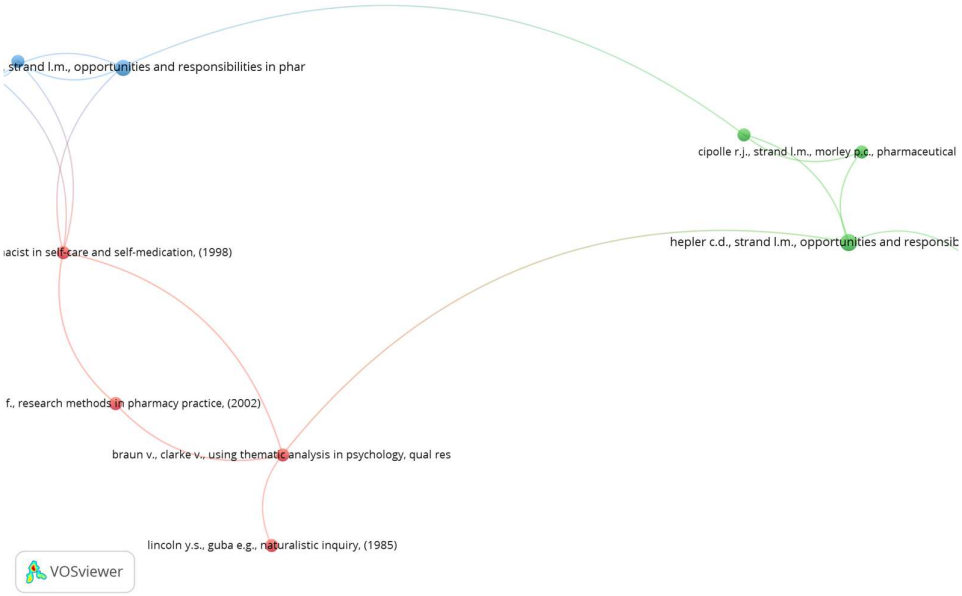


Figure 5. co-occurance analysis of co-cited reference cited more than 5 times.

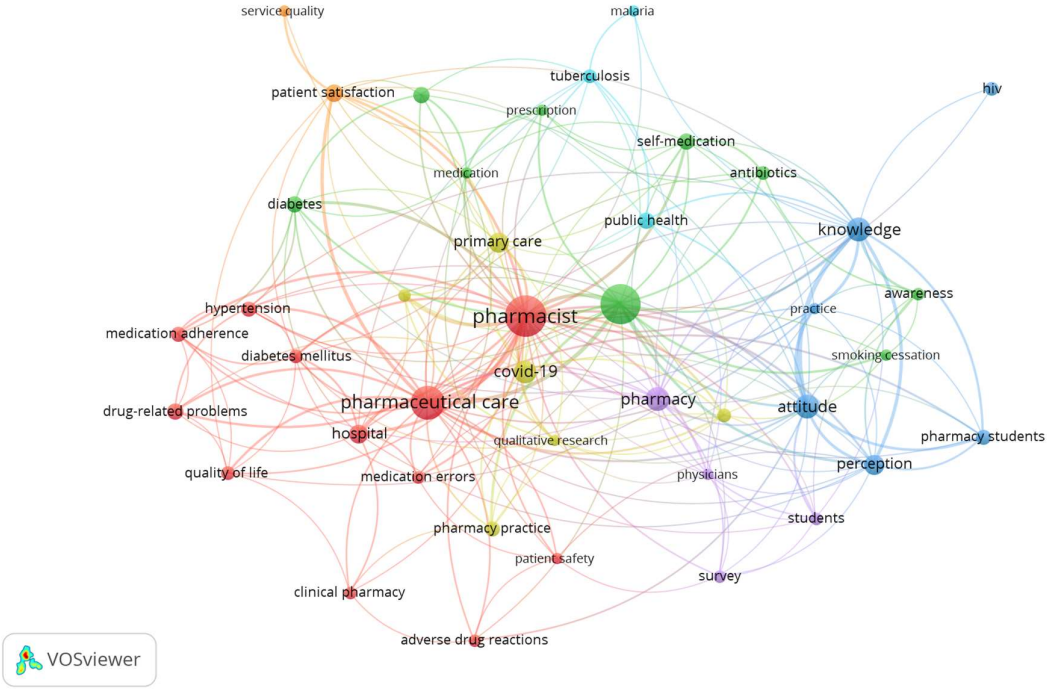


Figure 6. Analysis of keywords. co-occurance analysis of author keywords with threshold over 9.

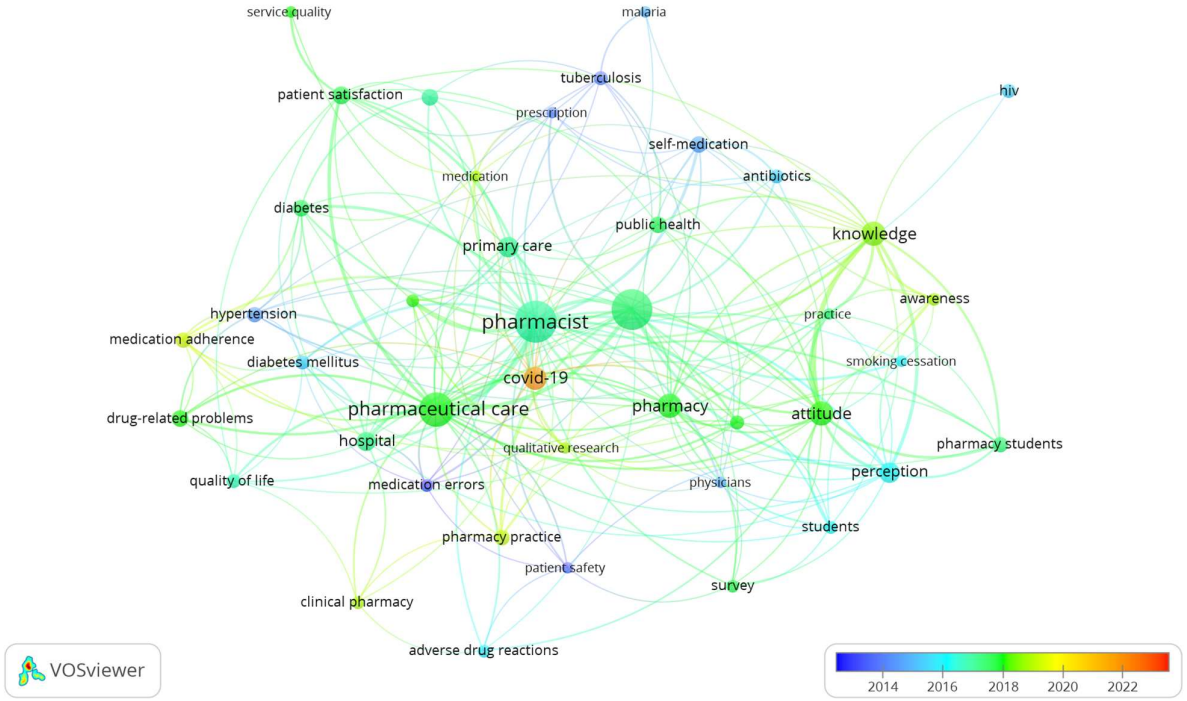


Figure 7. Analysis of keywords. Co-occurance analysis of author keywords Overlay visualitazation Year 2013 to 2023 with threshold over 9.

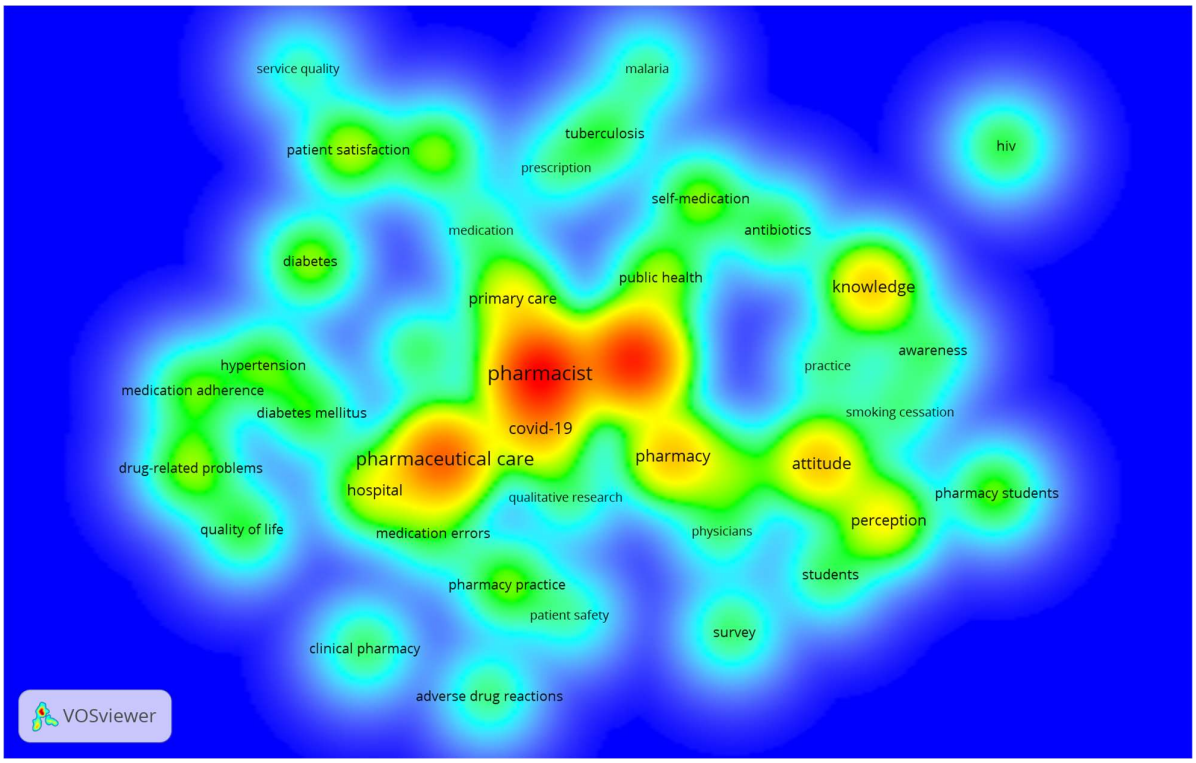


Figure 8. Analysis of keywords. Co-occurance analysis of author keywords Density Visualization with threshold over 9.

DISCUSSION

This research is essential for understanding the development of pharmaceutical care in Southeast Asia, identifying key trends, and addressing gaps in collaboration that impact healthcare improvements. Southeast Asia is a microcosm of global health, straddling vast Asian geography between India to the west and China to the north. Whilst these countries share many historical and cultural elements, this diversity also manifests in contemporary health achievements, with life expectancy ranging from 56 years in Myanmar to 81 years in Singapore [16]. In the last 10 years, research topics on pharmaceutical care have been found to be on the rise in Southeast Asian countries. This shows a similar relationship with research in the world to develop this field. When the data from the ten nations in the region were closely examined, it was revealed that five countries have emerged as key players, collectively accounting for over 90% of publications. Amongst these nations, Malaysia was the leading nation, boasting the highest number of publications and citations. This country became one of the top 10 countries in the world with the number of publications and citations [6]. Malaysian research productivity has grown substantially in the last two decades, driven by well-funded public research universities. Highly cited studies are often published in prestigious journals, involve international collaborations, and are linked to leading research institutions. Countries with high publication counts, such as Malaysia, likely benefit from stronger research infrastructure, greater funding allocations, and institutional prioritization of pharmaceutical care studies, leading to increased scholarly output and citations.

Southeast Asia lacks a fully effective structure for regional health cooperation. The split in the World Health Organization's regional structure has challenged the cohesion between the regions whilst ASEAN has yet to prioritize health issues, despite recent efforts to combat emerging infections and response to health emergencies [16]. Moreover, collaborative research effort amongst Southeast Asian countries have shown promise, with nations like Indonesia, Myanmar, and Brunei Darussalam witnessing an increase in joint publications, particularly in recent years. The pandemic Covid-19 has prompted collaborative strategies and efforts in Southeast Asia [17]. Through research initiatives, community engagement, and shared learning materials, institutions have strengthened their partnerships and collaborations. It has also facilitated knowledge exchange and innovation within the ASEAN region [4].

In Southeast Asian countries, the top 10 institutions that produced the most publications originated from Malaysia (n=100), followed by Thailand (21), Indonesia (19), and Singapore (18). Universiti Sains Malaysia and University of Malaya played a significant role in the total number of citations. Universiti Sains Malaysia (USM) and University of Malaya (UM) have consistently ranked among the top universities globally, reflecting their strong research contributions and academic influence. UM maintained its position within the top 100 universities worldwide for employer reputation, further solidifying its status as a leading institution in Southeast Asia. These rankings highlight the impact of Malaysia's investment in research and development, fostering innovation and academic excellence on an international scale.

Malaysia, Thailand, and Singapore had more resources expended, which yielded a high %GDP for Research and Development. Countries that emphasize the progression of research development and the advancement of technology demonstrate a correlation with increased research output, both in terms of quantity and impact [13].

From the collective efforts of the 1,233 authors that contributed to driving the research on the field of pharmaceutical care, Hassali, M.A. from Universiti Sains Malaysia stand out for their prolific contributions, with an impressive H-index of 67 and a staggering 60 published articles, which was indicative of their significant impact on the scholarly landscape. Hassali, M.A. distinction as the most cited author underlined the profound influence of his work, as reflected in the extensive citation count, underscoring the widespread recognition and relevance of his research within the academic community. Hassali, M.A. has significantly contributed to pharmaceutical care research, particularly in medication adherence, pharmacy practice, and healthcare policy in developing countries. His extensive work, with a high citation impact, highlights the role of pharmacists in improving patient outcomes and addressing medication-related challenges Analysis of the thematic areas explored from the authors' journal show the role of a pharmacist in developing countries [18], the knowledge & behaviour of patients diagnosed with diabetes [19], antibiotic use [20], medication adherence [21], medication disposal practices [22], antimicrobial resistance [23], and general drug policy [24]. However, there is a lack of network collaboration amongst the authors.

Collaboration between researchers in Southeast Asia must be enhanced. Although ASEAN has emphasized the importance of educational cooperation between its member states, research cooperation remains low [25]. The lack of collaborative cooperation between researchers from ASEAN countries may be a barrier to the advancement of pharmaceutical care research in the region. The EU Competent Research Centres' (CRC's) Survey Report provide key barriers to researchers' collaboration, which include time constraints, funding, and finding suitable partners [26]. These obstacles can be overcome by using digital technology, creating funding agencies in the framework of ASEAN harmonization, and finding partners through searching for researchers' articles in reputable journals.

Pharmaceutical care research topics in Southeast Asian countries have been published in highly reputable journals on Scopus. International Journal of Clinical Pharmacy has the highest number of publications (n=42), followed by Plos One (n=34) and Pharmacy Practice (n=28). This increase in publications is because there were also journals that remained specific to the field of pharmaceutical services. It was also found that the journal, "Systematic Reviews in Pharmacy", no longer has an impact and is not listed in Scopus. An example of a relevant journal article is "*Clinical Pharmacy Practice in the Care of Chronic Kidney Disease Patients: A Systematic Review.*" This study systematically examines the role of clinical pharmacists in managing medication therapy, optimizing treatment outcomes, and improving patient care for individuals with chronic kidney disease.

The occurrence of co-cited references and keywords hinted that pharmacy practice is a fundamental theme in pharmaceutical care. Medication adherence and qualitative research were also implied in analysis keyword. Pharmacy practice aims to contribute with the improvement of health and aid patients with their health problems related to medicines [9]. Pharmaceutical Care involves giving the right medication to patients to help them get better or stay healthy. It is the responsibility of the pharmacist to find and fix any issues related to medicines and health in order to improve their patient's quality of life. This represents a continual enhancement process to ensure the quality of medication usage [1]. In Asia, with Low-Middle Income Countries, the provision quality provided to the public falls below the globally recognized standards in pharmacy practice. Such inadequate practices can pose detrimental effects on public health, thus underlying the need for heightened attention from researchers in the field of public health [27].

Medication adherence is referring to how well patients follow their prescribed medication regimens as instructed by the pharmacist. It is essential for patients to take their medications regularly and correctly to ensure that the treatment works effectively. Failure to adhere to medication schedules can lead to various health problems and may prevent patients from achieving the desired treatment outcomes [28]. Maintaining patient adherence with medication remains a substantial obstacle in healthcare, with few effective interventions available to tackle this challenge [29]. Good Pharmacy practice plays a vital role in enhancing medication adherence [30]. Qualitative research approach has increasingly become prevalent in health services research, extending to pharmacy research in recent years. These designs serve as effective tools for researchers in pharmacy practice to investigate into and grasp the perspectives, perceptions, and emotions of patients and professional healthcare [31]. These themes have become prospective trends in Southeast Asia in pharmaceutical care research.

▪ CONCLUSION

In conclusion, Southeast Asia still lacks effective structures for regional health cooperation. Collaborative research efforts have shown promise, especially in response to the COVID-19 pandemic, fostering partnerships and knowledge exchange within the ASEAN region. Whilst research productivity varies across institutions and countries, emphasis on research development correlates with increased resources and technological advancement. Furthermore, there is a noticeable lack of network collaboration amongst authors, hindering the advancement of research in pharmaceutical care.

Enhanced collaboration among researchers in Southeast Asia is imperative for further progress. While ASEAN promotes educational cooperation, research collaboration remains low. Key barriers such as time constraints, funding limitations, and partnership identification need to be addressed through digital technology, harmonized funding mechanisms, and proactive networking strategies.

The findings of this study highlight the potential trends of pharmaceutical care research in Southeast Asia published from 1979 to 2023 and indicate the key topics of this field. Based on bibliometric analyses of

citations and keyword occurrences, the research topics are pharmaceutical practice, medication adherence and research using a qualitative approach. The need for Pharmaceutical Care to improve pharmacy practice standards and address medication adherence issues is an ongoing topic. Medication adherence, a crucial aspect of patient care, remains a significant challenge in healthcare, necessitating interventions to ensure treatment effectiveness. Good pharmacy practice plays a pivotal role in enhancing medication adherence, while qualitative research methodologies offer valuable insights into patient perspectives and experiences. This study review could contribute to highlighting the trends prospective research directions of pharmaceutical care in Southeast Asia.

The bibliometric analysis conducted in this study allows researchers to track the evolution of pharmaceutical care research across Southeast Asia, identifying emerging trends and key focus areas. Furthermore, by mapping high-impact publications, this study provides valuable insights into influential research contributions, guiding future studies and policy development in pharmaceutical care.

This bibliometric study has limitations, including language bias from only analyzing English publications, publication lag affecting recent research visibility, and missing grey literature such as policy reports and institutional studies. Additionally, reliance on specific databases may introduce selection bias, while collaboration metrics may not fully capture informal research partnerships.

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