Asian Journal of Research in Education and Social Sciences
e-ISSN: 2682-8502 | Vol. 6, No. 2,162-174, 2024
http://myjms.mohe.gov.my/index.php/ajress

Delving into the Dynamics of Opium Research: A Bibliometric Perspective

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Received: 23 March 2024 | Accepted: 9 May 2024 | Published: 1 June 2024

DOI: https://doi.org/10.55057/ajress.2024.6.2.13

Abstract: *Opium was an important commodity in trading activities in Asia in the century the 19th. In Malaya, opium is also an important commodity where the Strait Settlements carried out a lot of opium import and export during the British and Ducth era. This study aims to explore opium research-related publishing patterns and rank the most used author keywords in the Scopus and Web of Science (WoS) databases. The eminent software, ScientoPy and VOSviewer, are used to run and execute relevant publication data retrieved from Scopus and WoS. The results showed a positive trend in the growth of opium literature in both databases since 2002. The top three research areas that dominate this topic are "chemistry", "plant sciences", and "substance abuse". Based on the country analysis, Iran has become an active publisher, followed by United States and United Kingdom. Importantly, this study emphasizes the use and history of opium research. The trends will assist researchers in recognising the various fields in identifying the core areas, proactive institutions, and productive authors published in this knowledge for supplementary investigation. Besides, by examining the most popular keywords, the results of this study enable researchers to discover the possibility for future research that may be conducted, particularly concerning the annual growth rates, which have been trending in the last five years.*

Keywords: Opium, Heroin, Drugs, Morphine, Bibliometric Perspective

1. Introduction

Opium is a plant that originates from areas in West Asia whereas The Arabs have been spread this plant to India, then to China via Burma and Yunan (Nasir, 2020). Opium not only contributed to British income in Malaya, however also contributed to the income of other colonial powers in Southeast Asia such as the Dutch in Java. Opium has brought income to the colonial side through two ways namely opium tax and opium trade (Fang & Nordin, 2017) Therefore, it cannot be denied that opium was as a source income for the colonial powers.

In the early history of opium activities and trade, the presence of opium in the Malay States is only a trade commodity. However, the situation was changed when the habit of taking opium as a hallucinogenic substance began to permeate local communities (Marimuthu & Haniffa, 2021). Majority of local opium smokers were kings and Malay magnate because they consider smoking opium as an indicator of luxury status life. Meanwhile, the citizens are not stuck with

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this practice due to the high price of opium. Besides, during medieval and Tudor England, the medicinal and recreational qualities of opiate drugs are particularly difficult to disentangle, and addiction to opium was likely common among working people who used it either to alleviate the pain of physical ailments, to relieve emotional strain or for enjoyment (Moncrieff, 2006).

The use of opium today is primarily for medical purposes. Medically, opium and its derivatives, such as morphine and codeine, are used for pain relief, particularly in cases of severe pain such as after surgery or in palliative care for terminal illnesses (Koller et al., 2019). Opium-derived medications are carefully regulated and prescribed by healthcare professionals due to their potential for addiction and abuse. However, it's important to note that the use of opium for recreational purposes is illegal in most countries due to its highly addictive nature and associated health risks (Degenhardt et al., 2019). Additionally, the production and trafficking of opium and its derivatives are often linked to organized crime and pose serious challenges for law enforcement and public health authorities.

It is challenging for researchers to evaluate the material's current grasp, usefulness, and future direction due to the volume of information and the never-ending publication of the study on any research topic (Abdullah & Sofyan, 2023). It is, thus, in order to address the issue of excessive information availability and the breadth of different research topics, specific methodologies, such as bibliometric analysis, assist scholars and researchers in gaining a broad or even microscopic view of the overall progress and steady and continuous flow status (Gazali et al., 2021). Information retrieval is crucial to the cross-disciplinary field; this process can analyse aspects of information science and publication trend analysis. The bibliometric technique visualises vast publishing outputs necessary for deriving valid conclusions, such as the evolution of publications, study fields, and influential authors (Sofyan & Abdullah, 2022).

Bibliometrics made it easier for researchers to identify research gaps, emerging research prospects, and significant research areas (Abdullah & Othman, 2022). It indirectly enables them to summarise the significant trends of a particular study field. This study used Scopus and Web of Science (WoS) databases and was executed using ScientoPy to accomplish bibliometric analysis. The current study's primary goal was to identify patterns in opium-focused publications.

In contrast to most previous literature reviews that focused on single aspects of opium, this study contributes to a more systematic and updated analysis to better understand the landscape of opium research. Specifically, this study addressed the following question:

i. RQ1: What is the trend of research on opium published to date?
ii. RQ2: Which countries contribute significantly to the study of opium?
iii. RQ3: Who are the most prolific authors on opium research?
iv. RQ4: What are the most institutional of publications on opium?
v. RQ5: What are the main keywords of scientific research on opium?

2. Data and Methods

Figure 1 depicts the data processing sequence in this analysis based on Abdullah (2022). It consists of a systematic strategy that has been divided into three primary parts. First, the title should be determined, and the datasets be developed and gathered. The second phase involves integrating the databases and obtaining the ScientoPy-analysable parameters. In the last stage, ScientoPy and VOSviewer parameters are used to evaluate and analyse the results.

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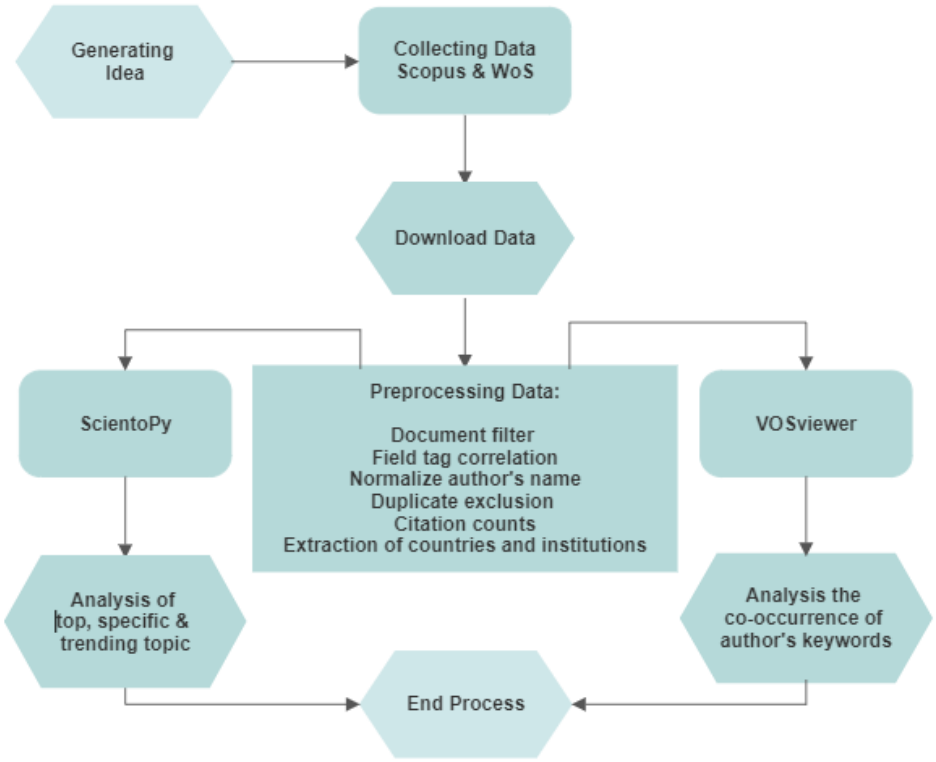


Figure 1: Selection strategy and research protocol

Given the multifaceted nature of the studied topic, the literature on opium study is spread across many different fields. As a result, it was necessary to use accessible and numerous bibliographic databases to search for and find pertinent material on this subject. As a result, the two primary databases, Scopus and Web of Science (WoS), were used to collect the data for this study. The Scopus and WoS database is preferred since it is a multidisciplinary database with more articles in social science, education-related journals, management and other documents in various academic disciplines (Sweileh, 2022; Visser et al., 2021). The Scopus and WoS databases also attract most scholars to obtain publications for their review purposes (Abdullah et al., 2023). These databases span multiple fields (Martín-Martín et al., 2021), and searching them would aid researchers in locating the most significant number of citations on opium primary sources for bibliometric studies (Pranckutė, 2021). After defining the databases, the search query "opium" was chosen. The following fields were scanned for topic-related terms: article title, abstract, keywords. This inquiry was completed on Nov 7, 2023.

During the second stage, ScientoPy was used to preprocess the data. The secondary dataset is then established for the following analysis stage. ScientoPy uses the following criteria during the pre-processing steps; (i) normalising the author's name: it is replaced with a semicolon for metadata retrieved from the Scopus database, it is stripped of dots, commas, and special characters for metadata retrieved from both databases, and (ii) removing duplicate samples with the same title and authors (Ruiz-Rosero et al., 2019). The pre-processing information is recorded in Table 1. Based on Table 1, the ScientoPy pre-processing script priorities Scopus documents over WoS documents; after duplicate removal, there are more papers in Scopus databases than in WoS. This study used a raw source dataset of 12072 papers from the WoS and Scopus databases. In this study, 2075 of the 12072 loaded papers were eliminated due to ScientoPy's analysis focusing exclusively on five types of publications: (i) conference papers, (ii) articles, (iii) reviews, (iv) proceeding papers, and (v) articles in press (Ruiz-Rosero et al., 2019). Thus, other publications such as books, letters, and errata were omitted. Following data

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reconciliation, this study examined 7818 papers from both databases, containing 3762 papers from WoS and 4056 papers from Scopus, removing 2089 from Scopus and 90 duplicate papers from WoS.

Table 1: Information on pre-processed data analysis

Information	Number	Percentage (%)
Loaded papers	12072	
Omitted papers by document type	2075	17.20
Total papers after omitted papers removed	9997	
Loaded papers from WoS	3852	38.50
Loaded papers from Scopus	6145	61.50
Duplicated papers found	2179	21.80
Removed duplicated papers from WoS	90	2.30
Removed duplicated papers from Scopus	2089	34.00
Duplicated documents with different cited by	1438	66.00
Total papers after duplicate removal	7818	
Papers from WoS	3762	48.10
Papers from Scopus	4056	51.90

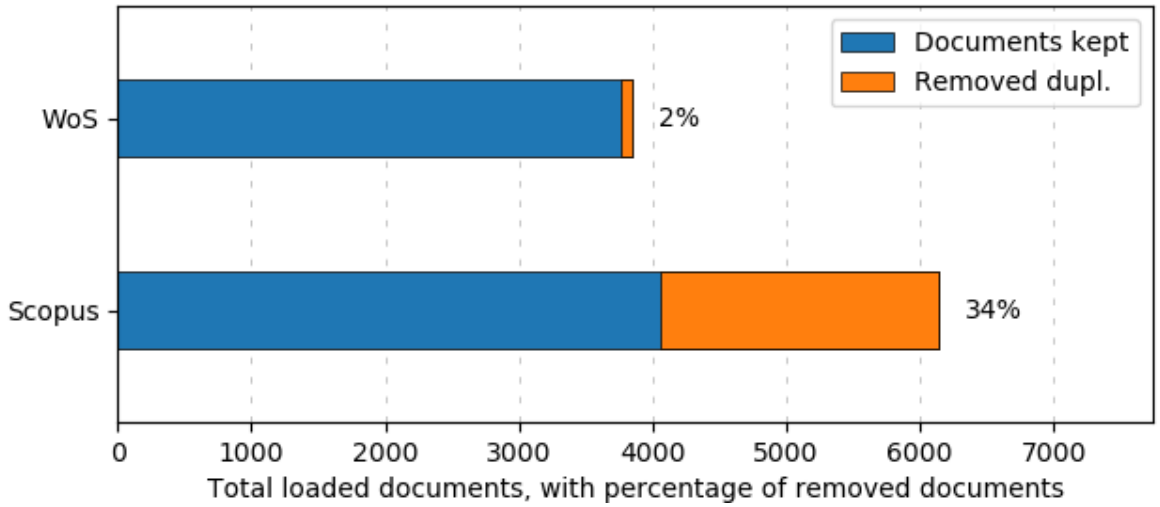


Figure 2: Timeline graph for pre-processing of metadata from Scopus and WoS databases

Scholars around the world use many bibliometric software programmes intending to provide information to readers with various interesting infographics and graphical visualisations (Roslan et al., 2023). Even if several software programmes are available for conducting bibliometric analysis, choosing a solution that corresponds to the study objectives and questions is essential. This emphasises assessing the research questions before selecting a software application. The success of software in bibliometric analysis ultimately depends on the researcher's capacity to answer the research questions posed in the study (Abdullah et al., 2023; Roslan et al., 2023).

In this study, two software programmes were utilised: ScientoPy and VOSviewer. ScientoPy is a free and an open-source scientometric analysis program built on Python software developed by Ruiz-Rosero et al. (2017) that sorts data according to the most well-liked, specific, and trending topics and subsequently tested for usability and effectiveness in a later study by Ruiz-Rosero et al. (2019). Pabon et al. (2020) demonstrated that this software helps detect and eliminate duplicate datasets and clean up non-standard data formats. ScientoPy, as demonstrated by Ruiz-Rosero et al. (2019), can automatically categorise and report on the top

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themes based on author or index keywords, as well as identify the most prolific authors and countries involved in the research, using bibliographical information. VOSviewer is another piece of software used to map the co-occurrence of authors' keywords. VOSviewer is a software application that assists in constructing and visualising bibliometric networks (Abdullah et al., 2020; Roslan et al., 2023). Finally, the 7818-piece data set was analysed, and the necessary statistical reports, graphs, and tables were generated using bibliometric data visualisation tools, ScientoPy and VOSviewer.

3. Result and Discussion

Publication Growth

The number of peer-reviewed publications is an excellent indicator of a scientific topic's growth. Since 2002, Figure 3 demonstrates a significant increase in articles on opium research. Compared to Scopus, WoS publications have grown steadily, with a sharp rise after 2008. Based on its recognition in scientific publications for a wide range of research fields, WoS has been identified as a leading data source. Also, Scopus is constantly updated and is favoured by many researchers in various research domains. From the data in Table 2, it shows the latest five years for publications in WoS and Scopus. From 2018 to 2022, it was discovered that WoS produced 208 publications in average, whereas Scopus produced 88 publications in average. The year 2021 shows the highest number of publications for WoS which is 228 papers, while for Scopus, the year 2021 has shown the highest achievement of publications which is 92 papers.

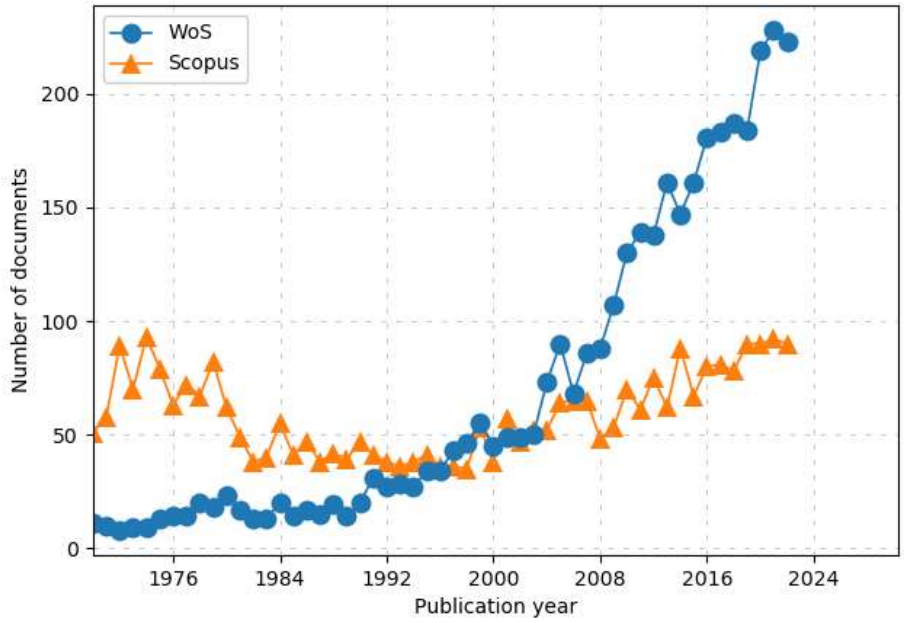


Figure 3: Timeline graph

Table 2: Five years publication trends

Publication	2018	2019	2020	2021	2022
WoS	187	184	219	228	223
Scopus	78	90	90	92	90

This study also sought to determine where opium documents were published by analysing document types and language data. Table 3 shows the different types of documents where publications on opium have been published. As can be seen, the majority of the publications

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are journal articles, with 6027 articles (85.38% of the total documents). Following the articles, it is a review paper (n = 550, 7.79%), a book chapter (n = 224, 3.17%), and a proceedings paper (n = 162, 2.29%). For other publications (conference paper, early access, data paper and book), approximately 1% for each document.

Table 3: Document type

Document Type	Total Publications	Percentage (%)
Article	6027	85.38
Review	550	7.79
Book Chapter	224	3.17
Proceedings Paper	162	2.29
Conference Paper	82	1.16
Early Access	11	0.16
Data Paper	2	0.03
Book	1	0.02
Total	7059	100.00

Subject Areas

Likewise, it is critical to conduct a review of relevant research articles. This strategy enables the essential disciplines in which research on opium has been undertaken to be identified. Figure 4 depicts an evolution graph of the top ten subject areas that can be used to categorise opium research in the Scopus and WoS databases. Chemistry has been identified as the most extensively investigated field, with over 400 publications. Another fascinating subject is Plant Sciences, and the third-ranked subject area is Substance Abuse. From the data in Table 4, showing the latest five years for publication trends from 2018 to 2022, it was found that History produced with an average of 21 publications, while for Chemistry with an average of 17.2 publications produced, and for Substance Abuse just produced an average of 15.8 publications. According to the data in Table 4, the year 2020 shows the highest number of documents for History which is 42 publications, while for Chemistry, the year 2021 has shown the highest among other years with 22 publications, followed by Substance Abuse, showing that the year 2020 was the highest, with 19 publications.

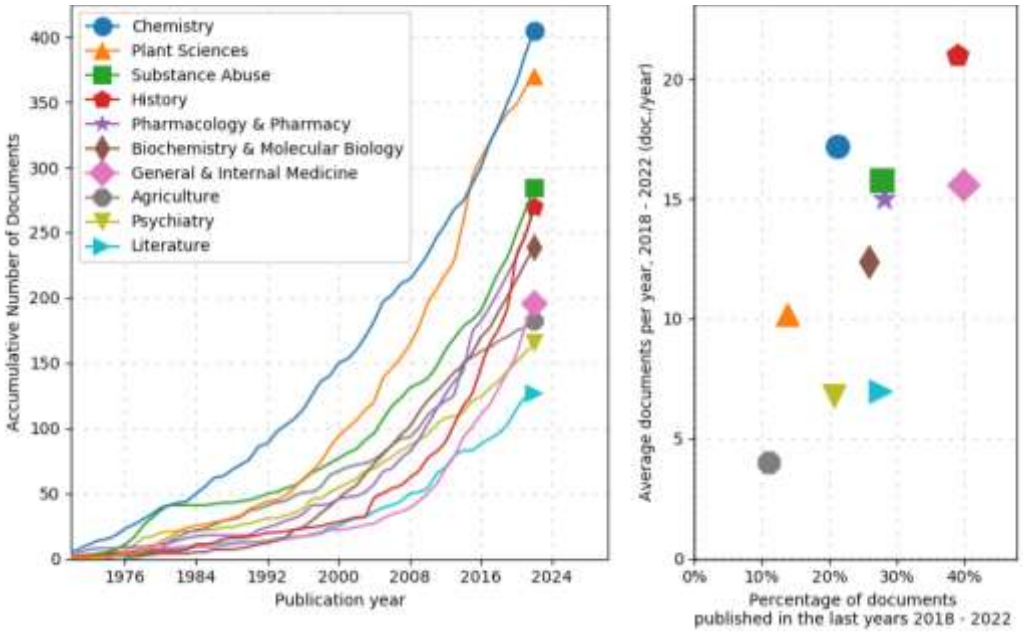


Figure 4: Subject evolution graph

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Table 4: Five years on top three subject areas

Publication	2018	2019	2020	2021	2022	Average
History	11	16	42	13	23	21
Chemistry	14	17	15	22	18	17.2
Substance Abuse	15	11	19	17	17	15.8

Publishing Countries

Since 1970, research on opium has been conducted in various countries. Figure 5 shows the country network visualisation of opium research. Based on Figure 5, Iran in the middle, has more connections than other countries. In addition, the United States and England also show a lot of connection after the country of Iran. Next, in Figure 6, Iran, United States and United Kingdom were identified as the top three publishing countries in opium research. While, the three lowest-ranked countries are France, Australia and Netherlands. Iran is at the top of the first chart in this study about opium. This is because Iran has proven to be the leading researcher in this field. However, there are still not many countries that contribute towards the publication of opium research. Thus, the study of opium should be explored deeper and further in many countries.

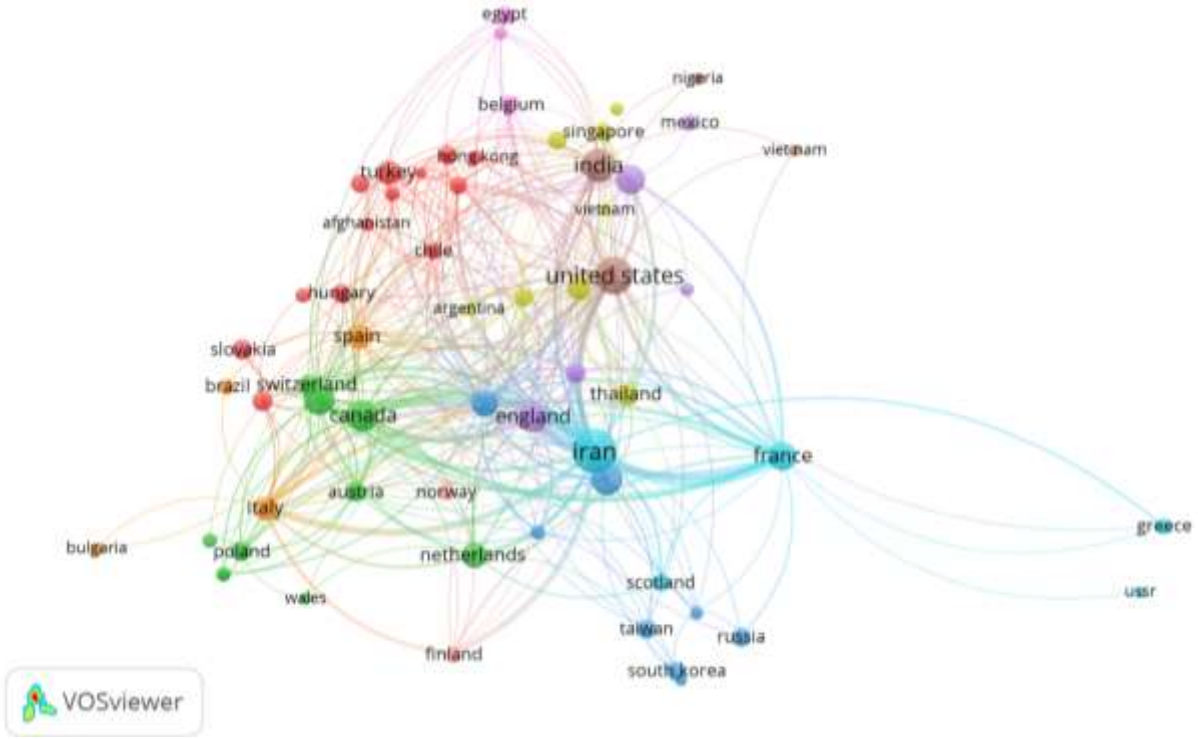


Figure 5: Network visualisation for publishing countries

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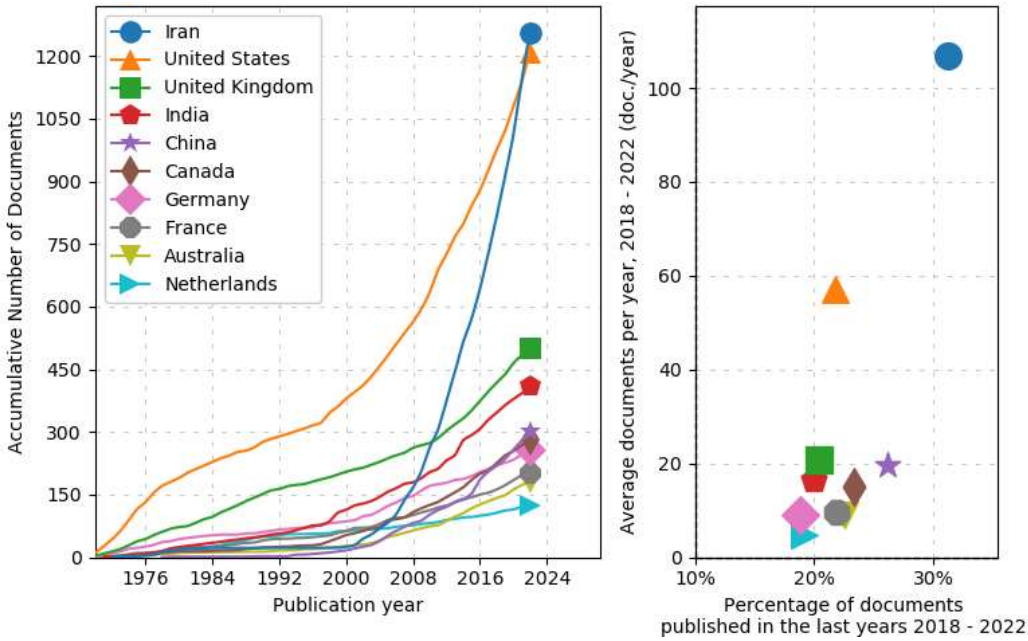


Figure 6: Country evolution graph

Productive Authors

The information in Figure 7 pertains to the most productive authors in opium research, which are ranked according to the number of publications. A list of ten authors is included, along with the 52 years and the last five years' trending percentages.

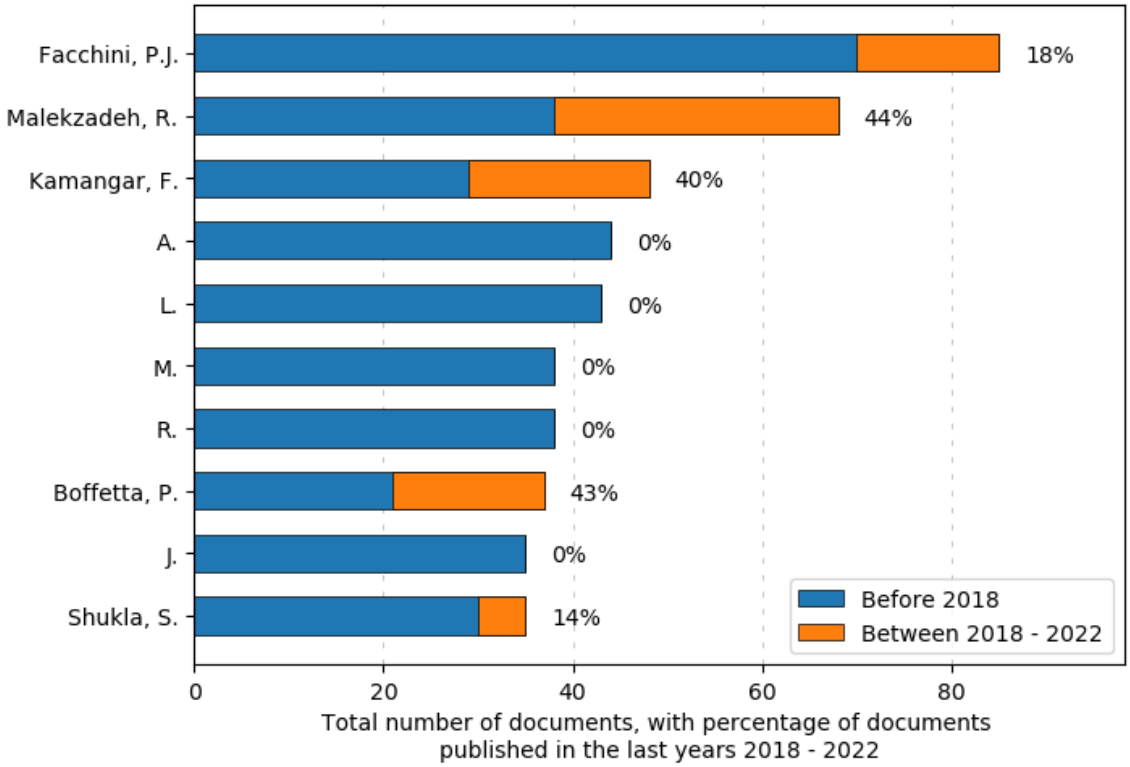


Figure 7: Productive authors bar trends

According to Figure 7, Facchini, P.J. was ranked first with 85 publications, followed by Malekzadeh, R. with 68 publications and Kamangar, F. with 48 publications. All three authors was the most productive writting journal and remained the most influential in opium research,

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with the possibility plans to maintain further publications for the future. Remarkably, Malekzadeh, R. has been the proactive author in the last five years, with 44% of publications released from 2018 to 2022. Also, the compelling authors in the previous five years is Boffetta, P., with 43% of publications. This author data is the most up-to-date information for future readers and researchers who want to know which authors are most active in this study of opium research.

Institutional Analysis

Figure 8 pertains to the top ten institutions that publish academic works on opium research. The scholars from Tehran University of Medical Sciences in Iran were credited with the most publications, with 198 publications. The second institution is Kerman University of Medical Sciences in Iran (n=106 publications), and Shahid Beheshti University of Medical Sciences in Iran (n=87 publications) is ranked third in this study. An intriguing feature of the top ten institutions in 52 years is that eight institutions are from Iran. Thus, Islamic Azad University is the most active for the last 5 years with 70% of publications in opium study. This shows that publications related to opium research are still growing over time.

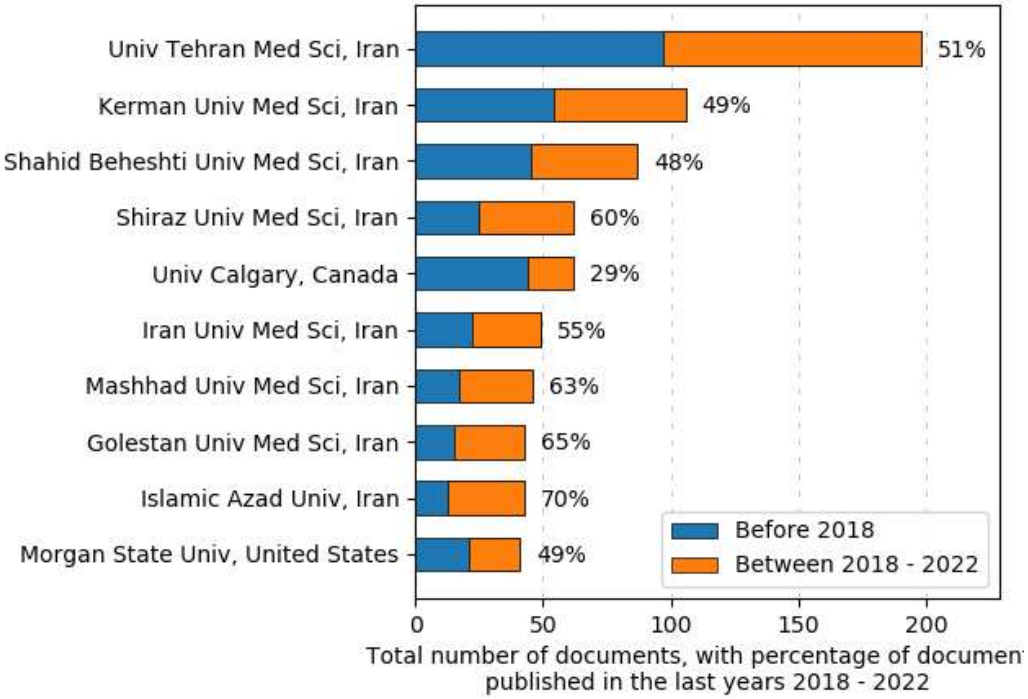


Figure 8: Institutional bar trends

Author Keywords

Analysis Author keywords refer to the terms used by authors to represent the content of their documents accurately. Most authors mention their study topic as a keyword in their document. The authors' keywords aided readers and future researchers in identifying the publications' significant ideas and arguments (Roslan et al., 2023). Numerous electronic search engines, databases, and journal websites use author keywords to identify and deliver relevant articles to prospective readers. Readers need to understand that keywords produce links to other relevant publications (Abdullah et al., 2022). In this case, Scientopy might track the evolution of a study topic or search argument using the authors' keywords. This section analyses the authors' top keywords in previous research on opium. In order to complete the procedure, the authors' keywords were used to find research trends. It has been suggested to use an appropriate term,

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such as “opium”. These manual tasks assist in organising data and eliminating term duplication, resulting in more robust results.

Figure 9 exhibits 10 previously researched keywords. As illustrated in Figure 9, the top three used term is “opium,” followed by “morphine” and “iran”. Data processing was given importance to this broad phrase directly related to the subject. Important keywords are made available to assist readers and future researchers in determining which ones to employ while conducting document analysis (Abdullah et al., 2022). While Figure 9 illustrates the first 10 keywords, ScientoPy enables us to view an infinite number of keywords (Ruiz-Rosero et al., 2019). Also, Figure 9 displays the percentage of documents published in the preceding five years (2018– 2022) to illustrate a relative increase. We can observe from this indicator that “methadone” has the highest proportion (43%) publication between 2018-2022. It is self-evident that the issue has increased significantly over the last five years compared to other keywords. Additionally, “opium” itself has been a hot topic, with 256 (39%) publications published from 2018 to 2022. Thus, this study depicted that opium and methadone has sparked scholars’ curiosity.

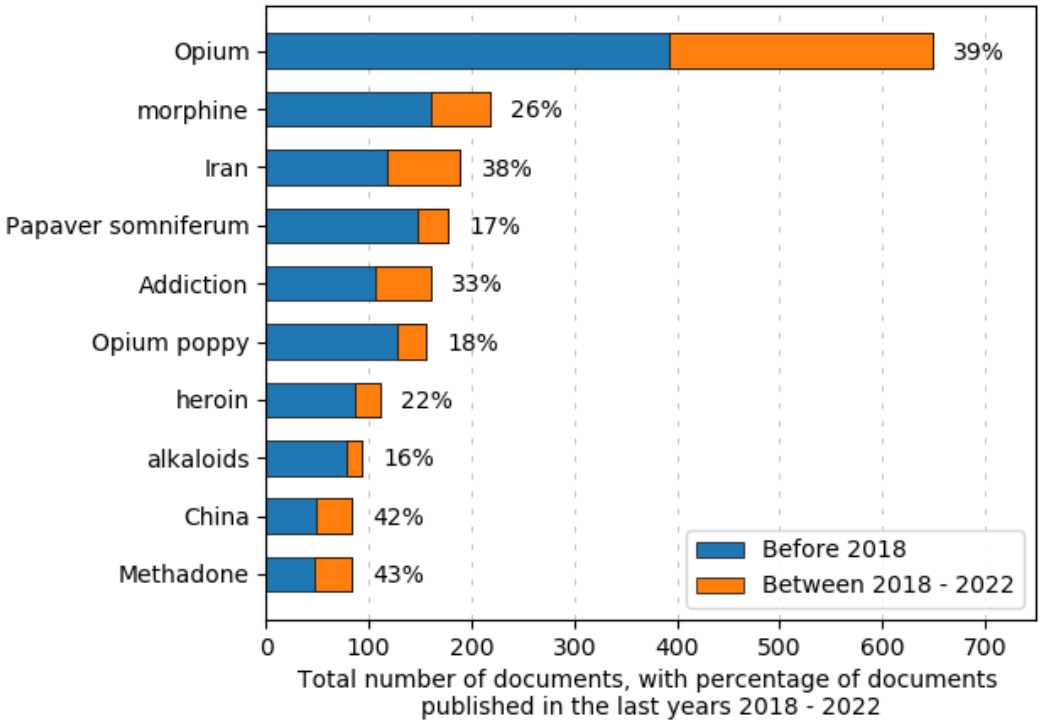


Figure 9: Author keywords bar trends

Furthermore, this study used cluster mapping to ascertain the co-occurrence of the authors’ keywords to denote themes or issues relevant to opium reasearch (see Figure 10). Before using the VOSViewer to generate a network map, the dataset was pre-processed with SientoPy (a combination of Scopus and WoS metadata). Additionally, this study used a thesaurus file to map the co-occurrence of the authors’ terms before mapping them. Concatenating related terms, spelling variants, and singular or plural terms requires the use of the thesaurus file.

Based on Figure 10, it can be deduced that the most frequently used keywords were “opium”, “morphine”, “heroin”, “methadone”, and “poppy”. These keywords are inextricably linked. The keyword “opium” was grouped in the same clusters (red colours) with “drugs”, and “heroin”. “Opium” is also closely linked to “morphine”.

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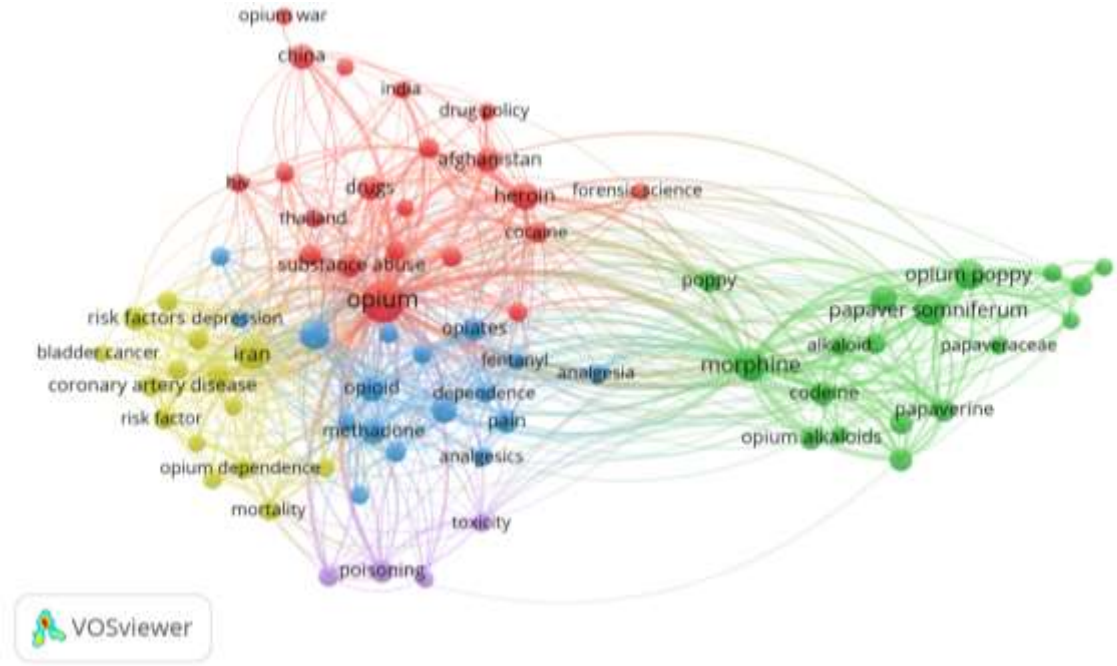


Figure 10: Network Visualisation of The Co-occurrence

4. Conclusion

This research looks at how often specific articles are published and how often they use certain keywords to determine opium research. In the meantime, this study can yield some results from its analysis. The results indicated that publications on opium research have increased significantly since 2002. Notably, WoS publications have expanded consistently compared to Scopus, with a sharp increase following 2008. With over 400 publications, Chemistry has been identified as the most thoroughly explored research area. Iran, United States, and United Kingdom have been designated as the research area's top three publishing countries. Facchini, P.J. was the most productive authors and often published in opium research, followed by Malekzadeh, R. and Kamangar, F.. With 198 publications, scholars from Tehran University of Medical Sciences in Iran were credited with the most active institution. The keyword "opium" is the most frequently used by previous researchers, followed by "morphine" and "iran". Opium was clustered in the same group with "drugs" and "heroin". Remarkably, "opium" and "morphine" are inextricably intertwined.

Certain limitations to this study may help direct future studies. Publications in the Scopus and WoS databases were analysed and mapped for this research. As a result, the findings of this study were limited to deducing the most critical themes or keywords associated with opium research found in those databases. Therefore, if future research wishes to expand on the foundation or address broad subjects, a systematic literature review or meta-analysis is recommended to provide the most relevant evidence synthesis possible. Nonetheless, scholarly dissemination in the opium research field is provided to potential readers and future researchers keen on this topic.

This study provides a novel perspective by demonstrating that research on opium is not restricted to drugs and substance abuse but has drawn scholars to explore opium within the framework of medical and research science, which transcends research areas. Therefore, the study will aid researchers from various fields in identifying essential publication trend factors for systematically disseminating opium research. In addition, this study's findings motivate

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researchers to collaborate and develop new research paradigms for evaluating opium research by analysing the most often-used terms through empirical studies.

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