BIBLIOMETRIC REVIEW OF DRUG ADDICTION RESEARCH: PUBLICATION PATTERNS, KEY CONTRIBUTORS, AND EMERGING TOPICS

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ABSTRACT

Drug addiction remains a widespread problem that affects people of all ages, backgrounds, and socioeconomic statuses. This study highlights the current research trend on drug addiction publishing patterns and the most used author keywords. A total of 13,476 relevant documents were obtained from the Scopus database for detailed analysis. This study used several analytical tools, including Microsoft Excel for frequency analysis, VOSviewer for data visualisation, and ScientoPy for running and executing relevant publication data retrieved and analysis. The results were presented using typical bibliometric indicators such as publication growth, author keywords analysis, publishing countries and productive authors. The findings showed a significant increase in drug addiction publications since 2006, highlighting the growing relevance of drug addiction and its broader societal impacts. The top three research studies based on a country analysis show that the United States has become an active publisher, followed by China and Italy. Importantly, these studies emphasised that the scholarly practices prevalent in drug addiction research have been impressively propagated. The trends will assist researchers in recognizing various fields and identifying the core areas, proactive institutions, and productive authors published in this knowledge for supplementary investigation. Furthermore, by examining the most popular keywords, the findings of this study enabled researchers to identify potential areas for future research, particularly in drug use prevention, laws and government policies to prevent the rising rate of addiction, and improved social well-being in comparison to drug use, which could be studied in the last five years.

Keywords: drug addiction, drug abuse, substance abuse, bibliometric analysis.

INTRODUCTION

Drug addiction is a complex and challenging issue that affects individuals and communities all over the world. It is challenging to address drug addiction in this day and age if it is not given thorough attention. According to Manurung (2024), society must understand the negative effects of drug addiction in order to better navigate its impact on the surrounding environment. The effects of the addiction cycle are frequently influenced by a number of factors including genetic predisposition, social environment, co-occurring mental health disorders, and trauma. As a result, society must now understand the risks of drug addiction by combating a complex network of biological and environmental factors.

Meanwhile, drug addiction is a chronic, recurring brain disease caused by compulsive drug use that can escalate to dangerous levels (Heilig et al. 2021). Drug addiction is not just a problem of willpower or moral failure; it can also be caused by brain disorders that are influenced by genetic, environmental, and developmental variables. Drug addiction can result from a variety of substances including prescription medications, alcohol, tobacco, and illicit substances like cocaine and heroin (Reichert et al. 2021). As a result, each of these substances has severe effects on the brain and body, causing a wide range of physical and psychological dependencies. One of the consequences of drug addiction is brain damage, which is likely to be permanent, particularly in severe cases, for a long time (Mullen et al. 2020). However, affected people can be cured by remaining calm and working hard to recover.

Recognizing the signs and symptoms of drug addiction is one of the first steps toward recovery. These include physical appearance changes, behavioral changes, and a preoccupation with obtaining and using the substance (Volkow, 2020). By educating ourselves and others about the warning signs of addiction, we can better recognize when someone requires assistance. Once addiction is identified, it is critical to seek assistance from loved ones, healthcare professionals, and addiction treatment programs. These resources can provide individuals with the necessary tools and guidance to overcome their addiction and live a healthier, drug-free life (Omale, 2024). Therefore, there are many options available to help those struggling with addiction find their path to recovery, ranging from therapy and counseling to medication-assisted treatment.

A growing global public health concern about drug addiction has the potential to have a significant impact on employment and workforce participation. This is because drug addiction in the workplace can have serious consequences for both employees and employers, including absenteeism, decreased productivity, and workplace accidents (Smith et al., 2020). Individuals struggling with substance abuse may also frequently call in sick or miss work entirely, resulting in a reduction in overall productivity and efficiency. This can put pressure on the rest of the team, causing disruptions and potentially lowering the quality of work produced. As a result, employees under the influence of drugs are more likely to lose focus, make poor decisions, and fail to complete tasks on time. This can have a negative impact not only on their own performance but also on their coworkers' productivity and the company's overall success (Chang, 2024). Furthermore, drug addiction in the workplace can increase the likelihood of workplace accidents (Bufano et al., 2023). Employees who are impaired by drugs are more likely to make mistakes, react slowly, and be involved in workplace accidents. This can not only injure the individual, but it can also endanger others, potentially resulting in legal and financial consequences for the employer.

Policy and legal implications play a significant role in shaping societies and ensuring individual safety and well-being. Meanwhile, national drug control policies have been developed to regulate drug production, distribution, and use within a country. These laws, which range from national drug control policies to workplace safety regulations, help to establish a harmonious and functional society (Lasswell &

McDougal, 2023). This is because these policies are intended to combat drug abuse, lower addiction rates, and protect public health (Jatau el al., 2021). Governments can control drug availability and prevent the illegal drug trade from spreading by enforcing strict laws and regulations. Furthermore, these policies provide resources for rehabilitation support programs, which help people recover from drug addiction and reintegrate into society.

Aside from that, rehabilitation support programs are essential for helping people overcome addiction and rebuild their lives. These programs provide counseling, treatment programs, and support services to help people break the cycle of addiction. Rehabilitation support programs play an important role in addressing the root causes of addiction and promoting long-term sobriety because they take a holistic approach to recovery. Furthermore, workplace safety regulations are an important aspect of policy and legal implications for ensuring employee well-being. These regulations provide employers with guidelines for creating a safe and healthy work environment free of hazards and risks (Brauer, 2022). By enforcing workplace safety regulations, governments can reduce the incidence of work-related injuries and illnesses, protect workers' rights, and promote productivity and overall well-being.

Additionally, a person's risk of developing a substance abuse disorder can be significantly impacted by family disruptions like divorce, separation, or the loss of a parent. Research has shown that individuals who experience family disruptions are more likely to turn to drugs or alcohol as a way to cope with their emotions and feelings of instability. The lack of strong support within the family can make it more difficult for individuals to seek help for their addiction and lead to difficulties in recovery (Stanojlović & Davidson, 2021). Furthermore, economic hardship is an important aspect of social well-being that can lead to drug addiction. Individuals who are struggling financially may turn to drugs or alcohol as a way to escape their reality or cope with the stress and anxiety of their situation. Therefore, economic insecurity can make it difficult for individuals to access quality treatment and support for their addiction, further perpetuating the cycle of substance abuse (Boucher et al. 2022). For individuals who rely on social welfare systems for support, drug addiction can pose a significant barrier to their ability to maintain stability and access necessary resources. As a result, individuals may feel stigmatized or judged for their addiction, leading them to avoid seeking help or support from social welfare programs.

Meanwhile, recovering from drug addiction is a difficult task that necessitates consistent effort, support, and treatment. Scott et al. (2020) state that those seeking assistance have access to a variety of resources, including therapy, support groups, medication-assisted treatment, and residential programs. Therapy and counseling can be extremely beneficial for people struggling with addiction, assisting them in addressing underlying issues and developing healthy coping mechanisms (Miller, 2020). Overall, society, support groups, and peer networks need to provide space and opportunities for those vulnerable to drug addiction, as well as provide the necessary awareness for long-term recovery.

However, there has been a lack of exploration conducted to analyse the research trends in the field of drug addiction within challenges and opportunities, particularly in identifying specific domains within this field that have received limited attention. Hence, the present studies employs bibliometric analysis to discern research trends within the realm of drug addiction research. This focus remains strong despite increasing interest in this field of studies (Shankar et al., 2021). As a result, it has been noted that most research has focused on managing and delivering records supporting materials and documentation (Farooq et al., 2021).

In order to address the issue of excessive information availability and the breadth of different research topics, 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).

METHOD AND DATA

Bibliometric analysis is a quantitative research technique that systematically analyses and evaluates scientific publications and their attributes, allowing the identification of patterns, trends, and relationships within a specific field of study (Leydesdorff & Vaughan, 2006). This analytical approach examines bibliographic data, including citations, to gain valuable insights into the scholarly communication process and the influence of scientific research (Waltman, 2016). 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 summarize the significant trends of a particular study field. The current studies primary goal was to identify patterns in drug addiction-focused publications.

In this study, Scopus database served as the primary source for collecting a thorough compilation of articles on drug addiction. Scopus was selected due to its status as the largest index comprising journals, book series, conferences, and proceedings that are ranked according to their citation impact (Sweileh, 2022; Visser et al., 2021). The Scopus 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 primary sources for bibliometric studies (Pranckutė, 2021). Given the multifaceted nature of the studied topic, the literature on drug addiction studies 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. After defining the databases, the search query "drug addiction" was chosen. The following fields were scanned for topic-related terms: article title, abstract, keywords is 9466 scripts. All of which met the inclusion criteria for the study and thus became the focus of a comprehensive bibliometric analysis. This inquiry was completed on May 20, 2025. The search timeframe was set between 2000 to 2024.

Two software programs were utilized: ScientoPy and VOSviewer to accomplish bibliometric analysis. 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 studies 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 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).

Figure 1 depicts the data processing sequence in this analysis and 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.

Figure 1
Selection Strategy and Research Protocol
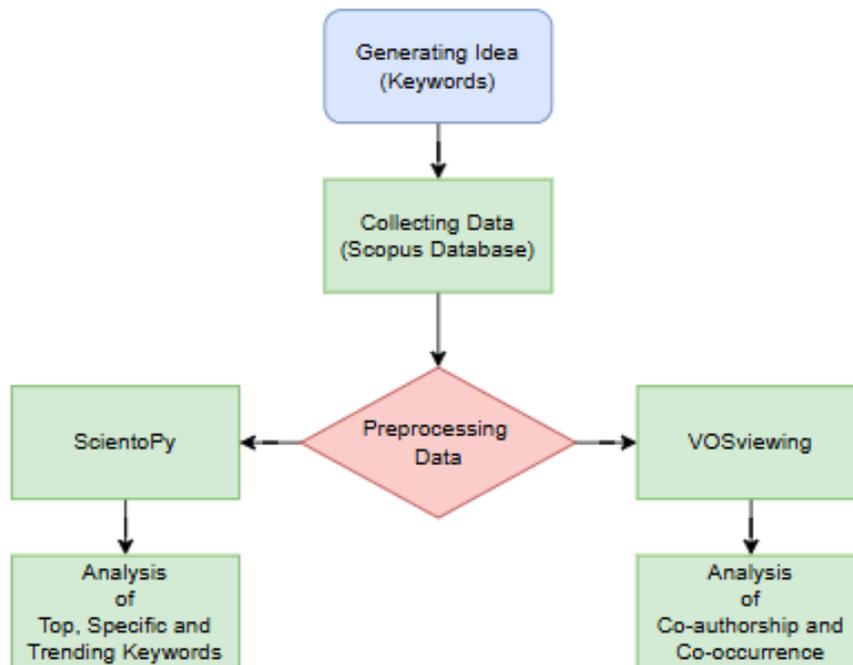
During the second stage, ScientoPy was used to preprocess the data. The secondary dataset is then established for the following analysis stage. ScientoPy uses the following criteria during the pre-processing steps; (i) normalizing the author's name: it is replaced with a semicolon for metadata retrieved 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. This study used a raw source dataset of 15010 papers from the Scopus databases. In this study, 1459 of the 15010 loaded papers were eliminated due to ScientoPy's analysis. Following data reconciliation, this study examined 13476 papers from the databases, after removing 75 papers from Scopus. Finally, the 13476-piece data set was analyzed, and the necessary statistical reports, graphs, and tables were generated using bibliometric data visualization tools, ScientoPy and VOSviewer.

Scholars around the world use many bibliometric software programs intending to provide information to readers with various interesting infographics and graphical visualizations (Roslan et al., 2023). Even if several software programs are available for conducting bibliometric analysis, choosing a solution that corresponds to the study objectives and questions is essential. This emphasizes 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).

Table 1

Information on Pre-processed Data Analysis

Information	Number	Percentage (%)
Loaded papers	15,010	
Omitted papers by document type	1,459	9.70
Total papers after omitted papers removed	13,551	
Loaded papers from Scopus	13,551	100.00
Duplicated papers found	75	0.60
Removed duplicated papers from Scopus	75	0.60
Duplicated documents with different cited by	52	69.30
Total papers after duplicate removal	13,476	
Papers from Scopus	13,476	100.00

RESULTS

Publication Growth

The number of peer-reviewed publications is an excellent indicator of a scientific topic's growth. Since 2000, Figure 2 demonstrates a significant increased in articles on drug addiction research. Scopus publications have grown steadily, with a sharp rise after 2006 and has also taken the lead from the overall number of documents in Scopus.

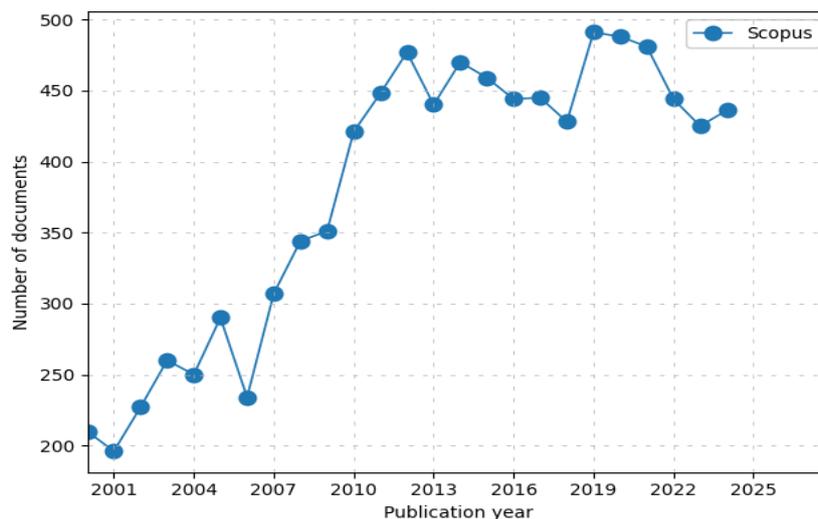**Figure 2**

Timeline Graph

Table 2 showed the latest five years of publications in Scopus. From 2020 to 2024, it was discovered that in total there is 2279 publications produced in Scopus. The year 2020 shows the highest number of publications which is 490 publications.

Table 2

Five Years Publication Trends

Year of Publication	Scopus
2020	490
2021	483
2022	444
2023	425
2024	437
Total	2,279

This study also sought to determine where drug addiction documents were published by analyzing document types and language data. Table 3 shows the different types of documents where publications on drug addiction have been published in Scopus. As shown in Table 3, majority of the publications are articles with 7,211 articles (75.71% of the total documents). This followed by a review (n = 1934, 20.31%), and a conference paper (n = 379, 3.98%).

Table 3

Document Type

Document Type	Total Publications	Percentage (%)
Article	7,211	75.71
Review	1,934	20.31
Conference Paper	379	3.98
Total	9.524	100.00

Publishing Countries

Since 1903s, research on drug addiction has been conducted in various countries. Figure 3 shows the country network visualization of drug addiction research. Based on Figure 3, United States has more connections than other countries. In addition, United Kingdom, Italy, Germany, China, and Canada also showed a lot of connection after the country of United States. In Figure 4, United States, China, and Italy were identified as the top three publishing countries in drug addiction research. While, the three lowest-ranked countries are Canada, Brazil, and Iran. United States is at the top of the first chart in this study about drug addiction. This is because United States has proven to be the leading researcher in this field. However, there are still not many countries that contribute towards the publication of drug addiction. Thus, the studies of drug addiction should be explored deeper and further in many countries.

Figure 3
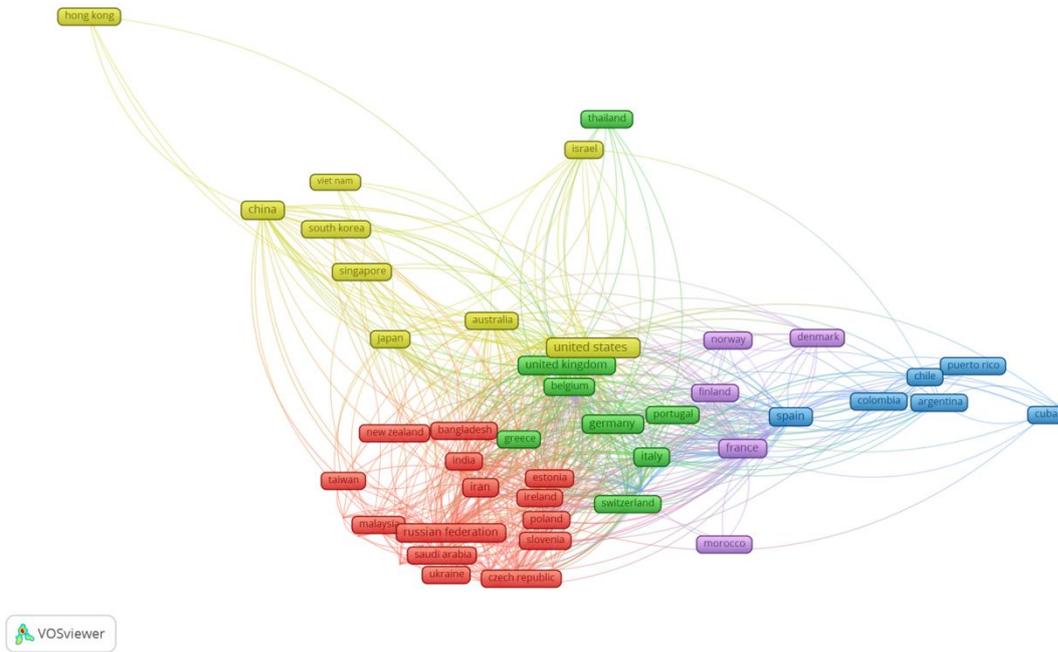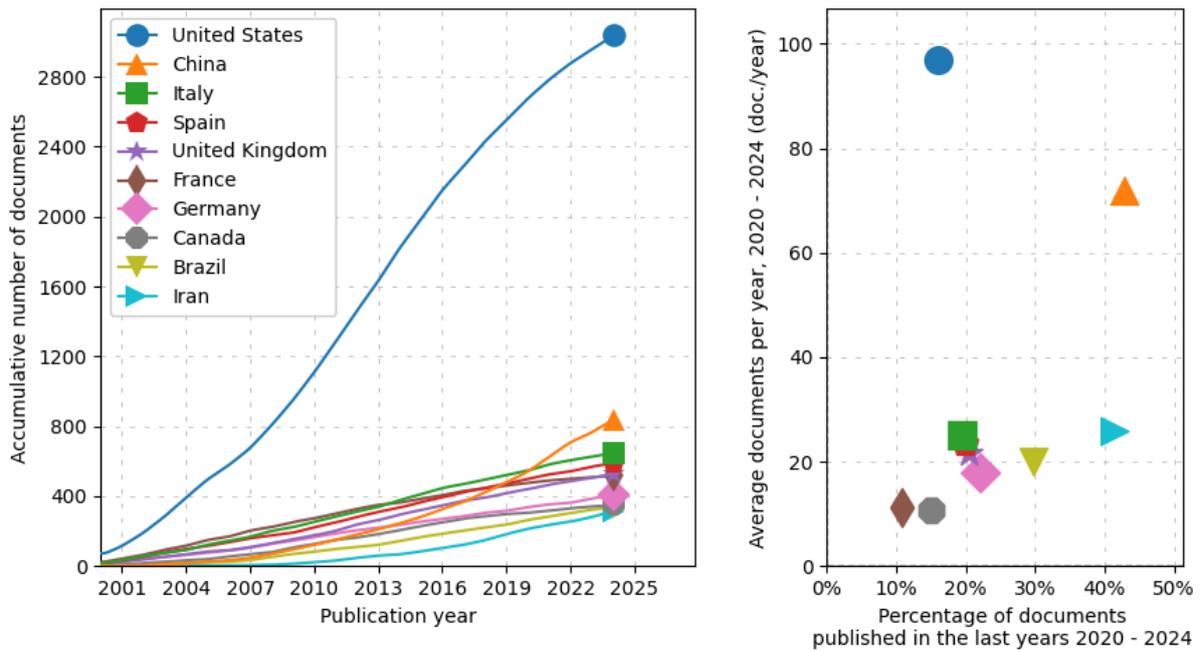
Network Visualisation for Publishing Countries

Figure 4

Country Evolution Graph

Productive Authors

The information showed in Figure 5 pertains to the most productive authors in drug addiction, which are ranked according to the number of publications. A list of ten authors is included, along with the 24 years and the last five years' trending percentages.

Figure 5
Productive Authors Bar Trends
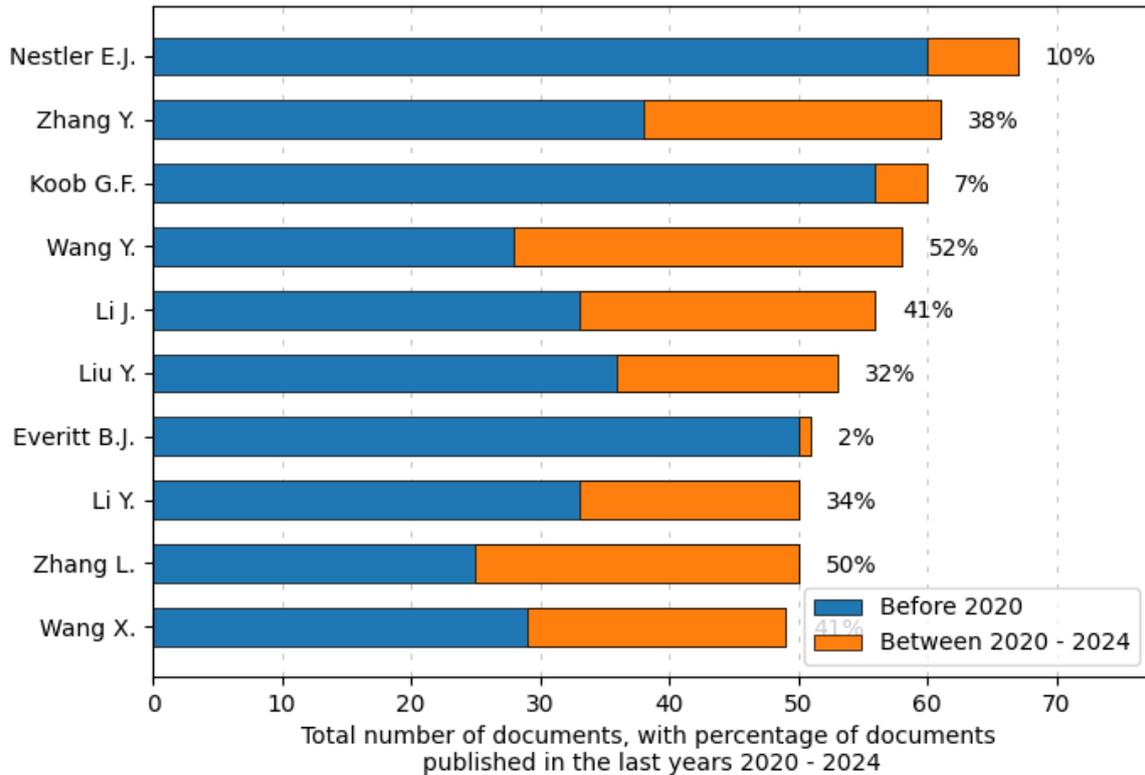
As shown in Figure 5, Nestler, E.J. was ranked first with 71 publications, and this followed by Zhang, Y. with 61 publications and Koob, G.F. with 60 publications. These three authors are the most productive journal writers and remained the most influential in drug addiction research, with the possibility plans to maintain further publications in the future. Remarkably, Wang, Y. has been the proactive author in the last five years, with 52% of publications released from 2020 to 2024. Also, the compelling authors in the previous five years is Zhang, L. with 50% of publications. This authors data was the most up-to-date information for future readers and researchers who want to know which authors are the most active in drug addiction research.

Author Keywords

Analysis of author keywords refer to the terms used by authors to represent the content of their documents accurately. Most authors mention their studies 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 or trends of a study topic or search argument using the authors' keywords. This section analyses the authors' top keywords in previous research on drug addiction. To complete the procedure, the authors' keywords were used to find research trends. It has been suggested to use an appropriate term such as "drug addiction". These manual tasks assist in organizing data and eliminating term duplication, resulting in more robust results.

Figure 6 exhibits 10 previously researched keywords. As illustrated in Figure 6, the top three used term is "drug addiction" and followed by "addiction" and "cocaine". 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 6 illustrates the first 10 keywords, ScientoPy enables us to view an infinite number of keywords (Ruiz-Rosero et al., 2019). Also, Figure 6 displays the percentage of documents published in the preceding five years (2020– 2024) to illustrate a relative increase. We can observe from this indicator that "methamphetamine" has the highest proportion with 84 (38%) publications between 2020-2024. It is self-evident that the issue has increased significantly over the last five years compared to other keywords. Additionally, "drug abuse" has also been a hot topic, with 72 (27%) publications published from 2020 to 2024. Thus, this study depicted that methamphetamine and drug abuse has sparked scholars' curiosity.

Figure 6
Author Keywords Bar Trends
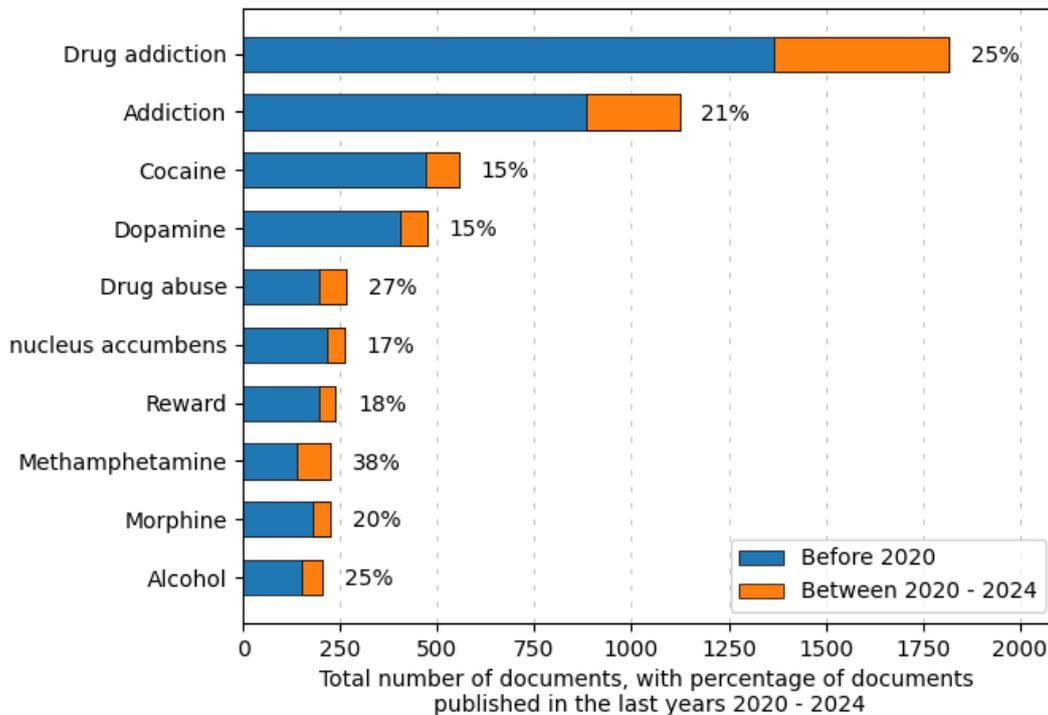
Furthermore, this study used cluster mapping to ascertain the co-occurrence of the authors' keywords to denote themes or issues relevant to drug addiction reasearch (see Figure 7). Before using the VOSViewer to generate a network map, the dataset was pre-processed with SientoPy (a combination of Scopus 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 7, it can be deduced that the most frequently used keywords were "drug addiction", "addiction", "cocaine", "heroin", and "substance abuse". These keywords are inextricably linked. The keyword "drug addiction" was grouped in the same clusters (red colours) with "heroin", and "substance abuse". "Drug addiction" is also closely linked to "addiction".

Figure 7

Network Visualisation of The Co-occurrence

DISCUSSION

Over the last two decades, the landscape of drug addiction has undergone significant transformations. From the early-2000s opioid overdose epidemic to the recent rise in synthetic drugs such as fentanyl. The world of drug abuse has never been more complicated or challenging (Nwogu, 2022). The early 2000s saw a dramatic increase in opioid addiction, with prescription painkillers such as OxyContin and Vicodin flooding the market, resulting in widespread abuse and overdoses. By the mid-2010s, the full extent of the crisis was becoming clear, as overdose deaths increased and communities across the country struggled to cope with the devastation caused by these powerful drugs.

As the opioid epidemic worsened, new challenges emerged in the realm of drug addiction. Synthetic opioids such as fentanyl, became more common, increasing overdose deaths and complicating crisis response efforts. At the same time, new drugs such as synthetic cannabinoids and branded amphetamines appeared on the market, posing new risks to public health and safety. Over the years, efforts to combat drug addiction have evolved and adapted to meet the changing landscape (Ekhtiari et al., 2020). Treatment strategies have become more holistic and personalized, with a greater emphasis on harm reduction and medication-assisted therapy. The stigma associated with addiction has begun to fade as more people come forward to share their stories and seek help for their drug abuse (O'Shay-Wallace, 2020).

Looking ahead, the challenge of drug addiction is as pressing as ever. While progress has been made in several areas, new challenges continue to arise, ranging from the spread of new psychoactive substances to the impact of the COVID-19 pandemic on substance use and mental health. To effectively address these challenges, we must maintain open and honest discussions about drug addiction and collaborate to develop innovative and effective solutions (Fink et al., 2023). As a result, this ongoing effort can create a generation free of all drug use and make societies healthy from drug addiction.

By using bibliometric analysis, researchers can identify key trends and gaps in the literature related to occupational health such as the prevalence of workplace hazards, the effectiveness of intervention programs, and the impact of occupational health policies. This information can then be used to inform policy decisions aimed at improving workplace safety and promoting worker well-being. Occupational health related to drug addiction as a whole is a complex issue because the workplace can have a significant impact on workers' physical and mental well-being and requires a comprehensive approach to address. According to Zaidi (2020), social support plays a critical role in helping individuals overcome addiction and maintain their recovery. Bibliometric analysis can help researchers identify the most effective types of social support interventions, key factors that contribute to successful outcomes, and gaps in the existing literature that need to be addressed. By leveraging these insights, policymakers can design targeted interventions to support individuals struggling with addiction and reduce the societal impact of drug abuse.

The prevalence of workplace addiction issues is increasing in today's fast-paced, high-pressure work environments. From alcoholism to drug addiction, the impact on employee performance, morale, and overall workplace dynamics cannot be overstated. In response to this growing problem, many organizations have implemented addiction management programs such as employee assistance programs (EAPs) and return-to-work policies on drug addiction, to assist employees in overcoming their addictions and getting back on track (Grant, 2022). While these programs are critical for providing employees with the resources and support they require to address their addictions, they also raise important questions about how to effectively balance workplace productivity and employee well-being. Therefore, organizations have a responsibility to address workplace addiction issues and assist employees in overcoming them (Packalen et al., 2024). However, they must prioritize the organization's overall well-being and success.

One of the most difficult aspects of managing workplace addiction issues is finding the right balance between providing support and maintaining professional boundaries. EAPs and return-to-work policies can be valuable resources for employees dealing with addiction, but they must also be carefully implemented and monitored to avoid being taken advantage of or exploited. Furthermore, organizations must consider the potential impact of addiction issues on the larger workplace community and take proactive steps to mitigate any negative consequences (Smith et al., 2020). Finally, effective addiction management in the workplace necessitates a multifaceted approach that includes support, education, and accountability. By implementing comprehensive programs that address both the individual needs of employees and the broader organizational goals, organizations can create a healthier and more productive work environment for all.

CONCLUSION

Drug addiction is a serious issue that requires attention and action. Addiction can be overcome and a healthier, drug-free life can be led by educating ourselves, getting help, and remaining dedicated to recovery. Recovery from drug addiction is a lifelong process that requires dedication, commitment, and perseverance. It is not always straightforward, and there may be setbacks along the way. However, with

the right support system and determination, it is possible to break free from addiction and create a better future. As a result, there is always hope for a better tomorrow, free of addiction. This study underscores the need for integrated policy responses that address drug addiction not only as a health issue, but also as a socio-economic challenge. The insights generated from this bibliometric review can support preventive workplace interventions, inform legal frameworks, and enhance social well-being programmes targeting addiction recovery.

By continuing to explore these important topics, this study looks at how often specific articles are published and how often they use certain keywords to see their use in drug addiction research. In the meantime, this study can yield some results from its analysis. The results indicated that publications on drug addiction research have increased significantly since 2006. United States, China, and Italy have been designated as the research area's top three publishing countries. Nestler, E.J. was the most productive authors and often published in drug addiction research, followed by Zhang, Y. and Koob, G.F.. The keyword "drug addiction" is the most frequently used by previous researchers, followed by "addiction" and "cocaine". Drug addiction was clustered in the same group with "heroin" and "substance abuse". Remarkably, "drug addiction" and "addiction" are inextricably intertwined.

Certain limitations to this study may help direct future studies. Publications in the Scopus databases were analysed and mapped for this study. As a result, the findings of this study were limited to deducing the most critical themes or keywords associated with drug addiction 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 drug addiction research field is provided to potential readers and future researchers keen on this topic.

This study provides a new perspective by demonstrating that research on drug addiction is not limited to drug addiction alone, but has attracted scholars to investigate drug addiction in the workplace, rehabilitation policies, the burden of addiction on the national social insurance system, and challenges and opportunities from research findings outside of the research field. Therefore, the study will assist researchers from various fields in identifying important publication trend factors to systematically disseminate drug addiction research. In addition, the findings of this study encourage researchers to collaborate and develop new research paradigms to evaluate drug addiction research by analyzing the most frequently used terms through empirical studies.

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