













Original Research

# Exploring the Global Landscape of Self-Medication Among Students: Trends, Risks, and Recommendations for Safe and Responsible Practices

Yasser Bustanji , Jalal Taneera , Afnan Bargooth, Ahmad Abuhelwa , Ala Issa , Waseem El-Huneidi , Eman Abu-Gharbieh , Kareem H. Alzoubi , Mohammad A.Y. Alqudah , Ahmed Alhusban , Islam Hamad , MoezAllIslam E. Faris , Mohammad H. Semreen 

Received (first version): 11-Jul-2023

Accepted: 14-Aug-2023

Published online: 28-Feb-2024

## Abstract

**Objective:** This study aimed to provide a comprehensive overview of self-medication practices among students by conducting a bibliometric analysis of the available scientific literature. This research highlights the importance of promoting safe and responsible healthcare behaviors among students. **Methods:** A systematic search was conducted in the Scopus database to retrieve all peer-reviewed English articles and reviews published from 1968 onwards. The retrieved documents were analyzed to identify publication trends, citation counts, top journals, geographical distribution, and emerging research themes. **Results:** The findings indicate a significant increase in published literature about student self-medication over the past fifteen years. However, it was observed that the citation count for these documents was lower than expected, suggesting a need for increased attention toward this critical topic. The analysis also identified several hot topics in student self-medication, including the misuse of over-the-counter medications, dietary supplements, and psychoactive substances. The inappropriate use of antibiotics and the self-medication of mental health issues, such as anxiety and depression, were also identified as significant problems. **Conclusions and recommendations:** Self-medication among students is a complex and critical issue that requires immediate attention. This study highlights the urgent need for greater awareness and education regarding responsible self-medication practices among students. New policies, interventions, and strategies should be developed to address malpractices, misconceptions, and harmful practices related to self-medication. Educational institutions and health authorities should play a crucial role in providing students with mental health resources and support services. Collaborative efforts among healthcare providers, universities, and policymakers are required to consider this issue as public health priority, establish counseling centers, organize stress management and mental health workshops and develop comprehensive programs to control risks associated with student self-medication.

**Keywords:** self-medication; university students; medical students; bibliometric analysis; anxiety; depression; antibiotics; analgesics; alcohol; adolescents; awareness

**Yasser BUSTANJI\***. School of Pharmacy, The University of Jordan, Amman 11942 Jordan. College of Medicine, University of Sharjah, Sharjah 27272 United Arab Emirates. Research Institute of Medical and Health Sciences, University of Sharjah, Sharjah 27272 United Arab Emirates. [bustanji@ju.edu.jo](mailto:bustanji@ju.edu.jo); [ybustanji@sharjah.ac.ae](mailto:ybustanji@sharjah.ac.ae)

**Jalal TANEERA**. College of Medicine, University of Sharjah, Sharjah 27272 United Arab Emirates. Research Institute of Medical and Health Sciences, University of Sharjah, Sharjah 27272 United Arab Emirates.

**Afnan BARGOOTH**. Faculty of Pharmacy, Al-Zaytoonah University of Jordan, Amman Jordan.

**Ahmad Y. ABUHELWA**. Department of Pharmacy Practice and Pharmacotherapeutics, College of Pharmacy, University of Sharjah, Sharjah 27272 United Arab Emirates. Research Institute of Medical and Health Sciences, University of Sharjah, Sharjah 27272 United Arab Emirates.

**Ala ISSA**. School of Pharmacy, The University of Jordan, Amman 11942 Jordan.

**Waseem EL-HUNEIDI**. College of Medicine, University of Sharjah, Sharjah 27272 United Arab Emirates. Research Institute of Medical and Health Sciences, University of Sharjah, Sharjah 27272 United Arab Emirates

**Eman ABU-GHARBIEH**. College of Medicine, University of Sharjah, Sharjah 27272 United Arab Emirates. Research Institute of Medical and Health Sciences, University of Sharjah, Sharjah 27272 United Arab Emirates. School of Pharmacy, The University of Jordan, Amman 11942 Jordan.

**Kareem H. ALZOUBI**. Department of Pharmacy Practice and Pharmacotherapeutics, College of Pharmacy, University of Sharjah, Sharjah 27272 United Arab Emirates. Research Institute of Medical and Health Sciences, University of Sharjah, Sharjah 27272 United Arab Emirates.

**Mohammad A.Y. ALQUDAH**. Department of Pharmacy Practice and Pharmacotherapeutics, College of Pharmacy, University of Sharjah, Sharjah 27272 United Arab Emirates. Research Institute of Medical and Health Sciences, University of Sharjah, Sharjah 27272 United Arab Emirates. Department of Clinical Pharmacy, Faculty of Pharmacy, Jordan University of Science and Technology, Irbid 22110, Jordan

**Ahmed ALHUSBAN**. Department of Pharmacy Practice and Pharmacotherapeutics, College of Pharmacy, University of Sharjah, Sharjah 27272 United Arab Emirates. Research Institute of Medical and Health Sciences, University of Sharjah, Sharjah 27272 United Arab Emirates.



**Islam HAMAD.** Department of Pharmacy, Faculty of health sciences. American University of Madaba, Amman, Jordan.  
**MoezAlIslam E. FARIS.** Department of Clinical Nutrition and Dietetics, College of Health Sciences, University of Sharjah, Sharjah 27272 United Arab Emirates. Research Institute of Medical and Health Sciences, University of Sharjah, Sharjah 27272 United Arab Emirates.  
**Mohammad H. SEMREEN.** Department of Medicinal Chemistry, College of Pharmacy, University of Sharjah, Sharjah 27272 United Arab Emirates. Research Institute of Medical and Health Sciences, University of Sharjah, Sharjah 27272 United Arab Emirates.

## INTRODUCTION

Self-medication, the practice of individuals treating their medical problems without the guidance of a healthcare professional, is a growing trend in contemporary societies worldwide.<sup>1,2</sup> This phenomenon is observed in both developed and developing countries. The World Health Organization (WHO) defines self-medication as using over the counter (OTC) drugs to address self-diagnosed symptoms or diseases. However, some individuals go beyond OTC medications and acquire and administer drugs that are neither available without a prescription nor monitored by a medical professional.<sup>3</sup> Various factors, including but not limited to age, sex, income, self-care attitude, and medical knowledge, influence how different populations approach self-medication. Surprisingly, self-medication is far more common among healthcare professionals compared to the general population.<sup>4</sup>

Over the years, self-medication has been a prevalent practice. Still, its popularity has surged due to the easy accessibility of online information and the vast array of OTC drugs now available.<sup>5-7</sup> It is common for individuals to self-treat various common illnesses, such as headaches, coughs, allergies, and minor pains, using readily available medications.<sup>8,9</sup>

To get a better understanding of the extent of self-treatment's problem, there's a need to understand its possible consequences. Self-treatment carries potential hazards such as misdiagnosis, improper dosing, drug interactions, allergic reactions, and medication errors. Accurate self-diagnosis can be challenging as seemingly minor health ailments may exhibit symptoms overlapping with more severe illnesses.<sup>10</sup> The irrational use of medicines can have detrimental effects and delay the diagnosis of underlying health issues.<sup>10-12</sup> To ensure responsible self-medication, individuals must be well-informed about the medications they plan to use and actively seek education on their appropriate usage. The later necessitates the individual's need for knowledge of the primary constituents of medications, recommended dosage, potential side effects, and contraindications to engage in responsible self-medication. It is crucial to make informed decisions by seeking trustworthy information from reliable sources such as reputable websites, pharmacists, or healthcare professionals.<sup>13,14</sup> Communication with medical professionals plays a vital role in ensuring the

safe and effective use of medications, and individuals should not hesitate to seek their advice when needed.<sup>15,16</sup> By adhering to these practices, individuals can promote the responsible and informed practice of self-medication.

Self-medication is a common practice among students, particularly university students, who often resort to it to alleviate minor ailments such as headaches, colds, and minor pains. Unfortunately, in some countries, this trend extends to the inappropriate use of prescription drugs and the self-administration of potent analgesics and antibiotics.<sup>17,18</sup> However, the implications of self-medication among students go beyond physical health concerns. It also encompasses managing psychiatric health issues such as stress, anxiety, depression, and emotional distress. In these instances, students rely on psychoactive substances like recreational drugs, alcohol, or comfort foods to self-regulate their mental well-being.<sup>19-24</sup> Students who engage in self-medication can be categorized into two groups based on their level of health literacy. Previous studies have highlighted the significant impact of school type and medical knowledge on the prevalence of self-medication among student populations, although the overall effects remain uncertain. Moreover, research indicates that medical education plays a role in influencing the frequency of self-medication among students.<sup>13,25,26</sup>

Bibliometric research is a comprehensive and systematic statistical analysis methodology employed to examine information derived from scientific literature.<sup>27,28</sup> This approach identifies emerging research subjects and concepts and provides insights into the most productive research countries, institutions, authors, and publications. Additionally, these investigations facilitate a qualitative and quantitative assessment of the progress made thus far, thereby enhancing the understanding and interpretation of scientific advancements in this particular field of study.<sup>29</sup> Researchers can utilize the findings of such studies to develop more focused and specific projects that consider the emerging and niche themes identified within the investigation.<sup>30-32</sup>

The main objective of this study was to conduct a comprehensive qualitative and quantitative analysis of the research on self-medication among students. The research methodology involved retrieving relevant documents from the Scopus database and employing bibliometric techniques, such as VOSviewer and Biblioshiny. These techniques were used to evaluate various variables, including scientific productivity, citation analysis, international collaboration, and keyword association analysis. The aim was to identify and map this field's most prominent areas of interest.

The findings of this bibliometric analysis can provide valuable insights for developing evidence-based policies and practices in the healthcare sector. Policymakers and healthcare providers can benefit from a thorough understanding of student self-medication's prevalence, patterns, and outcomes. By implementing evidence-based interventions, educational programs, and policies that promote responsible self-medication, students' health and safety can be better ensured.



## METHODS

### Search plan and refining the retrieved documents

The Scopus database was utilized to conduct a comprehensive search to identify and characterize global research on self-medication among students. The investigation was performed on February 26, 2023, using author keywords, abstracts, and titles. The search query employed the following string: (TITLE-ABS-KEY (self-medication OR "self medication") OR TITLE-ABS-KEY (self-treatment OR "self treatment")) AND TITLE-ABS-KEY (student OR students) AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "re")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "j")). Inclusion criteria considered only research articles and reviews published between 1968 and 2022 in English peer-reviewed journals. The search excluded documents in the press, letters, notes, editorials, conference articles, and errata. Additionally, publications in books, book chapters, and conference proceedings were not included in the analysis.

### Data export

Scopus data was used to retrieve the necessary documents for our study. Subsequently, the obtained data were exported in CSV format to enable further processing and extraction of bibliometric parameters.

### Bibliometric analyses and visualization

We mapped the collaborations, keywords, and citations in the retrieved documents using the latest version of the Visualization of Similarities (VOSviewer 1.6.19) ([www.vosviewer.com](http://www.vosviewer.com)). Using the VOSviewer mapping technique and cluster analysis, we were able to create visual representations of the relationships between countries, authors, and keywords.<sup>33</sup>

Additionally, cluster density maps were created to visually the distribution of keywords. To further analyze authors' keyword usage, we employed Biblioshiny, a program from the

Bibliometrix package.<sup>34</sup> This tool helped researchers identify commonalities and focus areas by examining patterns in the authors' utilization of keywords.

To ensure accuracy, we carefully reviewed the highly frequented keywords and countries that participated. During the keyword analysis, all similar or related terms have been merged into one word, i.e., self-medication and self-medication were standardized into one term. These alterations were made achievable by Biblioshiny and VOSviewer<sup>33,34</sup>. Similarly, we addressed variations in the naming of contributing countries. For instance, some papers used different writing styles (e.g., "United Kingdom" vs. "UK") or referred to the word "city" instead of "country" (e.g., "United States" vs. "New York").

## RESULTS

### Analysis of publications by year

A total of 735 relevant documents were retrieved in the search for self-medication-related literature from 1968 to 2022. Among these documents, 598 (81.4%) were published within the last fifteen years, specifically from 2008 to 2022. The distribution of research documents over the years is graphically depicted in Figure 1.

### Analysis of contributing journals

Out of the 735 documents retrieved from the Scopus database, approximately 451 were published in peer-reviewed journals. About 451 However, out of these journals, only 20 have published five or more articles related to the topic. Table 2 presents the top ten prolific publications, with PLOS ONE emerging as the leading journal with 16 articles (2.20%) published, closely followed by the International Journal of Environmental Research and Public Health with 14 articles. Notably, 7 out of the top 10 journals have been assigned a "Q1" rating by Scopus, indicating their high quality and impact.

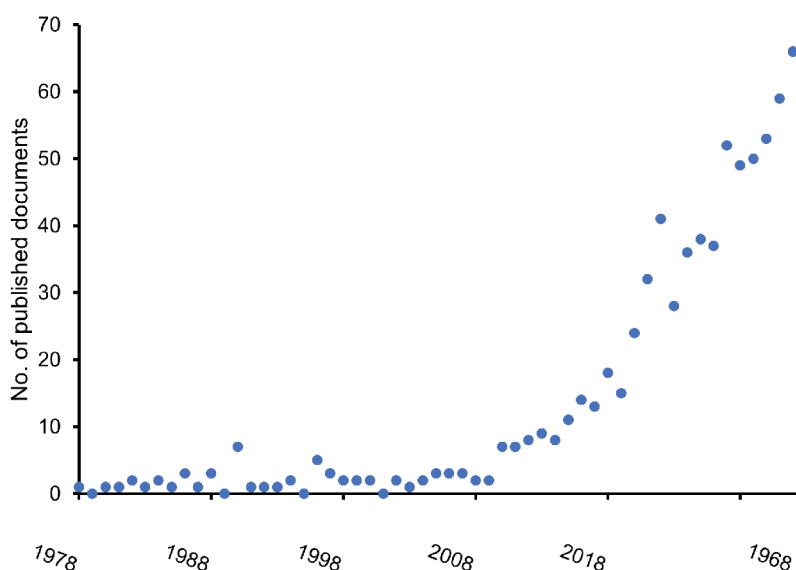


Figure 1. Growth of annual publications (1968 to 2022)



### Analysis of articles

The annual citation normalization for the ten most-cited documents is presented in Table 2.

The retrieved articles exhibited an average of 23.5 citations per document with an *h*-index of 67 and a total citation count of 17305. Furthermore, it is worth noting that 285 documents have been cited at least five times, further highlighting their influence and relevance in the field. The annual citation normalization of the ten most-cited documents is presented in Table 2, offering insights into the ongoing impact and citation trends of these highly influential publications.

### Analysis of authors

A total of 2,789 authors contributed to the publication of the retrieved documents, resulting in an average of 3.8 authors per document. Among them, eleven authors have produced at least five publications each. Notably, McCabe, S., from the University of Michigan, was the most prolific author with eight published documents, accounting for 1.1% of the total publications. However, when analyzing the collaborative authorship network using VOSviewer, it was observed that there was limited author collaboration. The graphic representation of the web revealed minimal connections and collaborations among authors

Journal Name	No of publications	%	Citations	Scopus Percentile (Q)
PLOSE ONE	16	2.2	740	87 (Q1)
International journal of environmental research and public health	14	1.9	249	75 (Q1)
Addictive behaviors	13	1.8	626	89 (Q1)
Journal of the Nepal medical association	11	1.5	20	25 (Q3)
Substance Use and Misuse	11	1.5	201	68 (Q2)
Pharmacy Practice	9	1.2	132	79 (Q1)
Psychology of addictive behaviors	9	1.2	345	82 (Q1)
BMC public health	8	1.1	252	79 (Q1)
Drug and alcohol dependence	8	1.1	453	82 (Q1)
Risk Management and Healthcare Policy	8	1.1	97	43 (Q3)

Rank	Authors	Title	Year	Number of citations	Total citations/year	Journal
1 <sup>st</sup>	Drossman, D.A., <i>et al</i> <sup>35</sup>	Bowel Patterns Among Subjects Not Seeking g Health Care: Use of a Questionnaire to Identify a Population with Bowel Dysfunction	1982	650	15.4	Gastroenterology
2 <sup>nd</sup>	Kontikiari, T. <i>et al</i> <sup>36</sup>	Randomized trial of cranberry-lingonberry juice and Lactobacillus GG drink for the prevention of urinary tract infections in women	2001	400	17.2	BMJ
3 <sup>rd</sup>	Deykin, E.Y. <i>et al</i> <sup>22</sup>	Adolescent depression, alcohol, and drug abuse	1987	349	9.4	American Journal of Public Health
4 <sup>th</sup>	Krantz, D.S., <i>et al</i> <sup>37</sup>	Assessment of preferences for self-treatment and information in health care	1980	321	85.5	Journal of Personality and Social Psychology
5 <sup>th</sup>	Hughes, P.H. <i>et al</i> <sup>38</sup>	Prevalence of Substance Use Among US Physicians	1992	304	98.4	JAMA
6 <sup>th</sup>	Patton, G.C. <i>et al</i> <sup>39</sup>	Is smoking associated with depression and anxiety in teenagers?	1996	273	118.6	American Journal of Public Health
7 <sup>th</sup>	Shankar, P.R. <i>et al</i> <sup>40</sup>	Self-medication and non-doctor prescription practices in Pokhara Valley, Western Nepal: A questionnaire-based study	2002	244	70.9	BMC Family Practice
8 <sup>th</sup>	Wilens, T.E. <i>et al</i> <sup>41</sup>	Attention-deficit/hyperactivity disorder and substance use disorders: The nature of the relationship, subtypes at risk, and treatment issues	2004	232	66.3	Psychiatric Clinics of North America
9 <sup>th</sup>	O'Loughlin, J. <i>et al</i> <sup>42</sup>	Nicotine-dependence symptoms are associated with smoking frequency in adolescents	2003	226	57.3	American Journal of Preventive Medicine
10 <sup>th</sup>	Boyd, C.J. <i>et al</i> <sup>43</sup>	Adolescents' Motivations to abuse prescription medications	2006	220	49.8	Pediatrics



### Active Countries

Within the Scopus database, our search terms yielded contributions from ninety-nine countries toward the publications in this field. Table 3 presents the top 10 countries based on the number of publications. The United States emerged as the leading contributor to the field, with 161 documents representing 21.9% of the total publications. Following closely, researchers from India contributed 78 papers, accounting for 10.6% of the total publications. Pakistani researchers secured the third position with 37 articles, representing 5.0% of the total publications. Notably, papers originating from the United States and the United Kingdom have demonstrated the highest scientific impact, as evidenced by their average citation counts of 47.5 and 27.3 per document, respectively. These figures highlight the significant influence and recognition of research from these countries within the field.

### Bibliometric mapping

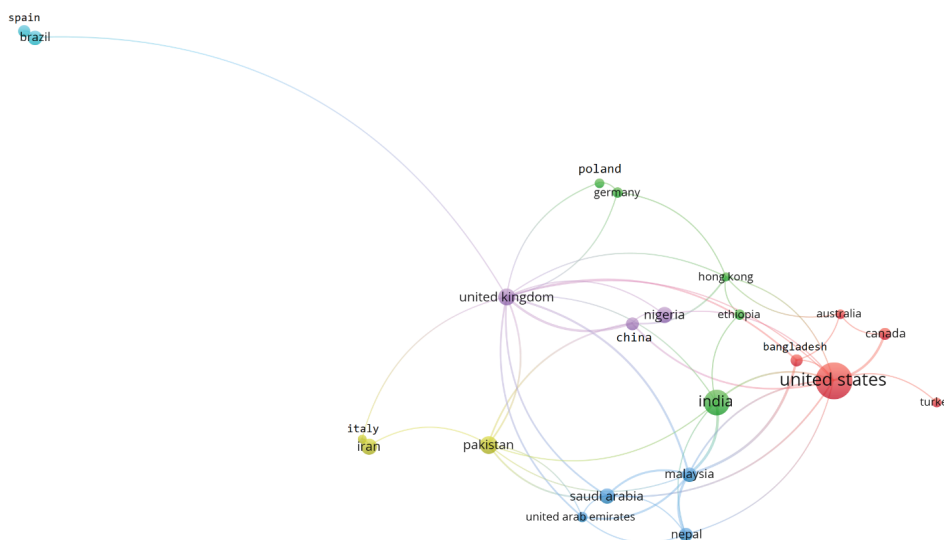
#### International collaboration

The VOSviewer software provides valuable insights into the publication and collaboration trends among countries. By utilizing this software, an analysis of international partnerships and collaborations was conducted, resulting in the creation of a network visualization map (Fig. 2). In this map, countries are represented as spheres, with larger spheres indicating a higher number of published documents (Fig. 2A) or citations received by those documents (Fig. 2B). Out of the 99 countries included in the analysis, only 24 countries met the minimum threshold of 10 published documents. However, the collaboration map featured 22 countries, as Jordan and France had no international partnerships and thus did not appear in the visualization map. These 22 countries were categorized into six groups based on their degree of cooperation. Group 1 (represented by

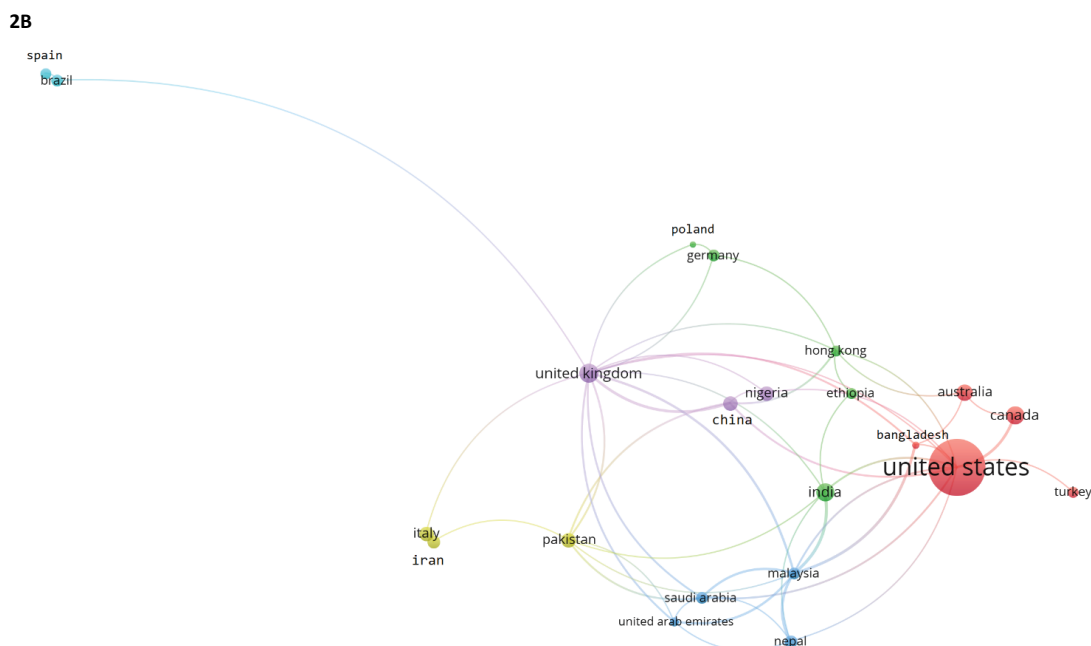
Table 3. Top ten active countries in publishing documents on self-medication among students

Rank	Country	Number of publications (absolute research output)	% of Total documents	Total citations	Citation /Document
1 <sup>st</sup>	United States	161	21.9	7654	47.5
2 <sup>nd</sup>	India	78	10.6	913	11.7
3 <sup>rd</sup>	Pakistan	37	5.0	485	13.1
4 <sup>th</sup>	United Kingdom	33	4.5	902	27.3
5 <sup>th</sup>	Iran	32	4.4	440	13.8
6 <sup>th</sup>	Nigeria	29	3.9	505	17.4
7 <sup>th</sup>	Saudi Arabia	28	3.8	365	13.0
8 <sup>th</sup>	Brazil	25	3.4	328	13.1
9 <sup>th</sup>	Malaysia	24	3.3	333	13.9
10 <sup>th</sup>	Nepal	22	3.0	383	17.4

2A







**Figure 2.** Map of international collaboration on the self-medication among students research as a network visualization. (A) based on a number of documents. (B) based on citations

red) comprises five countries: Australia, Bangladesh, Canada, Turkey, and the United States. Group 2 (green) comprises the following five countries: Ethiopia, Germany, Hong Kong, India, and Poland. Each one has a green hue. Group 3 (blue) comprises four different countries: Malaysia, Nepal, Saudi Arabia, and the United Arab Emirates. Group 4 consists of the three countries of Iran, Italy, and Pakistan (all shown in yellow). The fifth group (violet) comprises China, Nigeria, and the UK. Brazil and Spain (cyan) make up the sixth group.

### Analysis of author keywords and Hotspots Forecasting

To identify active research areas in students' use of self-medication, we conducted a keyword association analysis using bibliometric tools such as VOSviewer and Biblioshiny. The analysis focused on author keywords, using a thesaurus file to filter out synonyms and a minimum occurrence threshold of ten times.

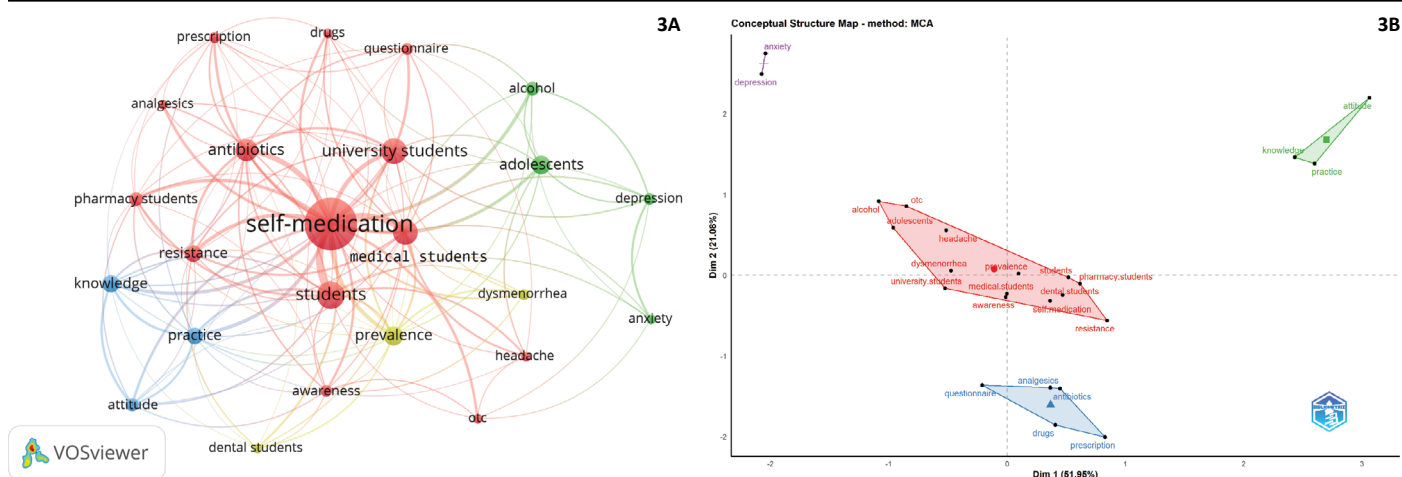
Table 4 and Figure 3 display the most frequent author-key words with a minimum of ten occurrence. Figure 3A depicts a network visualization map of author-keywords, showcasing the most frequent keywords (with ten or more occurrences) as circular nodes. Nodes of the same color are connected, and their size corresponds to the frequency of connections.

The identified author keywords were organized into four distinct clusters. Cluster 1 (represented in red) includes 14 terms such as analgesics, antibiotics, awareness, drugs, headache, medical students, OTC, pharmacy students, prescription, questionnaire, resistance, self-medication, and university students.

Cluster 2 (shown in green) comprises keywords related to adolescents, alcohol, anxiety, and depression. Cluster 3 (depicted in blue) includes words like perspective, expertise, and application. Lastly, Cluster 4 (represented in yellow)

Table 4. Highly frequent keywords (10 times and more)	
Author keywords	occurrences
Self-medication	267
Students	75
University students	64
Medical students	63
Antibiotics	48
Prevalence	37
Adolescents	35
Knowledge	30
Resistance	29
Practice	28
Pharmacy students	20
Alcohol	19
Attitude	17
Awareness	15
Depression	14
Questionnaire	14
Dysmenorrhea	13
Prescription	13
Analgesics	10
Anxiety	10
Dental students	10
Drugs	10
Headache	10
OTC	10





**Figure 3.** Analysis of the highest occurrence of author keywords. Keywords with a minimum occurrence of ten times were included (A): Network visualization map obtained by VOSviewer (B) Conceptual structure map.

encompasses three words related to dental students, dysmenorrhea and prevalence.

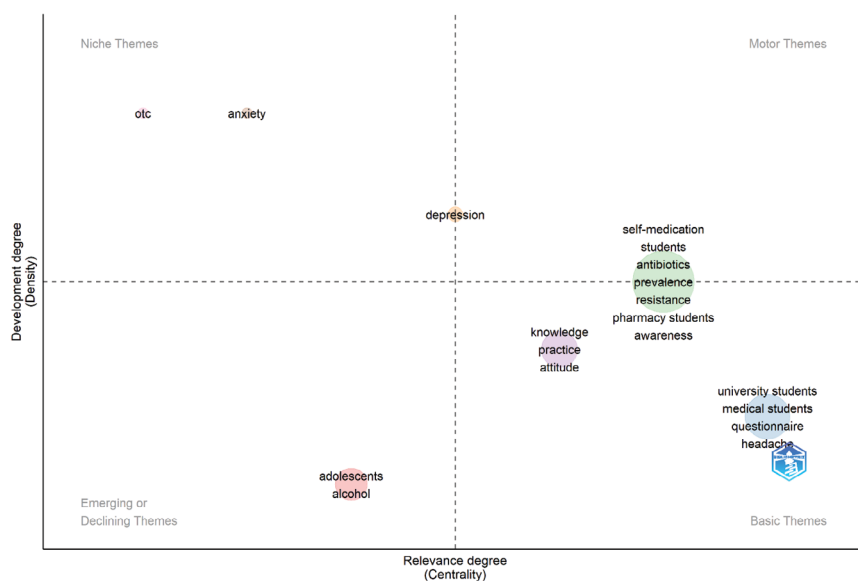
These clusters provide insights into the main research areas and topics surrounding students' use of self-medication, facilitating a better understanding of the prominent themes within the field.

Furthermore, a conceptual structural map was employed to assess the clustering of author-keywords, utilizing biblioshiny as the bibliometric tool (Fig. 3B). Notably, these clusters align closely with the previously identified clusters, indicating that the interconnections between keywords significantly influence research focuses within the field. To gain further insights into the extracted keywords, Biblioshiny was utilized to generate a thematic map (Fig. 4). Thematic maps are commonly employed in bibliometric studies to explore and present the diverse topics identified within a collection of published materials. The extracted keywords were classified into four overarching

thematic groups: niche, motor, emerging, and basic themes. Within the niche themes, anxiety, OTC medications, and depression emerged as prominent areas of study. These topics likely represented specialized and focused research within the broader context of self-medication among students.

In emerging themes, adolescence, and alcohol consumption they were stood out as important areas of investigation. These topics indicate emerging research interests and highlight the growing importance of understanding the role of self-medication among students during adolescence and the associated risks associated with alcohol consumption. The thematic analysis conducted in this study offers valuable insights into the various research themes and topics prevalent in students' use of self-medication.

Two complementary methods were employed to gain deeper insights into the author's keyword analysis. The first method involved creating an average publication year-



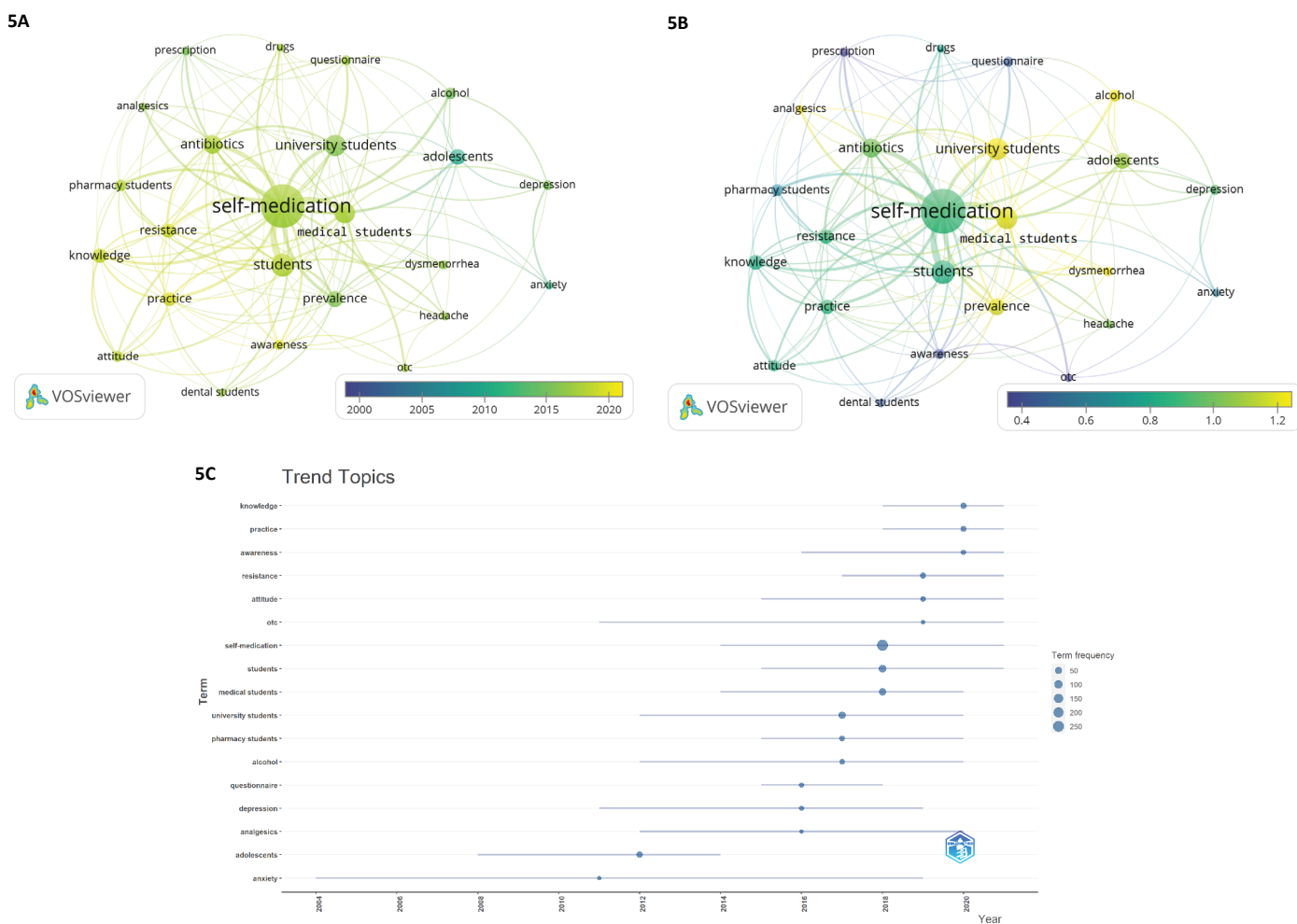
**Figure 4.** Thematic map obtained from author keyword analyses using Biblioshiny

based normalized overlay of keyword clusters, as illustrated in Figure 5A. The color-coded clusters in the figure represent author keywords based on their publication dates, with yellow indicating recently published keywords. This visualization provides a comprehensive overview of how different keyword clusters have evolved. The second method utilized Biblioshiny to visualize trend topics, as shown in Figure 5B. This analysis revealed that knowledge, practice, and awareness were the most extensively researched author keyword trends in the field. By exploring trend topics, researchers can identify the evolving interests and priorities within the study of self-medication among students. Remarkably, both methods yielded consistent findings, reinforcing the robustness of the results. The number of citations varied widely across individual author keywords. To account for the influence of publication age on citation counts, the citations were normalized based on the publication date, ensuring a fair comparison across different periods.<sup>27</sup> Figure 5C displays the normalized mean number of citations for the author keywords under consideration. Among the author keywords, “medical students,” “university students,” and

“prevalence” demonstrated the highest normalized citation counts, indicating their significant impact and visibility within the research literature. These data provide a comprehensive understanding of the temporal trends, topical foci, and citation impacts of author keywords in the field of self-medication among students. These insights contribute to the growing knowledge base and aid researchers in identifying key areas of interest and potential avenues for future research

### Analysis of all keywords

The study also examined the relationships between all-keyword terms found in the titles and abstracts of scholarly articles. Figure 6 presents a cluster density map visualization of the co-occurrences of these keywords; a minimum of fifty instances of each keyword was required for inclusion. Out of the 1274 words, only 54 met this criterion and were included in the final cluster density map. Words of the same color indicate a strong correlation, and the intensity of the colors in the map corresponds to the frequency of occurrences.



**Figure 5:** (A) Overlay visualization map of the highest occurrence of author keywords with average publication year overlay. (B) Author keyword trends (C): Overlay visualization map of the most increased occurrence of author keywords, with an average normalized citations overlay.



## DISCUSSION

Self-medication is an important healthcare system issue and plays a critical part in daily self-care. Students who self-medicate frequently use readily available OTC drugs and nutritional supplements. These products are frequently used by students to treat common minor ailment symptoms like headaches, colds, and minor aches.<sup>1</sup> It is important to remember, though, that students may self-medicate in ways that go beyond using traditional treatments. Occasionally, it can entail the self-administration of strong analgesics and antibiotics or the abuse of prescription drugs.<sup>44-47</sup> Additionally, self-medication among students is not just for reasons related to physical health, in order to cope with mental health problems like stress, worry, and emotional anguish, students also turn to self-medication. As a kind of self-management for their mental health in such circumstances, students may turn to psychoactive substances like recreational drugs, alcohol, or comfort foods.<sup>19-21</sup> However, it is crucial to recognize the inherent dangers linked to student self-medication. Without competent medical supervision, there is a risk of wrong diagnosis, ineffective dosage, and negative effects. It's possible that students lack the knowledge necessary to appropriately evaluate their symptoms and make healthcare decisions. Furthermore, self-medication has the potential to postpone professional identification and treatment by temporarily masking underlying medical issues.<sup>3</sup>

Bibliometric analysis can be used for analyzing and visualizing large-scale scientific knowledge. The current bibliometric study on student self-medication provides a thorough analysis of the subject, identifying key research areas, encouraging researcher cooperation, and promoting the use of sound evidence in decision-making. In this study, the bibliometric analysis provides better understanding about self-medication practices among students and makes it easier to create effective strategies to promote safe and responsible healthcare behaviors in this population. Due to its huge collection of pertinent documents, the Scopus database—the biggest abstract and citation database of peer-reviewed literature—was chosen for this investigation. It provides simple and complex search options, analytical tools, and data export capabilities for further in-depth analysis and mapping. Journals indexed in Scopus undergo rigorous peer review and evaluation processes.<sup>27</sup> The findings of this study can be utilized by academics, research organizations, and decision-makers to focus their efforts and guide further research in this critical area.

We conducted a comprehensive search for documents related to student self-medication spanning the past 55 years, focusing exclusively on peer-reviewed English articles and reviews. The analysis revealed a notable increase in publications in this field over the last fifteen years, with approximately 81.4% of the retrieved documents published between 2008 and 2022 (Figure 1). We obtained 735 papers from 451 Scopus-indexed journals, with the top ten active journals accounting for around 14.6% of all disseminated articles (Table 1). The retrieved documents collectively amassed 17,305 citations, averaging 23.5 citations per document, resulting in a published h-index of 67. Despite the significance of this topic, it appears to attract relatively

less attention from readers than other research areas. Among the retrieved documents, the highest number of citations was associated with papers published in PLOS ONE.

The study by Drossman, D.A., *et al.*<sup>35</sup>, which was published in *Gastroenterology*, was the one with the most citations. This study investigated how common gastrointestinal motility disorders among a non-medical people, including college students and hospital staff. On the other hand, the most cited article per year, authored by Patton, G.C. *et al.*<sup>39</sup> was published in the *American Journal of Public Health*. This article investigated the connection between adolescent smokers, depression, and anxiety. Based on our analysis of the geographical distribution of the retrieved papers, the United States was found the leading contributor with 161 publications (21.9%), followed by India with 78 publications (10.6%). Table 3 and Figure 2 show that papers from the United States have the highest scientific impact when comparing countries based on the average number of citations per document, with an average of 47.5 citations per document, followed by the United Kingdom with 27.3 citations per document.

Despite the importance of the topic, the total number of citations for the retrieved documents (17,305) seems lower than one might anticipate given that they were published in reputable periodicals. Seven of the top ten journals in this discipline are categorized as Q1 journals, as seen in Table 1. Additionally, the research collaborations network across countries was found to have minimal collaboration (Figure 3), with two countries that had published at least 10 papers in the field not being represented on the visualization map.

### Research trends and hotspots

Analysis of author keywords in this study has revealed a significant hotspot in research, highlighting critical concerns that demand global attention (Table 4, Figures 3-6). Self-medication practices among students, including university students, pose a severe and complex issue, encompassing using analgesics, antibiotics, and other drugs without proper medical supervision. Understanding the factors associated with self-medication, such as the attitudes, knowledge, and practices of different student groups, is crucial to address potential risks and promote responsible healthcare behaviors.

Medicine is a necessity for the general population and a strategic asset in every country. While significant advancements in medical services have improved accessibility to medications, they have also given rise to a dangerous social phenomenon known as irrational drug use. This includes inappropriate antibiotic use, unnecessary injections when oral medication is more suitable, excessive medication intake per prescription, prescribing medication without following clinical guidelines, failure to adhere to prescribed medication regimens and the widespread practice of self-medication. Self-medication is often the initial response to early symptoms of illness and has become a prevalent health issue. However, it carries inherent risks, such as drug dependence, intoxication, bacterial resistance, and masking symptoms associated with severe underlying conditions.





Adolescence is a critical time in life marked by significant physical, emotional, and social changes. During this time, students face various challenges, including social issues, academic pressure, and the search for one's own identity. These stressors can contribute to anxiety and depression among students, leading some to self-medication as a coping mechanism.<sup>50,51</sup> Unfortunately, the substance of choice for self-medication among students could be alcohol. It is frequently viewed as a momentary diversion from issues, a technique to reduce social anxiety, and a mood enhancer. But over time, abusing alcohol as a coping strategy can make mental health problems worse. Alcohol works as a depressant, amplifying feelings of despair and anxiety, which leads to a hazardous cycle of self-medication and worsening mental health.<sup>22,23,38</sup>

Self-medication can provide momentary respite from the symptoms of depression and anxiety, two common mental health issues among college students. Individuals with panic disorder, social phobia, specific phobia, and generalized anxiety disorder may engage in self-medication, with those with generalized anxiety disorder showing the highest rates of alcohol-only self-medication.<sup>51</sup>

Self-medication should not be considered a long-term option for treating students' anxiety and depression. It is important to recognize that self-medication does not address the underlying issues and may discourage students from seeking professional help and evidence-based treatments.<sup>51,52</sup> To address this issue, awareness-building and promoting mental health literacy are essential. Students must be educated about the importance of seeking appropriate help for their mental health concerns. It is important to promote therapy, counselling, and other evidence-based interventions as successful treatments for anxiety and depression.<sup>13</sup> Reducing mental health stigma is crucial in creating a supportive environment for students. Universities and other educational institutions can play a vital role by offering mental health resources and support services. This may entail setting up counselling facilities, holding seminars on stress management and coping mechanisms, and encouraging an environment where people can talk openly about their mental health.<sup>53,54</sup> Students are more likely to seek appropriate help and avoid using self-medication as a coping method by encouraging mental health literacy, raising knowledge of the hazards associated with self-medication, and developing a supportive environment. Prioritizing students' well-being is crucial, as is giving them the resources and tools they require to effectively manage their mental health.

Students' self-medication habits are greatly influenced by their level of awareness. The inherent risks, restrictions, and effects of self-medication must be thoroughly explained to students. This can be accomplished by running awareness campaigns, including health education programs into the curriculum, and enticing students to professional experts. Students are more likely to comprehend the benefit of seeking the advice of medical professionals and the significance of practicing responsible self-care if awareness is increased.

Special consideration should be given to medical, dental, and pharmacy students when addressing self-medication practices.

Although these students may have a better grasp of drugs and their effects as a result of their education, this does not imply that they will always use drugs responsibly.<sup>13</sup>

It is important to assess medical students' attitudes, knowledge, and behaviors to identify gaps or misconceptions contributing to inappropriate self-medication. Tailored educational interventions can then be developed to address these specific needs.<sup>25,54</sup>

Prescription questionnaires and surveys can be valuable instruments for examining student self-medication practices.

These instruments enable researchers to gather essential data on students' medication use, attitudes, and behaviors about self-medication. Researchers can identify patterns, prevalence rates, and factors influencing self-medication behaviors among students by analyzing the data collected through such questionnaires. To encourage responsible self-medication practices, these data are crucial for creating targeted interventions, educational initiatives, and policy changes.<sup>7,10,55</sup> Healthcare providers, educators, and policymakers must work together to create comprehensive programs that address the difficulties related to self-medication among students.

## CONCLUSION

Student self-medication is a complicated and significant problem that needs more focus attention and quick resolution. Educating students about the potential risks and dangers associated with self-medication is crucial. The implementation of awareness campaigns and health education programs is a crucial proposal to encourage responsible and safe self-medication practices. These initiatives can increase students' awareness about the importance of seeking professional advice and provide them with the necessary information to make informed decisions about their health.

In addition, Accessible mental health treatments and resources must also be established on campuses. By offering such assistance, students can better cope with stress and other mental health challenges, reducing the likelihood of seeking to self-medication. Collaborative efforts among healthcare professionals, educational institutions, and government officials are necessary to develop comprehensive programs that address the various aspects of self-medication among students.

More focus research is needed to comprehend the prevalence of self-medication among students and identify specific factors contributing to this behavior. This study can help in targeted interventions and policies promoting safe and responsible self-medication practices. In order to ensure the wellbeing of students and promote responsible self-care behaviors, it will be essential to adopt a multifaceted strategy comprising education, awareness, accessible services, and research.

## Limitations

The current study has some minor drawbacks that can be acknowledged. Firstly, because Scopus was the only database



we used to find pertinent documents, we might have missed important publications on student self-medication that were published in journals that weren't indexed in Scopus. Additionally, it's possible that a small number of papers from 2022 were not included in our analysis since they were not yet included in Scopus at the time of our research. Furthermore, our study did not include any "in press" publications, which might have left out any recent and important investigations. Additionally, despite efforts to assure the relevance of the documents that were collected, a thorough evaluation of each document was not carried out, which might have resulted in the inclusion of certain papers that have no direct connection to student self-medication. Another drawback of our analysis is that we only took into account papers that were published in English. Studies conducted in other languages could give researchers important knowledge of how students use self-medication. Finally, it is crucial to admit that minute inaccuracies or typos in the authors' names or affiliations may have happened during the data extraction procedure, which may have had insignificant effect on the outcomes of our study.

## ACKNOWLEDGMENTS

The authors would like to express their gratitude to the University of Sharjah and the University of Jordan for their continuous support and for supplying the necessary resources for this study.

## AUTHOR CONTRIBUTIONS

YB and JT: Conceptualization. AF, AAH and AI: Methodology. YB,

WEH, EAG: Formal analysis. KA, MAYA and AA: Investigation. IH, MEF and MHS: Data curation. All authors have significantly contributed to the development and writing of this manuscript and have read, reviewed, and approved the final manuscript.

## FUNDING

This research has no external funding.

## DECLARATION OF CONFLICT OF INTEREST

The authors declare that they have no conflict of interest

## DECLARATION OF COMPETING INTEREST

The authors declare that they have no competing interests.

## DATA AVAILABILITY STATEMENT

Data included in article/supplementary materials/referenced in the article. Further data will be made available on request.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

## CONSENT FOR PUBLICATION

Not applicable.

## References

1. Al-Qerem W, Bargooth A, Jarab A, et al. Information sources, attitudes, and practices of Self-Medication by Jordanian patients: A cross-sectional study. *Saudi Pharmaceutical Journal*. 2023;31(4):482-491. <https://doi.org/10.1016/j.jsps.2023.01.015>
2. Behzadifar M, Behzadifar M, Aryankhesal A, et al. Prevalence of self-medication in university students: Systematic review and meta-analysis. *Eastern Mediterranean Health Journal*. 2020;26(7):846-857. <https://doi.org/10.26719/emhj.20.052>
3. Alwhaibi M, Bin Malik S, Alswailem L, et al. Self-medication among adults with chronic health conditions: A population-based cross-sectional survey in Saudi Arabia. *BMJ Open*. 2023;13(4). <https://doi.org/10.1136/bmjopen-2022-069206>
4. Loni SB, Eid Alzahrani R, Alzahrani M, et al. Prevalence of self-medication and associated factors among female students of health science colleges at Majmaah University: A cross-sectional study. *Frontiers in Public Health*. 2023;11:1090021. <https://doi.org/10.3389/fpubh.2023.1090021>
5. Nakakande J, Taremwa IM, Nanyingi M, et al. The Utility of Internet-Enabled Antibiotic Self-Medication and Its Associated Factors Among Patients Attending Private Clinics in Kawempe Division in Kampala Capital City, Uganda: Community-Based Cross-Sectional Study. *Drug, Healthcare and Patient Safety*. 2023;15:85-91. <https://doi.org/10.2147/dhps.s405072>
6. Alsaad HA, Almahdi JS, Alsalameen NA, et al. Assessment of self-medication practice and the potential to use a mobile app to ensure safe and effective self-medication among the public in Saudi Arabia. *Saudi Pharmaceutical Journal*. 2022;30(7):927-933. <https://doi.org/10.1016/j.jsps.2022.05.010>
7. Salameh I, Awwad S, Khdour M, et al. Online self-medication practices among university students in palestine: A questionnaire-based study. *Jordan Journal of Pharmaceutical Sciences*. 2021;14(3):243-254.
8. Kiroğlu O, Berktaş F, Khan Z, et al. Self-medication practices with conventional and herbal drugs among ear, nose, and throat patients. *Revista da Associação Médica Brasileira*. 2022;68(10):1416-1422. <https://doi.org/10.1590/1806-9282.20220430>
9. Khairy WA, Nasser HA, Sarhan MD, et al. Prevalence and predictors of self-medication with antifungal drugs and herbal products among university students: A cross-sectional study from egypt. *Risk Management and Healthcare Policy*. 2021;14:2191-2200. <https://doi.org/10.2147/rmhp.s308400>
10. Zeb S, Mushtaq M, Ahmad M, et al. Self-Medication as an Important Risk Factor for Antibiotic Resistance: A Multi-Institutional





- Survey among Students. *Antibiotics*. 2022;11(7):842. <https://doi.org/10.3390/antibiotics11070842>
11. Panda TK, Goya D, Nebhinani N, et al. Mania after codeine self-medication in a case of panic disorder. *Minerva Psychiatry*. 2022;63(3):305-308.
  12. Feingold D, Tzur Bitan D. Addiction Psychotherapy: Going Beyond Self-Medication. *Frontiers in Psychiatry*. 2022;13: 820660. <https://doi.org/10.3389/fpsy.2022.820660>
  13. Muralidharan, Ganapathy D, Sasanka K. Awareness on self-medications practices among dental students. *International Journal of Research in Pharmaceutical Sciences*. 2020;11(Special Issue 3):1389-1392.
  14. Dos Silva DS, De Yamaguchi KKL. Drug chemistry and self-medication awareness as a tool in teaching organic functions. *Periodico Tche Quimica*. 2019;16(31):223-234.
  15. Daanish AF, Mushkani EA. Influence of Medical Education on Medicine Use and Self-Medication Among Medical Students: A Cross-Sectional Study from Kabul. *Drug, Healthcare and Patient Safety*. 2022;14:79-85. <https://doi.org/10.2147/dhps.s360072>
  16. Roberts EP, Roberts BS, Burns A, et al. Prevalence and dental professional awareness of antibiotic self-medication among older adults: Implications for dental education. *Journal of Dental Education*. 2020;84(10):1126-1135. <https://doi.org/10.1002/jdd.12239>
  17. Khadka S, Shrestha O, Koirala G, et al. Health seeking behavior and self-medication practice among undergraduate medical students of a teaching hospital: A cross-sectional study. *Annals of Medicine and Surgery*. 2022;78:103776. <https://doi.org/10.1016/j.amsu.2022.103776>
  18. Al-Kubaisi KA, Hassanein MM, Abdulkarem AR. Prevalence and associated risk factors of self-medication with over-the-counter medicines among university students in the United Arab Emirates. *Pharmacy Practice*. 2022;20(3):2679. <https://doi.org/10.18549/pharmpract.2022.3.2679>
  19. Rasheed FA, Naqvi AA, Ahmad R, et al. Academic stress and prevalence of stress-related self-medication among undergraduate female students of health and non-health cluster colleges of a public sector University in Dammam, Saudi Arabia. *Journal of Pharmacy and Bioallied Sciences*. 2017;9(4):251-258. [https://doi.org/10.4103/jpbs.jpbs\\_189\\_17](https://doi.org/10.4103/jpbs.jpbs_189_17)
  20. Chowdhury N, Haque A, Aysha F. Investigation into self-medication of drugs for primary and adjunct therapy in psychiatric diseases among students in Chittagong City of Bangladesh: A comparison between medical and nonmedical students. *Indian Journal of Psychological Medicine*. 2012;34(4):313-317. <https://doi.org/10.4103/0253-7176.108195>
  21. Lawrence TI, McField AA, Byrne MM, et al. Depression and Substance Use as Consequences of Exposure to Family Violence: A Moderation Mediation and Self-Medication Hypothesis Study. *Journal of Child and Adolescent Trauma*. 2023;16(1):69-79. <https://doi.org/10.1007/s40653-022-00464-3>
  22. Deykin EY, Levy JC, Wells V. Adolescent depression, alcohol and drug abuse. *AM J PUBLIC HEALTH*. 1987;77(2):178-182. <https://doi.org/10.2105/ajph.77.2.178>
  23. Zhong BL, Xu YM, Xie WX, et al. Alcohol Drinking in Chinese Methadone-maintained Clients: A Self-medication for Depression and Anxiety? *J Addict Med*. 2019;13(4):314-321. <https://doi.org/10.1097/adm.0000000000000500>
  24. Hawn SE, Cusack SE, Amstadter AB. A Systematic Review of the Self-Medication Hypothesis in the Context of Posttraumatic Stress Disorder and Comorbid Problematic Alcohol Use. *J Trauma Stress*. 2020;33(5):699-708. <https://doi.org/10.1002/jts.22521>
  25. Petrović AT, Pavlović N, Stilinović N, et al. Self-Medication Perceptions and Practice of Medical and Pharmacy Students in Serbia. *Int J Environ Res Public Health*. 2022;19(3). <https://doi.org/10.3390/ijerph19031193>
  26. Issa AY, Farhaa RA, Elayeha E, et al. Impact of medical specialty on the prescription patterns of topical corticosteroid among healthcare professionals. *Jordan Journal of Pharmaceutical Sciences*. 2016;9(2):103-114.
  27. Bustanji Y, Taneera J, Semreen MH, et al. Gold Nanoparticles and Breast Cancer: A bibliometric Analysis of the Current State of Research and Future Directions. *OpenNano*. 2023/05/29/ 2023:100164.
  28. Zyoud SH. The Arab region's contribution to global COVID-19 research: Bibliometric and visualization analysis. *Globalization Health*. 2021;17(1). <https://doi.org/10.1186/s12992-021-00690-8>
  29. Wallin JA. Bibliometric methods: Pitfalls and possibilities. *Basic Clin Pharmacol Toxicol*. 2005;97(5):261-275. [https://doi.org/10.1111/j.1742-7843.2005.pto\\_139.x](https://doi.org/10.1111/j.1742-7843.2005.pto_139.x)
  30. Bustanji Y, Shihab KHA, El-Huneidi W, et al. Analysis and mapping of global scientific research on human monkeypox over the past 20 years. *Veterinary World*. 2023;16(4):693-703. <https://doi.org/10.14202/vetworld.2023.693-703>
  31. Sweileh WM. Global research publications on irrational use of antimicrobials: call for more research to contain antimicrobial resistance. *Globalization Health*. 2021;17(1). <https://doi.org/10.1186/s12992-021-00754-9>
  32. Sweileh WM. Global research activity on mathematical modeling of transmission and control of 23 selected infectious disease outbreak. *Globalization Health*. 2022;18(1). <https://doi.org/10.1186/s12992-022-00803-x>
  33. van Eck NJ, Waltman L. Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*. 2010;84(2):523-538. <https://doi.org/10.1007/s11192-009-0146-3>
  34. Aria M, Cuccurullo C. bibliometrix: An R-tool for comprehensive science mapping analysis. *J Inf*. 2017;11(4):959-975.
  35. Drossman DA, Sandler RS, McKee DC, et al. Bowel Patterns Among Subjects Not Seeking Health Care: Use of a Questionnaire to Identify a Population With Bowel Dysfunction. *Gastroenterology*. 1982;83(3):529-534.
  36. Kontiokari T, Sundqvist K, Nuutinen M, et al. Randomised trial of cranberry-lingonberry juice and Lactobacillus GG drink for





- the prevention of urinary tract infections in women. *BMJ*. 2001;322(7302):1571. <https://doi.org/10.1136/bmj.322.7302.1571>
37. Krantz DS, Baum A, Wideman MV. Assessment of preferences for self-treatment and information in health care. *J Pers Soc Psychol*. 1980;39(5):977-990. <https://doi.org/10.1037//0022-3514.39.5.977>
  38. Hughes PH, Brandenburg N, Baldwin DC, et al. Prevalence of Substance Use Among US Physicians. *JAMA*. 1992;267(17):2333-2339.
  39. Patton GC, Hibbert M, Rosier MJ, et al. Is smoking associated with depression and anxiety in teenagers? *AM J PUBLIC HEALTH*. 1996;86(2):225-230. <https://doi.org/10.2105/ajph.86.2.225>
  40. Shankar PR, Partha P, Shenoy N. Self-medication and non-doctor prescription practices in Pokhara valley, Western Nepal: A questionnaire-based study. *BMC Fam Pract*. 2002;3:1-7. <https://doi.org/10.1186/1471-2296-3-17>
  41. Wilens TE. Attention-deficit/hyperactivity disorder and the substance use disorders: The nature of the relationship, subtypes at risk, and treatment issues. *Psychiatr Clin North Am*. 2004;27(2):283-301. [https://doi.org/10.1016/s0193-953x\(03\)00113-8](https://doi.org/10.1016/s0193-953x(03)00113-8)
  42. O'Loughlin J, DiFranza J, Tyndale RF, et al. Nicotine-dependence symptoms are associated with smoking frequency in adolescents. *Am J Prev Med*. 2003;25(3):219-225. [https://doi.org/10.1016/s0749-3797\(03\)00198-3](https://doi.org/10.1016/s0749-3797(03)00198-3)
  43. Boyd CJ, McCabe SE, Cranford JA, et al. Adolescents' motivations to abuse prescription medications. *Pediatrics*. 2006;118(6):2472-2480. <https://doi.org/10.1542/peds.2006-1644>
  44. Alrabiah Z, Arafah A, Rehman MU, et al. Prevalence and Self-Medication for Acne among Students of Health-Related Science Colleges at King Saud University in Riyadh Region Saudi Arabia. *Medicina (Lithuania)*. 2023;59(1).
  45. Bi B, Qin J, Zhang L, Lin C, Li S, Zhang Y. Systematic Review and Meta-Analysis of Factors Influencing Self-Medication in Children. *Inquiry : a journal of medical care organization, provision and financing*. 2023;60:469580231159744. <https://doi.org/10.1177/00469580231159744>
  46. Shrestha R, Bhandari MS, Shrestha SS, et al. Self-medication in Primary Dysmenorrhea among Undergraduate Students in a Medical College: A Descriptive Cross-sectional Study. *Journal of the Nepal Medical Association*. 2022;60(256):1011-1015. <https://doi.org/10.31729/jnma.7816>
  47. Yousef AMM, Al-Bakri AG, Bustanji Y, et al. Self-medication patterns in Amman, Jordan. *Pharmacy World and Science*. 2008;30(1):24-30. <https://doi.org/10.1007/s11096-007-9135-x>
  48. Jayanthi B, Anuradha HV. Self-medication practice for dysmenorrhoea in medical, paramedical and non-medical students. *International Journal of Pharmaceutical Sciences Review and Research*. 2014;27(1):141-145.
  49. Al-Bakri AG, Bustanji Y, Yousef AM. Community consumption of antibacterial drugs within the Jordanian population: Sources, patterns and appropriateness. *International Journal of Antimicrobial Agents*. 2005;26(5):389-395. <https://doi.org/10.1016/j.ijantimicag.2005.07.014>
  50. Sarvet AL, Wall MM, Keyes KM, et al. Self-medication of mood and anxiety disorders with marijuana: Higher in states with medical marijuana laws. *Drug Alcohol Depend*. 2018;186:10-15. <https://doi.org/10.1016/j.drugalcdep.2018.01.009>
  51. Turner S, Mota N, Bolton J, et al. Self-medication with alcohol or drugs for mood and anxiety disorders: A narrative review of the epidemiological literature. *Depression Anxiety*. 2018;35(9):851-860. <https://doi.org/10.1002/da.22771>
  52. Bolton J, Cox B, Clara I, et al. Use of Alcohol and Drugs to Self-Medicate Anxiety Disorders in a Nationally Representative Sample. *The Journal of Nervous and Mental Disease*. 2006;194(11). <https://doi.org/10.1097/01.nmd.0000244481.63148.98>
  53. Shah K, Halder S, Haider SS. Assessment of knowledge, perception, and awareness about self-medication practices among university students in Nepal. *Heliyon*. 2021;7(1):e05976. <https://doi.org/10.1016/j.heliyon.2021.e05976>
  54. Alduraibi RK, Altowayan WM. A cross-sectional survey: knowledge, attitudes, and practices of self-medication in medical and pharmacy students. *BMC Health Serv Res*. 2022;22(1). <https://doi.org/10.1186/s12913-022-07704-0>
  55. Abu-Rish EY, Elayah ER, Mousa LA, et al. Knowledge, awareness and practices towards seasonal influenza and its vaccine: Implications for future vaccination campaigns in Jordan. *Family Practice*. 2016;33(6):690-697. <https://doi.org/10.1093/fampra/cmw086>

