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A Bibliometric Analysis of Global Scientific Literature on Substance Abuse among School Students Based on PubMed Database (1991-2021)

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Abstract

The purpose of the study was to carry out a bibliometric analysis of the global scientific literature on substance abuse among school children to understand the global research trend on the subject. Bibliographic data of journal articles related to the study topic published during 1991-2021 were retrieved from PubMed database. Data were analyzed using the Bibliometrix R package and MS Excel. The study identified annual growth of publication trends, top authors, leading institutions, Core journals, most contributing countries, and the country collaboration in the research activities on this subject. A total of 3,326 records were selected for the analysis. The annual growth of publications was increasing in trend. Lowry Richard from USA was the most contributing author based on the highest number of publications. The USA was the most productive country publishing the highest number of articles (2408 articles) and the highest international country collaboration with 49 countries all over the world. The University of California was the leading institution (874 articles) in this study.

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The study identified that the journal titled ‘Addictive behaviors’ was found to be the top journal with the highest number of publications (118 articles) on this subject. The study provides the current status and development of research in the field.

Keywords: bibliometric analysis, substance abuse, drug abuse, school students

Introduction

American Psychological Association describes substance use disorder as a "complex condition in which there is uncontrolled use of a substance despite harmful consequences" (Psychiatry.org (n.d.)). Before 2013, there were two separate categories called substance abuse and substance dependence. The Diagnostic and Statistical Manual of Mental Disorders V (DSM-V) published in 2013 removed these two and replaced them with one category called substance use disorders. According to DSM-V-TR (2022), there are ten classes of substances that could lead to substance use disorder which are "alcohol; caffeine; cannabis; hallucinogens; inhalants; opioids; sedatives; hypnotics; stimulants; tobacco and other substances" (American Psychiatric Association, 2022). These substances can cause death both directly and indirectly. Directly, drug overdose could lead to death. Indirectly, substance usage is the underlying main cause of many diseases that lead to death.

In the year 2019, globally there were 583,000 deaths directly and indirectly due to substance use disorders (World Health Organization, 2019). According to the World Drug Report 2021, globally there were about 275 million people using drugs in the year 2020, and 36 million people were suffering from substance use disorders (United Nations Office on Drugs and Crime (UNODC), 2021). Substance use disorders are not limited to any specific age group. With regard to drug prevalence rates, substance use disorders are three or four times higher among youth than the general population in many countries due to adolescence being the most vulnerable growth period prone to substance use (United Nations, 2001). The main reason for this is the experimental and risky nature of adolescence.

According to the American Addiction Center, 35% of twelfth-grade students used marijuana (National Institute on Drug Abuse (NIDA), (n.d.)). Among middle school students in the USA, 570,000 were using E-cigarettes in 2018 compared to 60,000 students in 2011, a sharp increase from 0.6% to 4.9% (Cullen et al., 2018). However, the National survey on drug abuse among US students highlighted that there was an unusual decline in substance use in all grades of school students between 2019 and 2021 due to the COVID-19 pandemic effect (Miech et al., 2022). Authorities should give the utmost importance to implementing effective prevention programs for drug abuse in all grades including pre-school (Belcher & Shinitzky, 1998). These programs done in preschool and kindergarten have been shown to reduce cannabis usage by between 7 and 23 percent. A study done on 21-year-old young adults in the USA showed that cannabis usage was lower among the students who participated in kindergarten and preschool preventive programs than the ones who didn't but had a similar background (UNODC, 2015). Policymakers need to consider the research findings to develop an effective plan for these programs.

Bibliometric analysis is a quantitative way of analyzing published scientific literature on a specific subject. It identifies trending subtopics, prominent researchers, productive institutions, most contributing countries, productive information sources that publish research literature, collaborative relationships among countries and researchers, emerging themes, etc. As it provides an overall picture of the scientific production, the analysis guides the researchers to identify gaps in research on a subject and to plan for future research activities. Bibliometric analysis is done on various medical topics to understand the trend in research activities on the specific topic. Some studies would be bibliometric analyses on health informatics (Binkheder et al., 2021),

breast cancer, (Özen Çınar, 2020), hypertension (Devos & Menard, 2019), income and cardiovascular disease (Ding et al., 2020), and Covid-19 (Chahrour et al., 2020).

Some bibliometric studies were carried out related to substance abuse; for example, Bibliometric analysis of substance use disorders in Arab countries (Sweileh et al., 2014); Genetic factors of substance-related disorders (Wang et al., 2021); twenty years analysis on Illicit drug addiction (Khalili et al., 2018); substance use disorder and treatment (Tran et al., 2019); Drug abuse in India; (Azmi & Abbas, 2018); and Publications on Opioids (Azmi & Abbas, 2018). However, based on the knowledge of the author, no bibliometric study was conducted on the specific topic of substance abuse among school children. As substance abuse among school children is a global threat, it is important to carry out a bibliometric analysis on this topic to identify the research productivity in this area. The analysis will be useful to provide a better understanding to the researchers, policymakers, and other general public about the research trend on substance abuse among school children and to plan for future research activities.

Objective

The study aimed to explore the global trend in the research literature on substance abuse among school children between 1991 and 2021 based on the journal articles indexed in the PubMed database. Specific objectives of the study were to reveal the trend in publication growth, and to identify the prominent researchers, productive countries, leading institutions, and the leading core journals publishing scientific articles pertaining to substance abuse among school children. Further, the study analysed the research collaboration among countries all over the world on this subject.

Methodology

The PubMed database was used to retrieve global research publications related to substance abuse among school children. PubMed is a free biomedical database comprised of more than 30 million citations and abstracts of global publications developed and maintained by the National Center for Biotechnology Information at the US National Library of Medicine (PubMed, 2022). PubMed was chosen because it provides extensive coverage of quality literature in health and life sciences including articles from both established and emerging journals. This comprehensive coverage ensures that researchers have access to a wide range of relevant publications for the analysis. Further, PubMed is freely accessible to researchers worldwide, making it an inclusive and cost-effective resource for conducting bibliometric analysis.

The data collection was done with keyword search to identify all scientific publications related to the study topic during the period between 1991 - 2021. The period was considered based on the number of publications indexed in the PubMed database on this study topic and there were many incomplete records available in PubMed before the year 1990. A comprehensive search strategy was developed to retrieve full coverage of the records to achieve the objectives of the study. The entry search terms for the study were selected by consulting several sources without missing important records and avoiding false record retrievals. Medical Subject Headings (MeSH) list established by the National Library of Medicine; USA was referred to get the accurate search terms. Previous studies (Khalili et al., 2018; Sweileh et al., 2014; Tran et al., 2019; Wang et al., 2021) related to substance use disorders were also used to select the relevant search terms. The list of search terms was finalized through a discussion with a senior medical

librarian, who is an expert in searching PubMed database. Though we use specific search terms to retrieve the data, PubMed automatically adds all relevant MeSH terms to the search [PubMed, 2022.].

Advanced search method was applied and all key search terms related to substance use-related disorders were entered with the 'OR' operator and searched in 'All Fields' (Query 1). Then, query 2 was performed with the search terms "school students" OR "school children" OR "school education". Query 1 and query 2 were combined with an 'AND' operator. To get only publications related to school students, query 3 was combined with the 'NOT' operator to avoid "university students" OR "college students". As the study was defined during the period from 1991 -2021, the publication date was limited from the 01st of January 1991 to the 31st of December 2021. To increase the accuracy of the search results, the publication type was restricted only to journal articles. Table 1 shows the details of the search query. Data were retrieved from the PubMed database on the 15th of November 2022 and data retrieval was completed on the same day to avoid any discrepancies due to the database updates.

The publications of all languages were included in the study.The absence of duplicate records was confirmed with the support of MS Excel. For this, the retrieved data were exported in CSV format. All the records were retrieved with the abstracts and manually checked one by one to exclude the irrelevant records related to the study topic and the records without required bibliographic information (n=556).

Table 1

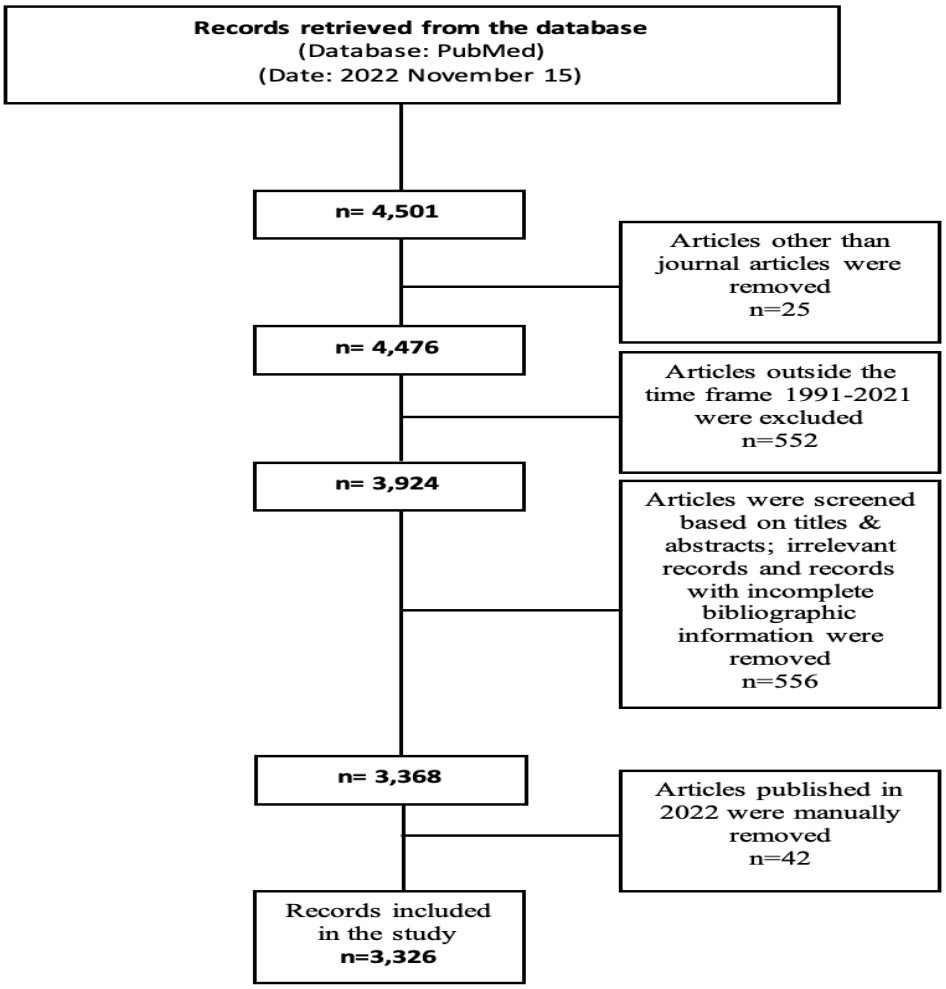
Details of the search query

Search	Query	Results
#1	((((((((((((((substance abuse) OR (substance use disorders)) OR (substance related disorders)) OR (substance dependence)) OR (drug abuse)) OR (drug dependence)) OR (drug addiction)) OR (drug related disorders)) OR (drug habituation)) OR (narcotics)) OR (alcoholism)) OR (tobacco)) OR (illicit drugs))	1,752,071
#2	((((((((((((((substance abuse) OR (substance use disorders)) OR (substance related disorders)) OR (substance dependence)) OR (drug abuse)) OR (drug dependence)) OR (drug addiction)) OR (drug related disorders)) OR (drug habituation)) OR (narcotics)) OR (alcoholism)) OR (tobacco)) OR (illicit drugs)) AND ((("school children") OR ("school students")) OR ("school education")))	4,605
#3	((((((((((((((substance abuse) OR (substance use disorders)) OR (substance related disorders)) OR (substance dependence)) OR (drug abuse)) OR (drug dependence)) OR (drug addiction)) OR (drug related disorders)) OR (drug habituation)) OR (narcotics)) OR (alcoholism)) OR (tobacco)) OR (illicit drugs)) AND ((("school children") OR ("school students")) OR ("school education"))) NOT (("university students") OR ("college students"))	4,501
#4	((((((((((((((substance abuse) OR (substance use disorders)) OR (substance related disorders)) OR (substance dependence)) OR (drug abuse)) OR (drug dependence)) OR (drug addiction)) OR (drug related disorders)) OR (drug habituation)) OR (narcotics)) OR (alcoholism)) OR (tobacco)) OR (illicit drugs)) AND ((("school children") OR ("school students")) OR ("school education"))) NOT (("university students") OR ("college students"))) AND ("Journal article"[Publication Type])	4,476
#5	((((((((((((((substance abuse) OR (substance use disorders)) OR (substance related disorders)) OR (substance dependence)) OR (drug abuse)) OR (drug dependence)) OR (drug addiction)) OR (drug related disorders)) OR (drug habituation)) OR (narcotics)) OR (alcoholism)) OR (tobacco)) OR (illicit drugs)) AND ((("school children") OR ("school students")) OR ("school education"))) NOT (("University students") OR ("College students"))) AND ("Journal article"[Publication Type])) AND (("1991/01/01"[Date - Publication] : "2021/12/31"[Date - Publication]))	3,924

Though the publication date was limited to 2021, there were some publications with the publication year 2022, due to the online publications being published in 2021 while the hard copies were being published in 2022. These records were manually excluded (n=42). Figure 1 shows the selection process of the data. Ethical approval was not required for the study, because it involved only the secondary data.

Figure 1

Flow chart of data retrieval used in the analysis.



Bibliometric analysis was performed using the Bibliometrix R package named 'Biblioshiny' (Aria & Cuccurullo, 2017). The retrieved data (n=3,326) was exported to the R package in PubMed format. MS Excel was also used for the analysis of this study. Figures were developed using MS Excel and R package. Core journals were identified using Bradford's Law (Sudhier, 2010).

Results and Discussion

Basic information about the data

The total number of records on substance abuse among school students during 1991 -2021 retrieved from the PubMed database based on the selection methods stated was 3,326, which were published in 927 sources. A total of 11,254 authors wrote these articles. Among these, 188 (05.6%) articles were sole-authored publications, and 3,138 (94.3 %) articles were multi-authored publications. On average, the number of co-authors per document was 4.69, which was approximately 5 authors per document. Further, a total of 4,967 author keywords were identified in this analysis. The average age of a document was 12.1 years and the annual growth rate of articles was 4.97%. The majority of the articles were published in English language (n=2950, 89.53%), followed by Spanish (n= 70, 2.12%); Chinese (n= 39, 1.18%); Japanese (n=26, 0.79%) and the rest of the articles were in many other languages (6.38%).

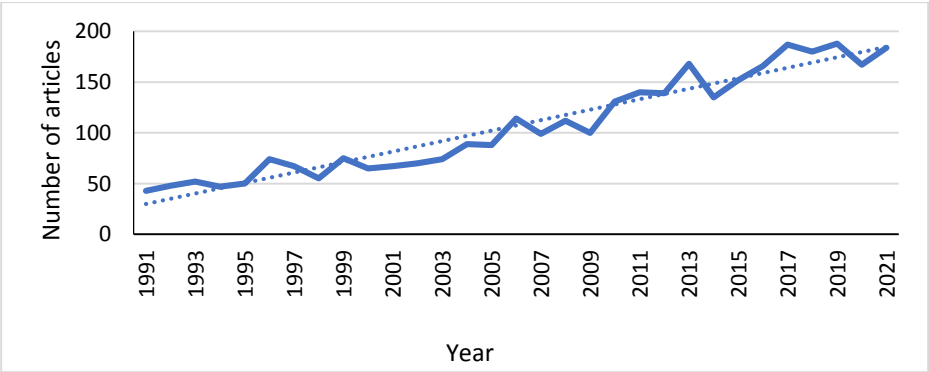
Growth of annual scientific research publication

Figure 2 illustrates the overall trend in the growth of global research publications on substance abuse among school students over the years during the study period. The annual growth of research publications was increasing in trend over the years, though there were small fluctuations in growth. There

were 576 articles published between 1991 and 2000, 944 articles between 2001 and 2010, and 1431 articles published between 2011 and 2021. The highest number of publications (n=188) was in the year 2019 and the lowest number of publications (n=43) was in the year 1991.

Figure 2

Growth of global research publications on substance abuse among school students from 1991 to 2021.



Contribution of prominent authors

The top twenty prominent authors related to substance abuse among school children were selected based on the number of articles published during the study period. As PubMed doesn't provide the number of citations, Prominent authors were selected based on the number of publications. Lowry Richard from USA was the prominent author contributing the greatest number of publications (n= 40) related to the study topic. It was followed by Kann Laura (n=37) from USA; Sussman Steve (n=31) from USA. Among the top twenty, 12 authors were from USA (Table 2). It is highlighted that Karl Peltzer from South Africa was included among the top twenty authors who published

15 articles. The study revealed that among the total of 11,254 authors, a major proportion (97.7%) of authors (10,991 authors) wrote less than 5 articles each.

Table 2

Details of the top twenty most productive authors

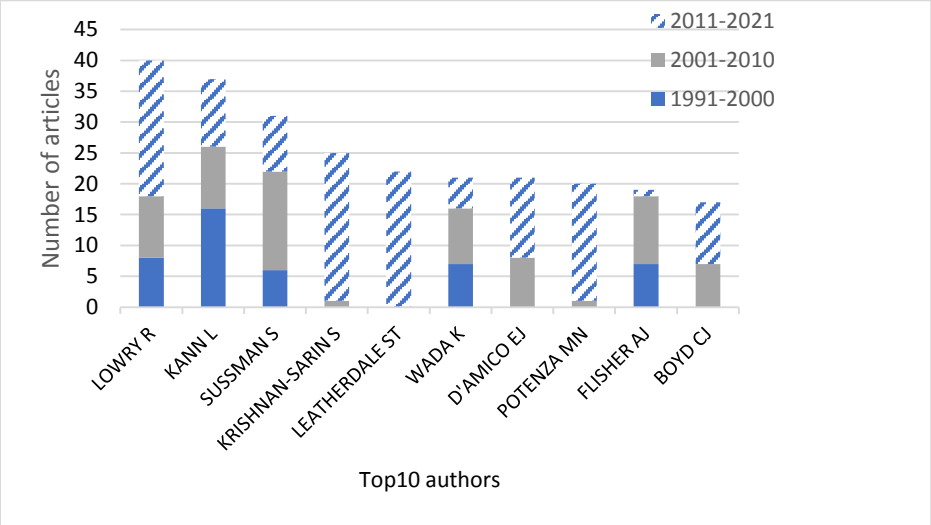
Rank	Author	Number of articles	Country
1	Lowry Richard	40	USA
2	KannLaura	37	USA
3	Sussman Steve	31	USA
4	Krishnan-Sarin Suchitra	25	USA
5	Leatherdale Scott T	22	Canada
6	Elizabeth J D'amico	21	USA
7	Kiyoshi Wada	21	Japan
8	Marc N Potenza	20	USA
9	Alan J Flisher	19	Norway
10	Carol J Boyd	17	USA
11	Sandra A Brown	16	USA
12	Hayley A Hamilton	16	Canada
13	Kiyozumi Suzuki	16	Japan
14	Henri Chabrol	15	France
15	Adam M Leventhal	15	USA
16	George CPatton	15	Australia
17	Karl Peltzer	15	South Africa
18	Jo Anne Grunbaum	14	USA
19	Renee M Johnson	14	USA
20	Sean Esteban McCabe	14	USA

Figure 3 illustrates the analysis of the publication growth of the top ten authors categorized in three time periods. Among the top ten authors, Lowry R, Kann L, Sussman S, Wada K, and Flisher AJ had been working in this research area constantly throughout the study period. Fifth-ranked author

Leatherdale ST from Canada was involved in this research area only from 2011-2021.

Figure 3

Publication growth of top ten authors in three time periods.



Productive country

Analysis of the research contribution of countries on substance abuse among school children was carried out based on the number of articles published during the study period. Publications retrieved from PubMed database with at least one author's affiliation mentioned were considered for the analysis. Table 3 provides the rank list of the top twelve productive countries. USA was the most productive country with the highest number of scientific outputs of 2,408 articles. It was followed by China (561 articles); Australia (447 articles); Canada (421 articles). China was the 9th ranked country with 36 publications during 1991-2000; then it was ranked as the 5th country with 188 publications during 2001-2010; it was ranked as the 2nd most productive country next to USA with 2,730 publications during 2011- 2021.

The study indicated an increasing trend in the involvement of research activities on this subject field by researchers from China.

Table 3

Ranked list of top 10 countries (1991-2021)

Rank	Country	Number of Articles
1	USA	2408
2	China	561
3	Australia	447
4	Canada	421
5	Italy	279
6	Iran	189
7	South Korea	149
8	Japan	148
9	Germany	139
10	Brazil	127
11	India	122
12	Nigeria	120

Leading institutions

Leading institutions involved in this research topic were analyzed based on the names of institutions mentioned with author affiliation in the PubMed database. The top twenty leading institutions involved in research activities related to substance abuse among school students were displayed in table 4. University of California was the most popular leading institution publishing the highest number of research articles (n=874) during the study period. It was followed by the Division of Adolescent and School Health (n= 714); then the University of Southern California with 680 publications. Except

for the sixth-ranked University of Auckland from New Zealand, all other institutions among the top ten were from USA.

Table 4

Ranked list of top 10 Institutions (1991-2021)

Rank	Institutions	Number of Articles	Country
1	University of California	874	USA
2	Division of adolescent and school health	714	USA
3	University of Southern California	680	USA
4	Columbia University	607	USA
5	Yale University school of medicine	410	USA
6	University of Auckland	405	New Zealand
7	Centers for disease control and prevention	389	USA
8	University of Michigan	381	USA
9	Florida international university	378	USA
10	Johns Hopkins Bloomberg school of public health	361	USA

Publications published during the periods 1991-2000, 2001 - 2010, and 2011 – 2021 were analyzed and the top 20 institutions were ranked for each period. The University of California was the leading institution during the periods 1991-2000(60 articles) and 2011- 2021(649 articles), whereas the Division of Adolescent and School Health was the leading institution during the years 2001-2010 with 188 publications.

Productive sources

Core journals on substance abuse among school students were identified based on Bradford's Law. According to Bradford's law, the sources are classified into three zones as zone 1, zone 2, and zone 3. Bradford's Law is used to identify the core journals in a particular subject area categorized in zone 1; nuclear zone (Zhang et al., 2022).

Zone I has the top 25 core journals, which published research articles on substance abuse among school children. The study identified 25 most productive journals among a total of 927 journals. The top 25 journals published a total of 1,114 articles among the total of 3,326 articles. 'Addictive behaviors' was found to be the top leading journal publishing the highest number of articles (n=118) on substance abuse among school children. The ranked list of top ten journals based on the number of publications is displayed in Table 5.

Table 5

Ranked list of core journals publishing more articles.

Titles of Journals	Rank	Number of articles	Cumulative Frequency	Zone
Addictive behaviors	1	118	118	Zone 1
The Journal of adolescent health	2	97	215	Zone 1
Drug and alcohol dependence	3	88	303	Zone 1
Substance use & misuse	4	86	389	Zone 1
The Journal of school health	5	83	472	Zone 1
BMC public health	6	58	530	Zone 1

Addiction	7	53	583	Zone 1
Journal of drug education	8	53	636	Zone 1
American journal of public health	9	40	676	Zone 1
International journal of environmental research and public health	10	37	713	Zone 1

Research collaboration among countries

Figure 4 illustrates the research collaboration on the study topic among various countries during the period 1991 - 2021. The relationship between the two countries was analysed if the two countries had at least one research collaboration. The intensity of the blue color reflects the amount of research collaboration. The higher the intensity of the blue color, the higher the frequency of research collaboration.

The USA had the greatest number of research in 49 countries all over the world. It was followed by Canada, Italy, Australia, and Germany with 24, 21, 19, and 15 countries respectively. Twenty-six countries had collaborated with less than five countries on substance abuse among school children; Seven countries had collaborated with five to ten countries, while another seven countries had collaborated with more than ten countries.

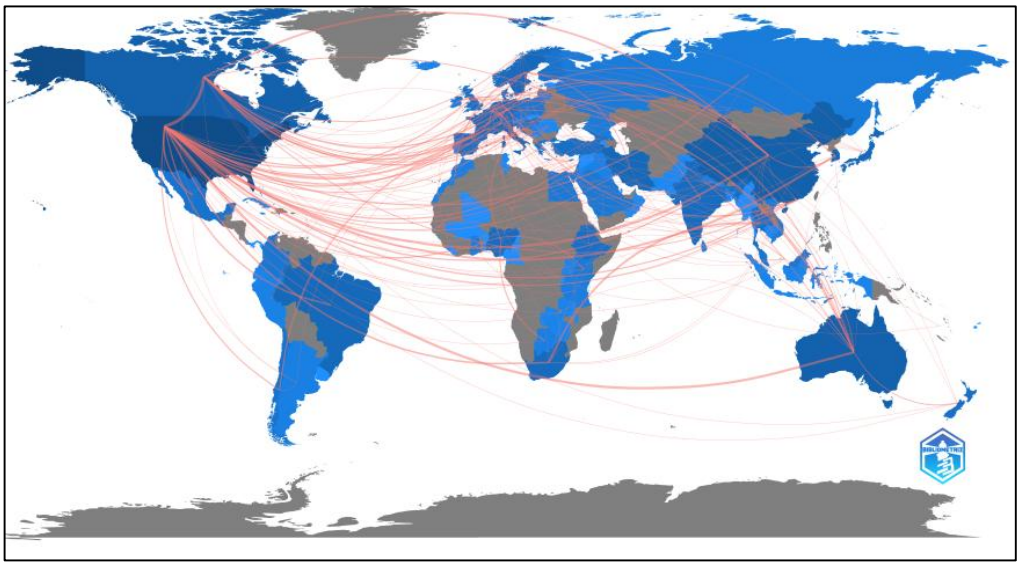
Discussion

Substance abuse among schoolchildren is a common problem in many countries. Bibliometric analysis of 3,326 articles retrieved from PubMed database on substance abuse among school children during the period 1991 -

2021 provides many insights about the trends in research activities on this subject. The global trend in the growth of publications was increasing from 1991 to 2021 except for small fluctuations in some years. Significant progress is noticed in the annual growth of research publications on this subject.

Figure 4

World map on research collaboration among countries.



In terms of author analysis, 94 % of the articles were multi-authored research papers indicating that researchers preferred collaborative research in the field of substance abuse among school children. The study analyzed the prominent authors actively involving research activities on this subject. The findings will support the researchers in identifying collaborators, reviewers, and mentors for their research activities. Among the top twenty authors, authors from USA were leading in research contributions on this particular topic. The publication growth of the top ten authors was analyzed in three

periods from 1991 to 2021, with only five authors involved in research activities on substance abuse among school children in all three periods. The fifth-ranked author named Leatherdale Scott T from Canada was involved in research publications only during the last period 2011 – 2021. The fourth-ranked author named Krishnan-Sarin Suchitra and the eighth-ranked author named Marc N Potenza also wrote only one publication each during the period from 2001-2010 and a greater number of publications during the last period 2011-2021. It indicates that new researchers are attracted to and actively involved in the field of substance abuse among school children.

Based on the country analysis, the USA was the most productive country, publishing the highest number of publications. It was followed by China. The majority of the publications were from high-income countries. Among the top twenty productive countries, 13 countries were high-income countries, and 6 countries were middle-income countries. It is highlighted that Ethiopia, which is a low-income country, was ranked 18th position with 72 articles on substance abuse related to school children. The United Kingdom was not included in the top twenty productive countries. In contrast, in a bibliometric study carried out based on the Scopus database, the United Kingdom was the second-ranked productive country related to scientific production on illicit drug addiction (Khalili et al., 2018). The leading institution related to this research activity was University of California, which had contributed the highest number of publications than any other institution. Among the top ten leading institutions, nine institutions were from USA. The study highlighted that USA is undoubtedly the dominant country performing research activities on substance abuse among school children.

Literature on substance abuse among children is published in a wide range of journals. The study identified core journals publishing articles on substance abuse among school children. This was done with the aim of guiding librarians, researchers, and other people who are interested in accessing information related to substance abuse among school children. The top three journals publishing articles on substance abuse among school children during 1991- 2021 were 'Addictive behaviors' (118 articles), 'The Journal of Adolescent Health' (97 articles), and 'Drug and alcohol dependence' with 88 articles. Identified keywords will be useful to future researchers to easily access information related to the study subject.

It is important to analyze the research collaboration among different countries. USA has the highest research collaboration with 49 other countries with 133 research publications. USA has the highest research collaboration with Canada having 18 research articles, followed by China and Australia, each having 10 research publications. USA was followed by Canada as the country with the second highest country collaboration, having collaborated with 24 countries with 34 publications, and Italy has collaborations with 21 countries with 27 publications. International collaboration in research activities increases the productivity and visibility of the research findings.

There are a few limitations in this study. The study findings are based on articles indexed only in the PubMed database. There are other databases indexing important research articles that are missing from the PubMed database. Citation analysis could not be performed as PubMed does not allow citation analysis. The findings of the study can be used to compare with future research studies on substance abuse among school children using publications indexed in other databases.

Conclusion

Bibliometric study on the global scientific literature on substance abuse among school children highlighted important facts of research trends in this field during 1991-2021. The study concluded that the USA was the most dominating country, contributing research on this topic. The study identified the prominent authors, institutions, productive information sources, and international country collaboration. The findings of the study are useful to guide the research community involved in research activities related to the field of substance abuse among school children. As substance abuse among school children creates serious threats in society, researchers should play a key role in promoting more research activities in this subspeciality to prevent school children from substance abuse.

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