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Original Article

A 10-year journey of toxicology publications in emergency departments: A bibliometric analysis

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Abstract

Aim: Poisoning is often diagnosed and treated in emergency departments. An analysis of the directions of publications and their scope makes it possible to assess the direction of research in selected areas of emergency department activities. Our study aimed to analyze toxicological studies worldwide involving emergency departments and show directions for research in toxicology in emergency medicine.
Materials and Methods: We analyzed the original articles in the field of toxicology by searching the Scopus database between 2014 and 2023 and bibliometric analysis was performed.
Results: 270 original articles were analyzed. There has been an increase of more than 100% in the total number of publications on an annual basis. The most significant number of studies has been performed in Turkey, followed by the USA. Regarding the number of citations per publication, Sweden ranked first with 133 citations, followed by Poland with 76 and Switzerland with 69 citations. The terms 'neurotoxicity', 'carboxyhemoglobin' and 'addiction' have gained popularity.
Conclusion: A bibliometric analysis of research in emergency department toxicology makes it possible to identify general research directions and interests. More bibliographic unity can be achieved by publishing articles in general medical journals with international participation.

Keywords: Toxicology, emergency department, bibliometrics, Scopus

INTRODUCTION

Poisonings are critical conditions that can seriously threaten human life and require a careful approach by physicians. According to Centers for Disease Control and Prevention (CDC) data, the mortality rate reaches 30 per 100.000 population [1,2]. Poisoning can be encountered in every aspect of life, whether at work or in social life. It may occur by accidental or intentional exposure to legal or illegal substances. These situations usually require first intervention in emergency services, and these interventions are of vital importance. Mortality and morbidity rates varying depending on the substance ingested increase the importance of emergency department approaches [3]. The diversity of toxicology cases increases with the renewed medical knowledge, which reveals that emergency physicians need to follow updated information and methods. Therefore, literature contributions in the field of toxicology are extremely valuable. Our methods to objectively evaluate these contributions include h-index and journal impact factor.

Bibliometrics is a method that objectively and quantitatively analyses criteria such as the number of citations, h-index and journal impact factor of scientific studies [4]. This is an essential tool for determining the areas where fewer scientific studies have been conducted in research fields, determining current trends and scientific effects, and comparing the standards of researchers [5,6]. In addition, bibliometric analysis provides the opportunity to evaluate the reliability, quality and impact of articles and can highlight articles that contribute more to science [7]. In addition to assessing the articles' reliability, quality and effect, keeping up

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to date with emerging technological developments and drugs is essential. From this perspective, bibliometrics also contributes to the visibility of scientific innovations.

New drugs and chemicals, combined with the development of technology, make it necessary for physicians to stay updated in toxicology. Our study aimed to analyze toxicological studies worldwide concerning emergency departments and show directions for research in toxicology in emergency medicine.

MATERIAL AND METHOD

Articles related to toxicology were analysed online in the Scopus (www.scopus.com) database. Although different search tools offer different possibilities, the Scopus search engine stands out in this field because it offers citation analysis, citation relationships between different institutions and groups, and a wide publication network [8-10]. It has a larger search network than Web of Science and more reliable than Google Scholar [9]. Therefore, it was also our choice. Ethical approval was obtained by the Ethics Committee of Etlik City Hospital with the decision number 14/08/2024. The screening process was completed on 21.08.2024.

The search was performed using the following keywords: 'Emergency Medicine' OR "Emergency Department" OR "Emergency Service" AND "Toxicology" OR "Poisoning" OR "Overdose" OR "Intoxication" OR "Drug Misuse". Keywords were identified using the MeSH (Medical Subject Headings) database. Only original articles with full text available (free or paid) were included in the study. After eliminating the excluded articles, the remaining articles were listed. Since the Scopus index allows a maximum of 2000 articles to be listed, the articles were ranked according to the number of citations. The articles that contributed the most to science and received the most citations were evaluated.

Titles such as article title, total number of citations, annual average number of citations, journal name, impact factor of the journal, year of publication, number of authors, author names, h-index of the authors, disciplines contributing to the article, institutions and countries to which the authors are affiliated, research topic, keywords of the article, funding status and funding institutions were analysed. For articles with authors from different countries or institutions, the country and institution of the first author were recorded. The impact factor and h-index of the journals were obtained from Thomson Reuters Journal Citation Reports (JCR). Analyses were performed using VOSviewer 1.6.20, Online Analysis Platform Bibliometrix (http://bibliometrix.com). As a result of this analysis, prominent authors, journals, institutions/countries, clustered networks, co-cited references/authors and strongest keywords and citation bursts were mapped.

Inclusion Criteria:

1. To be published in Science Citation Index-Expanded (SCIE) and Social Science Citation Index (SSCI) journals with Web of Science Thomson Reuters indexes.
2. Original article.
3. To be one of the articles that appear when searched with keywords ('Emergency Medicine' OR 'Emergency Department' OR 'Emergency Services' AND 'Toxicology' OR 'Poisoning' OR 'Overdose' OR 'Intoxication').
4. To be written in English language.
5. To be published between 2014 and 2023.

Exclusion Criteria:

1. Types other than original articles: meeting abstract, review article, editorial material, letter, proceeding paper, book chapters, early access, note, correction, book review, reprint, discussion, correction-edition, news item, biographical item, retracted publications, meeting, data paper, book, item about an individual, software review.
2. Articles focusing on research areas other than emergency medicine and poisoning.

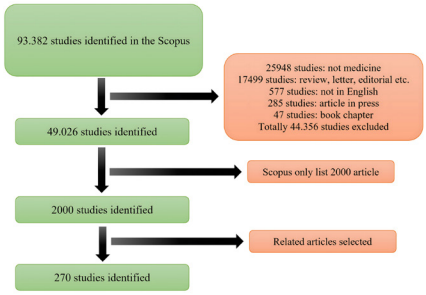
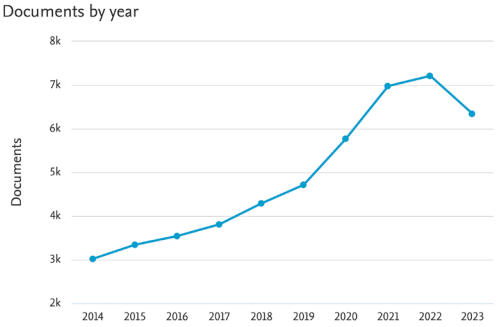


Figure 1. Flowchart

RESULTS

In the data, which included a total of 1454 authors from 70 different journals listed; it was determined that an average of 6 researchers contributed to each article and the international participation rate was 12%. The most cited article received 390 citations, while the average citation rate of the articles was 53.

When we examined the distribution of 49,026 articles by years, a continuous upward trend in the number of publications was observed. When we compare the years 2014 and 2023, it was seen that there was an increase of more than 100% in the total number of publications on an annual basis (Graph 1).



Graph 1. Number of publications by year

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The top 10 journals in which the selected articles were published are listed in Figure 2. The American Journal of Emergency Medicine (Impact Factor (IF) 2.7) ranked first with 52 publications, while the Journal of Emergency Medicine (IF 1.2) ranked second with 30 publications. In the association network analysis based on co-citations between journals, Annals of Emergency Medicine (IF 5.0) had the strongest association, followed by Clinical Toxicology (IF 3.0) (Figure 3).

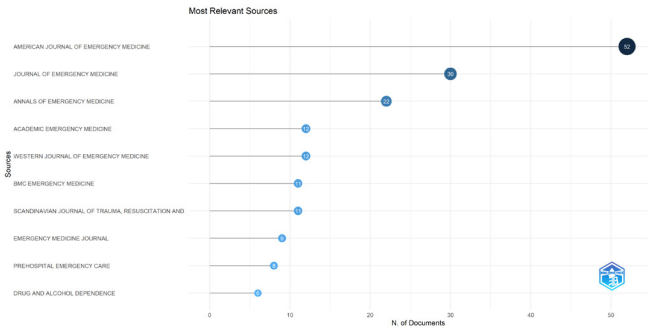

Figure 2. List of journals with the most articles

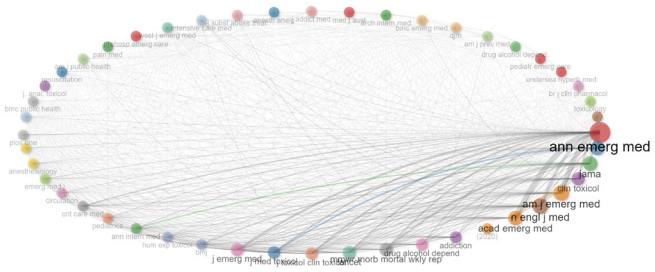

Figure 3. Relationship of journals via bibliographic coupling

According to the bibliographic association network analysis between countries, it was observed that the USA has the strongest network. While close relationships were found especially among European countries, it was understood that the USA formed a wide network of interaction beyond geographical borders. It was also observed that Turkey has more common relations with countries such as South Korea and Taiwan (Figure 4).

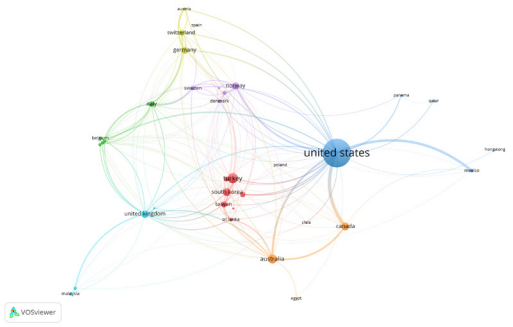

Figure 4. Bibliographic coupling of countries

When the average number of citations per publication was analysed, Sweden ranked first with 133 citations, followed by Poland with 76 citations and Switzerland with 69 citations (Figure 5). When the single country publication (SCP) and multiple country publication (MCP) status of the countries of the corresponding authors were analysed, it was found that most countries were SCP dominant (Figure 6).

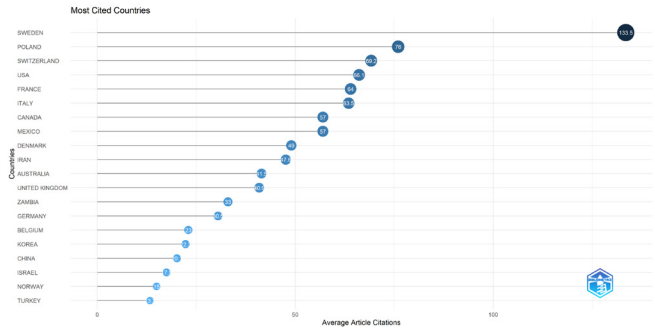

Figure 5. Countries with the most citations per article

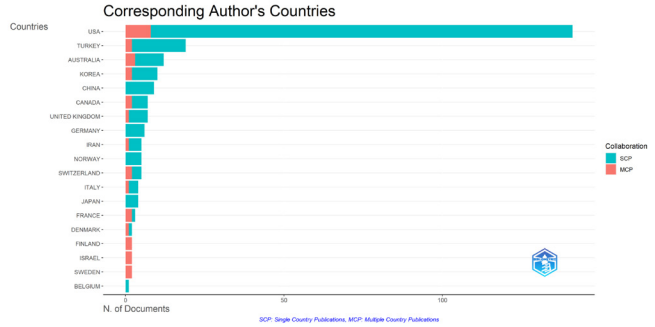

Figure 6. Publication graph of the corresponding author's countries

Among the authors with the most articles, Cole J. B. ranked first with 9 articles. He was followed by Klein L. R. and Martel M. L. with 6 articles, while Weiner S. G. and D'Onofrio G. ranked third with 5 articles. Bebarta V. S. , Boudreau S. M. , Brekke M. , Driver B. E. , and Graudins A. were observed to be important contributors with 4 articles each. In the analysis of the authors with the most publications by years, a significant decrease was observed after 2020. Looking at the countries of the top 10 authors, 8 were from the USA, 1 from Norway and 1 from Australia (Figure 7). It was determined that 3 of the US authors worked in the same clinic.

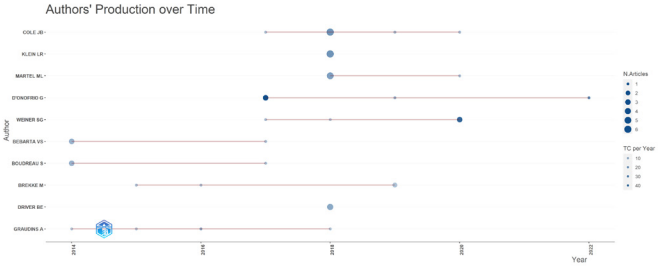

Figure 7. Authors' production over time

When the co-occurrence of keywords and their change over the years were analysed, it was observed that the terms

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'neurotoxicity', 'carboxyhemoglobin' and 'addiction' have gained popularity recently (Figure 8A).

According to the factorial analysis of keywords, a large pool of toxicity words was concentrated in the centre. In addition, word associations such as 'addiction' and 'substance use' and the terms 'drugs', 'opioids', 'benzodiazepines' and 'emergency service' were frequently used together and these areas were found to be particularly current and hot topics (Figure 8B).

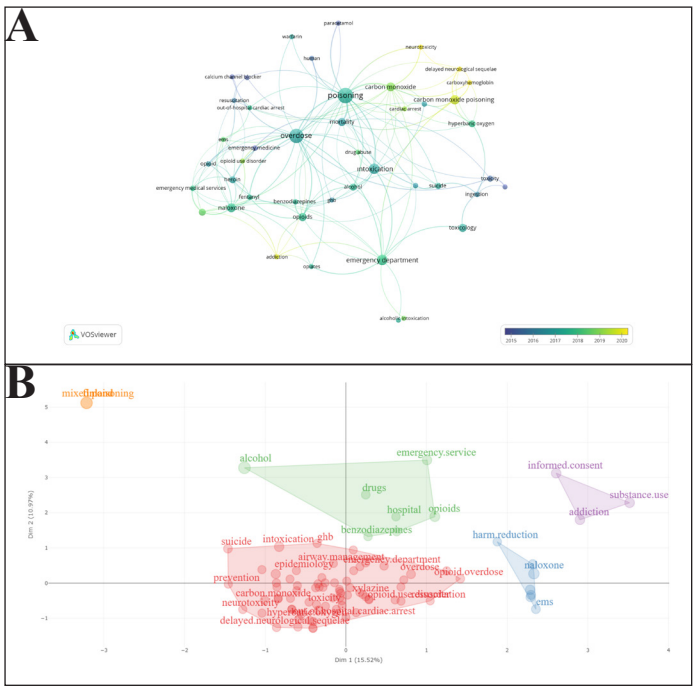

Figure 8. A. Network map of most used keywords organized by years; **B.** Factorial analysis of the most frequently used words

DISCUSSION

Our analysis provides some insights into research in the field of toxicology over the last decade. We completed our review with 270 articles accessed from Scopus that fulfilled the criteria. Although the literature includes regional and country-based studies or studies on a specific toxicology field, we could not find enough publications that make a worldwide analysis of all toxicological research and try to shed light on new studies [11-13]. With this inference, our study, which analyses toxicology-based research with a global approach, will contribute to an essential gap in the literature.

Technological and scientific developments cause the literature to grow rapidly [14,15]. With the increasing accessibility of information, more and more contributions are made to the scientific knowledge pool daily. Between 2014 and 2023, total publications in Scopus showed an annual increase. In our study, when we compared 2014 with 2023, we found that the number of publications increased by more than 100%. Zyoud et al., who conducted a study on the same subject in a local area, also mentioned that publications increased similarly [11]. Toxicology is a science that addresses a small specialized area of interest, and as a result, it is a slow-progressing science [13,16]. Every development in such a small and specialized field is valuable, and it is important to follow the current publications in the field of toxicology. It is encouraging that the scientific productivity of researchers working in such a small and specialized field has increased by more than 100% over the years.

When we examined the journals with the highest number of articles that play an essential role in this scientific productivity, we found that AJEM 52 (IF 2.7), JEM (IF 1.2) 30, Annals of Emergency Medicine (IF 5.0) 22. When we examined the bibliographic associations formed by the logic of two articles citing a common article, we found that Annals of Emergency Medicine ranked first, followed by Clinical Toxicology (IF 3.0) and JAMA (IF 63.1). We found that the main reason for this difference in the journal lists was the citation network and number of citations by the literature [17]. However, we found that JAMA obtained third place in the bibliometric association with a single article published. The more citations an article receives, the more association and visibility it provides. This is one factor that increases the quality of journals and articles. This is the reason why JAMA has more impact with a single article than 52 articles of AJEM and 30 articles of JEM. All the mentioned journals are field-specific, but JAMA is in the general medical journal category. It is important for field-specific authors who want their publications to be more cited and more visible to turn to general medical journals. This orientation of researchers interested in a specific field, such as toxicology, may bring along a general researcher interest in their field. This situation was also evaluated by Callaham et al. in our study, and it was found that the publications of emergency medicine researchers received more than twice as many citations when they were published in general medical journals other than emergency medicine [18].

When we analyzed the countries, we found the USA superior to the literature. We observed that European countries generally established close relationships with each other [19]. Differently, we found that Turkey was the second country with the highest number of publications after the USA and that it established close bibliometric relationships with Far Eastern countries such as South Korea, Taiwan, Sri Lanka and its neighbour Iran. This situation, which is different from the normal distribution, may be due to the close socio-cultural development levels of the countries and the common interests of toxicology about this. We can evaluate the socio-cultural development levels of countries with the Human Development Index (HDI) report prepared by the World Health Organisation (WHO). When we look at the HDI prepared with 2022 data, the fact that the mentioned countries have close rankings to each other supports this situation [20].

When we evaluate the citation status of countries per article, we see that countries such as the USA, Turkey and Australia, which have the highest number of publications, have been replaced by Sweden, Poland, Switzerland and France, respectively. This is related to the amount of MCP. The fact that the total number of publications in the USA is by far higher causes the citation rate per article to be relatively low. Khelfaoui et al., in their study

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evaluating the self-citations of the leading countries in science, mention that these countries tend to cite themselves and that international participation increases the citation rate [21]. In line with the literature, we observe that as the rate and amount of MCP increases, the citation potential of the countries' publications also increases. One of the reasons for this is that different international researchers increase the capacity and quality of research with their contributions to publications. From this point of view, the global participation of authors is an essential step for recognition and citation.

When we analyzed the keywords, we found that while the use of the words 'paracetamol', 'calcium channel blocker', 'ECMO' was high in the first years, the words 'neurotoxicity', 'carboxyhemoglobin' 'addiction' were used more frequently in recent years in the 10 years of our study. This situation indicates that the areas of interest in toxicity have shifted to different areas over the years. When we look at the factorial analysis of the most frequently used words, we know that the region on the upper right shows us the hottest areas. When we examine the word groups here, we understand that the literature progresses through the words 'addiction', 'substance use', 'informed consent', 'drugs', 'opioids', 'benzodiazepines', 'naloxone', and 'harm reduction'. This result constitutes essential data for further research. The data we obtained show that the literature is mostly centred on drug addiction. We explain this situation with the fact that opioids can be easily prescribed from emergency departments and other clinics with legal regulations in the USA, Canada and many European countries [22,23]. When we analyze the number of articles, citation amounts and journals, we see that these countries are the main countries that constitute the literature [24]. The fact that 8 of the top 10 authors contributing to the most publications originate from the USA and even three are from the same clinic helps to understand the situation. It is difficult for toxicological conditions not on the agenda of the mentioned countries to be cited in the literature, to increase their awareness of bibliographic associations, and to be among the hot areas. This problem stands before us as a task, waiting for a solution on behalf of the future of science and humanity.

Areas that cannot be developed sufficiently because they cannot be reached in the literature or remain undersized have special importance in toxicology. Poisonings may vary regionally due to industry and waste, contact with animals, drugs, eating habits, etc. We know as an important reality that the literature develops with the support of funding. Therefore, as a solution, it is important to support countries with low scores according to development indices such as HDI with special funds. Here, we can take the work of the WHO International Agency for Research on Cancer (IARC) working group on aflatoxin with funding as an example [25]. In this way, significant contributions will be made to developing toxicology literature, a specialized field of study.

Limitations

Since our study was a review of the last 10 years aiming to focus on the current literature, the fact that we could not cover the entire literature may have been a limitation. Another limitation is the restriction of databases to Scopus.

CONCLUSION

A bibliometric analysis of research in emergency department toxicology makes it possible to identify general research directions and interests. We examined the most cited studies, the most frequently discussed topics, and the most prolific authors and journals. More bibliographic unity can be achieved with articles published in general medical journals and international participation in this specialized field.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that they have received no financial support for the study.

Ethical Approval
Etlik City Hospital Ethics Committee Date:14.08.2024 Decision No: AEŞH-BADEK-2024-759.

References

1. It's time to regulate highly hazardous pesticides. https://cdn.who.int/media/docs/default-source/infographics-pdf/chemical-safety/highly-hazardous-pesticides-english-scroll.pdf?sfvrsn=468ef146_2 access date 15.09.2024
2. Safety topics, Poisoning. https://injuryfacts.nsc.org/home-and-community/safety-topics/poisoning/data-details/ access date 15.09.2024
3. Gummin DD, Mowry JB, Beuhler MC, et al. 2021 Annual Report of the National Poison Data System© (NPDS) from America's Poison Centers: 39th Annual Report. Clin Toxicol (Phila). 2022;60:1381-643.
4. Cooper ID. Bibliometrics basics. J Med Libr Assoc. 2015;103:217-8.
5. Thomson Reuters. Using bibliometrics: a guide to evaluating research performance with citation data. 2008;1-36.
6. Berlinberg A, Bilal J, Riaz IB, Kurtzman DJB. The 100 top-cited publications in psoriatic arthritis: a bibliometric analysis. Int J Dermatol. 2019;58:1023-34.
7. Jappe A. Professional standards in bibliometric research evaluation? A meta-evaluation of European assessment practice 2005–2019. PloS One. 2020;15:e0231735.
8. Baas J, Schotten M, Plume A, et al. Scopus as a curated, high-quality bibliometric data source for academic research in quantitative science studies. Quantitative Science Studies. 2020;1:377-86.
9. Kulkarni AV, Aziz B, Shams I, Busse JW. Comparisons of citations in web of science, scopus, and google scholar for articles published in general medical journals. JAMA. 2009;302:1092-6.
10. de Granda-Orive JI, Alonso-Arroyo A, Roig-Vázquez F. Which data base should we use for our literature analysis? Web of Science versus SCOPUS. Arch Bronconeumol. 2011;47:213.
11. Zyoud SH, Al-Jabi SW, Sweileh M, Awang R. A bibliometric analysis of toxicology research productivity in Middle Eastern Arab countries during a 10-year period (2003–2012). Health Research Policy and Systems. 2014;12:4.
12. Wang K, Duan Y, Chen H, et al. The rise of global research trends on cathinones during 1994-2018: lessons from a systematic bibliometric analysis. Journal of Substance Use. 2021;27:141-8.

DOI: 10.5455/NOFOR.2025.01.01

13. Zyoud Sh, Al-Jabi S, Sweileh W, Awang R. A bibliometric analysis of research productivity of Malaysian publications in leading toxicology journals during a 10-year period (2003-2012). Hum Exp Toxicol. 2014;33:1284-93.

14. Emrouznejad A, Yang G. A survey and analysis of the first 40 years of scholarly literature in DEA: 1978–2016. Socio-Economic Planning Sciences. 2018;61:4-8.

15. Delirrad M, Rashidi A, Karimi S. A bibliometric analysis of toxicology publications of Iran and Turkey in ISI web of science. 2013;6:735-45.

16. Jang DH, Rusyniak DE. Hard impact: journal impact factor and JMT. J Med Toxicol. 2011;7:256-8.

17. Wang S, Xia D, Zhang Z, et al. Mapping trends and hotspots regarding the use of ultrasound in emergency medicine: a bibliometric analysis of global research. Front Public Health. 2021;9:764642.

18. Callaham M, Weber E, Wears R. Citation characteristics of research published in Emergency Medicine versus other scientific journals. Ann Emerg Med. 2001;38:513-7.

19. Briganti M, Delnevo CD, Brown L, et al. Bibliometric analysis of electronic cigarette publications: 2003–2018. Int J Environ Res Public Health. 2019;16:320.

20. United Nations Development Programme. Human Development Report 2023/2024: Breaking the Gridlock - Reimagining Cooperation in a Polarized World. New York: UNDP; 2024;1-307.

21. Khelfaoui M, Larrègue J, Larivière V, Gingras Y. Measuring national self-referencing patterns of major science producers. Scientometrics. 2020;123:979-96.

22. Powell D, Peet ED, Pacula RL. Understanding the rise in overdose deaths involving opioids and non-opioid prescription drugs in the United States. Int J Drug Policy. 2023:104104.

23. García-Sempere A, Hurtado I, Robles C, et al. Initial opioid prescription characteristics and risk of opioid misuse, poisoning and dependence: retrospective cohort study. BMJ Qual Saf. 2023;33:13-23.

24. Zyoud Sh, Al-Jabi S, Sweileh W, et al. Bibliometric profile of the global scientific research on methanol poisoning (1902–2012). J Occup Med Toxicol. 2015;10:17.

25. International Agency for Research on Cancer (IARC). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Tobacco Smoke and Involuntary Smoking. Lyon: World Health Organization; 2004;1-1431.