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Research Article

Bibliometric Analysis of Articles on Methanol Poisoning in Web of Science Database

Pelin Koca[1], Hanefi Ozbek

İzmir Bakırçay University, Faculty of Medicine, Department of Pharmacology, İzmir, Türkiye

Abstract

Aim: Methanol, which is a type of toxic alcohol, can cause poisoning through voluntary or involuntary exposure. It is known that the frequency of methanol poisoning has increased especially recently. The aim of this research is bibliometric analysis of scientific studies conducted on methanol poisoning in Web of Sciences (WoS) database.

Material and Method: Studies in Web of Science database including the words "methanol" or "methyl alcohol" in their title and the words "poisoning" or "poison" or "toxicity" or "toxic" or "overdose" as the topic were reviewed as of 21.08.2023. "Web of Science Categories", "Web of Science Index" and "Document Types" categories were used as filtering options. Language of article, year of publication, the journal in which it was published, the publishing company to which the journal is affiliated, authors of the article, institutions of authors, the country where the research was conducted, whether financial support was received and citation status of the research were analysed and evaluated.

Results: A total of 548 articles were included in the research. It was found that language of most of the studies were English (n=536; 97.8%) and they were published in journals that were in Science Citation Index-Expanded (SCI-E) (n=451; 82.3%) indices. It was found that the highest number of articles were published in 2020 and the country in which the highest number of articles was published was the United States of America (n=143; 22.7%).

Conclusion: The present research performs a bibliometric analysis of articles on methanol poisoning in WoS database. The data found in this research can be a valuable source for other researchers and a guide future studies.

Keywords: Methanol poisoning, bibliometric study, Web of Science

INTRODUCTION

Methanol, which is also known as methyl alcohol (CH3OH), is an industrial solvent and also an odorless, colorless, toxic alcohol found especially in bootleg, paint removers and antifreezes. It can lead to voluntary (suicide, illegal alcohol consumption) or involuntary poisoning (1,2). The incidence of methyl alcohol poisoning has increased dramatically in Iran, especially after 2018 (3).

Gastrointestinal absorption of methanol in the body is quick (shorter than 10 minutes) and its volume of distribution is large (0.7L/kg). It is metabolized in the liver and only 2-5% is excreted via the kidney. Methanol poisoning may occur after through oral, dermal or inhalation intake. Adults are intentionally abuse this substance by using methanol instead of ethyl alcohol (ethanol, C2H5OH) or they are frequently exposed to methanol in window washer fluid for suicidal purposes. It is stated that especially alcoholic or suicidal individuals or young children who are just discovering their surroundings are at risk. Lethal dose of methanol has been indicated as approximately 30-240 mL or 1 gr/kg. Toxic effects of methanol occur 12-24 hours after exposure. Methanol is converted to formaldehyde and formic acid in the liver and causes various clinical symptoms and signs. While moderate methanol poisoning may cause non-specific symptoms such as abdominal pain, nausea and acidosis, severe methanol poisoning may cause multiple organ failure (acute renal failure, liver failure, dysrhythmias, coma), and papilledema (edema of the optic nerve), and especially visual disturbances such as appearance of snow, blurred vision or blindness. Methanol poisoning may result in coma, irreversible central system

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Corresponding Author: Pelin Koca, İzmir Bakırçay University, Faculty of Medicine, Department of Pharmacology, İzmir, Türkiye

E-mail: pelinozkan19@gmail.com

damage or death (2-6). It is difficult to diagnose methanol poisoning and requires highly suspicious anamnesis. Diagnosis is based on clinical signs and symptoms and supported by examining the serum methanol level, if available at the health institution. Symptomatic treatment is essential. Ethanol or fomepizol is used as antidote in methanol poisoning. Hemodialysis is an extracorporeal method that can be preferred to remove methanol and formic acid from the body (6,7).

For both scientists and the companies that provide financial support to them, it is very important how valuable a scientific research is. However, it is quite difficult to determine the value of a scientific research. Bibliometric analyses are important research methods that systematically assess scientific activity in a particular field of research over a specific time interval. Therefore, they provide both quantitative and qualitative information about the functioning of this field of research. Bibliometric analyses allow us to examine the impact of studies and to learn about new trends. Especially in the field of medicine, they also make some information about unusual symptoms or signs and rare diseases more accessible. Recent research has shown that with the development of interdisciplinary methodologies and increasing technological advances in analysing big data, bibliometric analyses have become more popular and are being performed more frequently than in the past (8-10).

Methanol poisoning is a preventable and important public health problem. There are no bibliometric studies conducted on methanol poisoning. The aim of this research is to access and bibliometrically analyse studies on methanol poisoning in Web of Sciences (WoS) database.

MATERIAL AND METHOD

In order to achieve the aim of the research, search engine of Web of Sciences (WoS) database was used and studies containing the words “methanol” or “methyl alcohol” in the title and at the same time having the words “poisoning”, “poison” or “toxicity”, “toxic” or “overdose” as the topic were analysed. Studies included in the WoS database related to methanol poisoning until 21.08.2023 were evaluated retrospectively.

The categories “Web of Science Categories”, “Web of Science Index” and “Document Types” were used from the filtering options in WoS database. Articles in Science Citation Index (SCI), Science Citation Index-Expanded (SCI-E) and Emerging Sources Citation Index (ESCI) included in “toxicology”, “pharmacology, pharmacy”, “medicine general internal”, “emergency medicine” or “medicine research experimental” categories were included in the research. The articles included in the research were evaluated by analysing the language of article, year of publication, the journal in which it was published, the publishing company to which the journal is affiliated, authors of the article, institutions of authors, the country where the research was conducted, whether financial support was received and citation status of the research.

Statistical Analysis

The data obtained from WoS were transferred to Microsoft Office Excel and analysed with SPSS-18 (SPSS INC., Chicago, IL, USA) statistical package program. The results of descriptive analyses were presented as number (n) and percentage (%).

Ethics Committee Approval

Approval was obtained from İzmir Bakırçay University Non-interventional Clinical Research Ethics Committee with the decision number 2023/1182.

RESULTS

Among all studies included in the WoS database, all studies on methanol poisoning published until 21.08.2023 were researched. A total of 2.853 publications including any one of the words “poisoning” or “poison” or “toxicity” or “toxic” or “overdose” as the topic and those including “methanol” or “methyl alcohol” in the title were accessed. By using a filtering method, 548 articles were found in SCI, SCI-E, ESCI indices which were in “toxicology” or "pharmacology, pharmacy” or “medicine general internal” or “emergency medicine” or “medicine research experimental” categories (Figure 1).

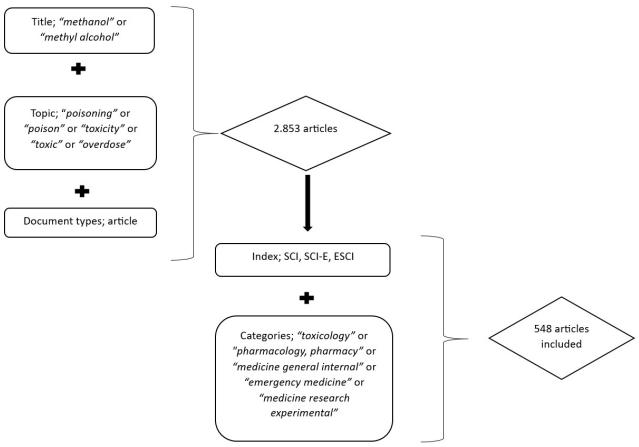


Figure 1. Filtering method used on the WoS database

The language of publication of the articles included in the research were English (n=536; 97.8%), French (n=4; 0.7%) and Turkish (n=4; 0.7%), respectively. While the total number of citations to these publications was 5.334, average number of citations per publication was 17. The information for the top 10 articles that had the most citations is shown in Table 1. It was found that 373 (68.0%) of the articles included in the research received financial support from a total of 188 institutions during research and/or publication. It was found that among the institutions that provided financial support, United States Department of Health Human Services (HHS) (n=41; 10.9%), National Institutes of Health (NIH) (n=40; 10.7%), National Institute of Environmental Health Sciences (NIEHS) (n=25; 6.7%) were the institutions that supported the highest number of studies, respectively (Table 2).

Table 1. The most cited articles

No	Articles	Total number of citations
1	Brent, J., McMartin, K., Phillips, S., Aaron, C., & Kulig, K. (2001). Fomepizole for the treatment of methanol poisoning. New England Journal of Medicine, 344(6), 424-429.	227
2	McMartin, K. E., Ambre, J. J., & Tephly, T. R. (1980). Methanol poisoning in human subjects: role for formic acid accumulation in the metabolic acidosis. The American journal of medicine, 68(3), 414-418.	203
3	Hovda, K. E., Hunderi, O. H., Tafjord, A. B., Dunlop, O., Rudberg, N., & Jacobsen, D. (2005). Methanol outbreak in Norway 2002–2004: epidemiology, clinical features and prognostic signs. Journal of internal medicine, 258(2), 181-190.	164
4	Paasma, R., Hovda, K. E., Tikkerberi, A., & Jacobsen, D. (2007). Methanol mass poisoning in Estonia: outbreak in 154 patients. Clinical toxicology, 45(2), 152-157.	150
5	Jacobsen, D., & McMartin, K. E. (1997). Antidotes for methanol and ethylene glycol poisoning. Journal of Toxicology: Clinical Toxicology, 35(2), 127-143.	143
6	Brent, J. (2009). Fomepizole for ethylene glycol and methanol poisoning. New England Journal of Medicine, 360(21), 2216-2223.	121
7	Paine, A. J., & Dayan, A. D. (2001). Defining a tolerable concentration of methanol in alcoholic drinks. Human & experimental toxicology, 20(11), 563-568.	119
8	Kasetti, R. B., Rajasekhar, M. D., Kondeti, V. K., Fatima, S. S., Kumar, E. G. T., Swapna, S., ... & Rao, C. A. (2010). Antihyperglycemic and antihyperlipidemic activities of methanol: water (4: 1) fraction isolated from aqueous extract of Syzygium alternifolium seeds in streptozotocin induced diabetic rats. Food and Chemical Toxicology, 48(4), 1078-1084.	106
9	Johlin, F. C., Fortman, C. S., Nghiem, D. D., & Tephly, T. R. (1987). Studies on the role of folic acid and folate-dependent enzymes in human methanol poisoning. Molecular pharmacology, 31(5), 557-561.	104
10	Sejersted, O. M., Jacobsen, D., Øvrebø, S., & Jansen, H. (1983). Formate concentrations in plasma from patients poisoned with methanol. Acta Medica Scandinavica, 213(2), 105-110.	104

Table 2. Institutions providing financial support

Institutions		Number (n)	Percentage (%)*
1	United States Department Of Health Human Services (HHS)	41	10.9
2	National Institutes Of Health (NIH)	40	10.7
3	Nih National Institute Of Environmental Health Sciences (NIEHS)	25	6.7
4	Ministry Of Health Czech Republic	13	3.5
5	Canadian Institutes Of Health Research Cihr	9	2.4
6	Charles University In Prague	7	1.9
7	Department Of Science Technology India	6	1.6
8	European Union Eu	5	1.3
9	National Natural Science Foundation Of China Nsfc	5	1.3
10	Nih National Eye Institute Nei	4	1.0
Total		**373**	**100.0**

*: Organized by total number of supported articles

It was found that 451 (82.3%) of the articles included in the research were published in journals indexed in SCI-E, while 97 (17.7%) were published in journals indexed in ESCI. When the journals in which articles were published were analysed, it was found that the highest number of articles (n=32; 5.9%) were published in Journal of Ethnopharmacology, which was followed by Clinical Toxicology (n=23; 4.3%), Human Experimental Toxicology (n=15; 2.8%) and Pharmaceutical Biology (n=15; 2.8%). The list of journals which published the highest number of articles on methanol poisoning according to WoS database is shown in Table 3. When the publishing companies to which these journals were affiliated were analysed, it was found that Elsevier (n=153; 27.9%), Taylor&Francis (n=66; 12.0%) and Wiley (n=43; 7.8%) stood out (Table 4). When the countries in which studies were conducted were analysed, it was found that the highest number of studies were conducted in the United States of America (n=143; 22.7%), followed by India (n=46; 7.3%), Türkiye (n=37; 5.9%) and Iran (n=35; 5.6%) (Table 5).

Table 3. Publishing tools of articles

	Journals	Number (n)	Percentage (%)*
1	Journal of Ethnopharmacology	32	5.9
2	Clinical Toxicology	23	4.3
3	Human Experimental Toxicology	15	2.8
4	Pharmaceutical Biology	15	2.8
5	Toxicology and Applied Pharmacology	15	2.8
6	Journal of Toxicology Clinical Toxicology	13	2.4
7	Tropical Journal of Pharmaceutical Research	12	2.2
8	Teratology	10	1.9
9	Toxicology	10	1.9
10	Basic Clinical Pharmacology Toxicology	8	1.5
Total		**536**	**100.0**
Conference			
1	Annual Meeting of the North American Congress of Clinical Toxicology	2	13.3
2	10th International Symposium on Biological Monitoring Isbm	1	6.7
3	19th International Neurotoxicology Conference	1	6.7
4	35th Annual Meeting of the Society of Toxicology	1	6.7
5	3rd European Congress of Toxicologıc Pathology	1	6.7
6	3rd International Conference on Innovations in Cancer Research and Regenerative Medicine	1	6.7
7	49th Annual Meeting of the Teratology Society	1	6.7
8	7th International Congress of Toxicology	1	6.7
9	Annual Meeting of the Association for Research in Vision and Ophthalmology	1	6.7
10	Meeting of The North American Congress of Clinical Toxicology	1	6.7
11	Natıonal Toxicology and Clinical Toxıcology Symposium	1	6.7
12	North American Congress of Clinical Toxicology	1	6.7
13	Southeastern Regional Meeting of the Socıety for Academic Emergency Medicine	1	6.7
14	Meeting of the North American Congress of Clinical Toxicology	1	6.7
Total		**15**	**100.0**
Books			
	Advances in Experimental Medicine and Biology	1	100.0
Total		**1**	**100.0**

*: Each group was organized by the total number of articles within it

Table 4. Publishing companies to which the journals were affiliated

	Publishing Companies	Number (n)	Percentage (%)*
1	Elsevier	153	27.9
2	Taylor & Francis	66	12.0
3	Wiley	43	7.8
4	Springer Nature	31	5.7
5	Sage	20	3.6
6	Marcel Dekker Inc	14	2.5
7	Pharmacotherapy Group	12	2.2
8	Lippincott Williams & Wilkins	11	2.0
9	Mdpi	8	1.5
10	Aves	7	1.3
	Others	183	33.5
Total		**548**	**100.0**

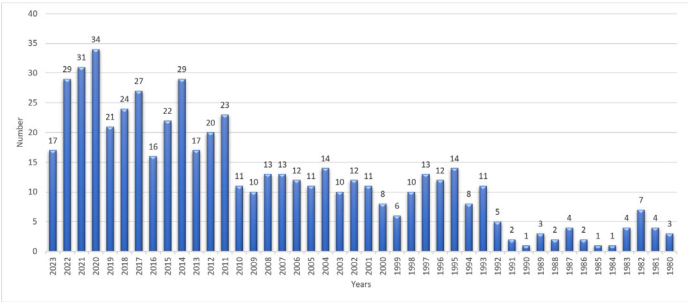
*: Organized by total number of articles

Table 5. Countries where studies are most frequently conducted			
Countries		**Number (n)**	**Percentage (%)***
1	**United States of America**	143	22.7
2	**India**	46	7.3
3	**Türkiye**	37	5.9
4	**Iranian**	35	5.6
5	**Nigeria**	33	5.2
6	**Canada**	30	4.8
7	**Czech Republic**	29	4.6
8	**Malaysia**	21	3.3
9	**Norway**	20	3.2
10	**Chinese**	16	2.5
Others		220	34.9
Total		**630**	**100.0**
*: Organized by total number of articles			

When the authors were analysed, it was found that Sergey Zakharov (n=24; 3.3%) was the author with the highest number of studies, followed by Tomas Navratil (2.5%) with 19 articles, Knut Erik Hovda (2.2%) with 16 articles, and Daniela Pelclova (2.08%) with 15 articles (Table 6). The institutions to which the authors were affiliated were mostly from Charles University Prague (n=28; 3.7%) and General University Hospital Prague (n=28; 3.7%) (Table 7). It was found that the highest number of studies were conducted in 2020 (n=34; 6.2%) and 2021 (n=31; 5.6%) (Graphic 1).

Table 6. Number of articles published by authors			
Authors		**Number (n)**	**Percentage (%)***
1	**Zakharov, S.**	24	3.3
2	**Navratil, T.**	19	2.6
3	**Hovda, K.E.**	16	2.2
4	**Pelclova, D.**	15	2.1
5	**Vaneckova, M.**	14	1.9
6	**Diblik, P.**	14	1.9
7	**Kotikova, K.**	13	1.8
8	**Seidl, Z.**	12	1.7
9	**Rogers, J.M.**	10	1.4
10	**Nurieva, O.**	9	1.2
Others		575	79.9
Total		**721**	**100.0**
*: Organized by total number of articles			

Table 7. Institutions affiliated with the authors			
Institutions		**Number (n)**	**Percentage *(%)**
1	**Charles University Prague**	28	3.7
2	**General University Hospıtal Prague**	28	3.7
3	**University of Oslo**	20	2.6
4	**Czech Academy of Sciences**	19	2.5
5	**J Heyrovsky Institute of Physical Chemistry of The Czech Academy of Sciences**	19	2.5
6	**United States Environmental Protection Agency**	19	2.5
7	**University Of North Carolina**	16	2.1
8	**Shahid Beheshti Unıversıty Medical Sciences**	15	2.0
9	**University Of North Carolina Chapel Hill**	15	2.0
10	**Egyptian Knowledge Bank Ekb**	12	1.6
Others		573	74.8
Total		**764**	**100.0**
*: Organized by total number of articles			



Graphic 1. Number of articles by year

DISCUSSION

The aim of scientific research on methanol poisoning is to define the variety of clinical signs and symptoms that may occur in the patient and/or to decrease mortality and morbidity by increasing the success of treatment. The contribution of these studies to literature is evaluated by citations. A total of 548 articles were included in this research and the total number of citations to these articles were 5.334, while the average number of citations per article was 17. These values obtained with the increasing number of studies especially after 2010 show the contribution of studies conducted on methanol poisoning to literature.

It was found that 68.0% of the articles included in the research had received financial support from 10 institutions in total. The institutions that provided the most support were found as HHS, NIH, NIEHS, respectively. The fact that more than 2/3 of the studies conducted on methanol poisoning were financially supported by large institutions was considered to indicate that scientific research on methanol poisoning is given the required importance by these institutions. It can be said that if these studies continue to receive financial support, the number and quality of research to be conducted on the subject will increase and also the points that are not still fully explained in the process from diagnosis to treatment related to methanol poisoning will be enlightened.

As a result of the filters used in the research, it was found that a total of 548 articles were published on methanol poisoning from 1980 to 21.08.2023 and studies are published on the subject almost every year, although the number varies. Graph 1 shows a significant increase in the number of articles published especially in the last 10-13 years. It was found that the highest number of articles conducted was 34 (6.20%) in 2020, followed by 31 (5.66%) articles in 2021, 29 (5.29%) articles in 2022 and 29 (5.29%) articles in 2014.

When the journals in which the articles included in the research were published were examined; it was found that Journal of Ethnopharmacology (n=32, 5.9%), Clinical Toxicology (n=23, 4.3%) and Human Experimental Toxicology (n=15, 2.8%) were the journals the articles were most frequently published, while Elsevier (n=153, 27.9%), Taylor & Francis (n=66, 12.0%) and Wiley (n=43, 7.8%) were the publishing companies the journals were affiliated to. It can be said that these journals and the publishing companies they were affiliated to contributed more to literature when compared with the other journals and publishing companies on methanol poisoning. Based on these data, it can be thought that the recognition and reputation of these journals and publishing companies in toxicology community is the reason of preference by authors.

When the countries from which articles on methanol poisoning were sent were examined, it can be seen that the countries which contributed most to this subject were the United States of America (n=143, 22.7%), India (n=46, 7.3%) and Türkiye (n=37, 5.9%). It can be said that a significant number of studies that contributed to literature are from Türkiye. Table 6 and Table 7 show the authors and the institutions of authors in studies. It was found that Zakharov, S. (n=24, 3.3%), Nevratil, T. (n=19, 2.6%) and Hovda, K.E. (n=16, 2.2%) were the authors who conducted the highest number of studies on methanol poisoning. When the institutions of authors were examined, the most frequent institutions were found as Charles University Prague (n=28, 3.7%), General University Hospital Prague (n=28, 3.7%) and University of Oslo (n=20, 2.6%). Considering the number of articles these authors and institutions contributed to literature, it can be thought that this situation may encourage other researchers and also institutions.

CONCLUSION

As a conclusion; with the analyses we conducted on methanol poisoning by using WoS database, we analysed the language, publication year, journal, publishing company of the journal, article authors, institution of the author, the country in which the research was conducted, whether financial support was received and citations. The present research is the first bibliometric research conducted on methanol poisoning by using WoS database. This research may be inspiring for bibliometric studies on other poisoning. It can be said that the data obtained from the research is a source of reference and compass for further studies to be conducted on methanol poisoning.

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Conflict of interest: *The authors have no conflicts of interest to declare.*

Ethical approval: *Approval was obtained from İzmir Bakırçay University Non-interventional Clinical Research Ethics Committee with the decision number 2023/1182.*

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