FLUORIDE

Quarterly Journal of The International Society for Fluoride Research Inc.

The Bibliometric Analysis on Scopus and Web of Sciences (WOS): The Most Cited 100 Articles on Systemic Fluoride Toxicity from 2013 to 2023

Unique digital address (Digital object identifier [DOI] equivalent):
https://www.fluorideresearch.online/epub/files/323.pdf

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Accepted: 2025 Feb 13
Published as e323: 2025 Feb 14

ABSTRACT

Purpose: Bibliometric analysis is one of the most widely used tools to quantify the research prolificacy in a specific area of knowledge. This paper aims to provide a list of the top 100 cited articles published between 2013 and 2023 on systemic fluoride toxicity to offer an up-to-date quantitative-qualitative analysis of publications.

Methods: In order to compare the topic of systemic fluoride toxicity in Scopus and Web of Sciences (WOS) databases between 2013 and 2023, the 100 most cited articles with the subject of "systemic fluoride toxicity" in the title, abstract and keywords as of January 9, 2024, were listed. The number of citations, authors, journal subjects, country, prominent funding sponsors, keywords density and affiliation of origin were evaluated. A graphical illustration of keywords, co-authors, and countries was created using VOSviewer.

Results: While the number of citations for 100 articles in the Scopus database varied between 207 and 54, in WoS this number varied between 218 and 7. All studies were published in English. The most productive institution in Scopus searches was the Ministry of Education of the People's Republic of China (n=8). Most of the studies in the articles were conducted in China, India, and the United States. The most prolific authors were Yousefi, M. (n= 6) in Scopus database searches and Choubisa, Shanti Lal (n=9) in WoS. According to both databases, the main sponsor was the National Natural Science Foundation of China. The majority of the most cited articles in the field of systemic fluoride toxicity were in the field of 'Environmental Sciences'.

Conclusions: A list of the 100 most cited articles published between 2013 and 2023 in the Scopus database was obtained. The WOS database provides a historical list showing which articles were cited with the topic 'systemic fluoride toxicity' between 2013 and 2023. The current citation analysis sheds light on existing publications on systemic fluoride toxicity in two different databases. It will assist researchers interested in this topic by saving significant effort and time in finding appropriate article leads.

Key-words: *Affiliations, Authors, Countries, Networks, Journal Subj, VOSviewer*

INTRODUCTION

Over 500 million individuals reside in regions characterized by endemic fluorosis, where elevated levels of fluoride are present in both drinking water and the surrounding environment, leading to significant public health challenges [1,2]. The symptoms of fluorosis range from mild impacts on tooth enamel, headaches, dizziness, and loss of appetite to more severe pathological disturbances. These severe effects encompass dental and skeletal fluorosis, hypothyroidism, sleep disorders, inflammations, deficits in IQ, and suspected cases of autism [3,4]. Fluoride is beneficial for skeletal metabolism and dental remineralization at appropriate concentrations [5]. A study conducted in the Dashtestan region of Bushehr Province, Iran, aimed to investigate the potential correlation between fluoride concentration in groundwater and the prevalence of dental caries in children aged 6–11. The fluoride levels in drinking water ranged from 0.99 to 2.50 mg/L, while the results revealed no significant association between fluoride concentration and dental caries across the studied villages [37].Nonetheless, prolonged intake of excessive fluoride quantities can lead to detrimental impacts on calcified tissues, predominantly affecting the skeletal systems and teeth. Additionally, soft tissues such as the brain, kidneys, and liver may also be adversely affected by the prolonged ingestion of elevated fluoride levels [6]. As of 2016, fluoride had gained recognition as one of the ten chemicals raising significant public health concerns.

Particularly in children, one of the most prevalent early adverse outcomes associated with fluoride is dental fluorosis (DF), a developmental disorder characterized by alterations in color and hypomineralization of the enamel [7]. Currently, fluoride toxicity is receiving heightened attention in endemic areas, primarily due to its negative effects on children's cognitive function, given their heightened susceptibility compared to adults. However, the existing body of evidence is limited, with most studies concentrated in specific countries, each with its own set of limitations and data gaps. The serious implications of fluoride toxicity underscore the need for comprehensive and well-designed research to address data gaps, particularly in developing countries. Moreover, extending research efforts to encompass all endemic regions globally could yield a larger and more comprehensive database, facilitating the resolution of this issue on a broader scale [8].

Bibliometric analysis is extensively employed across diverse fields such as management, environmental sciences, medicine, and more. In scientific bibliometrics, statistical analyses are conducted on a large scale, often involving thousands to tens of thousands of documents. This process entails extracting key information from these documents, creating a mathematical matrix, and subsequently visualizing it as a network diagram. This approach allows scholars to comprehend and analyze the main structural components by simplifying complex information [9]. VOSviewer was designed by NJ van Eck and L Waltman of Leiden University in the Netherlands, specifically for the visual analysis of bibliometrics [10].

Therefore, in this study, data were organized on Web of Science (WOS) and Scopus, and then VOSviewer was used for authorship analysis, countries, affiliation, journal subjects, funding sponsors and keyword analysis. This Bibliometric study is important in providing an updated perspective to the dental community, especially considering that the factors contributing to the development of systemic fluoride toxicity are not fully understood. Additionally, this bibliometric analysis allows mapping sub-areas that require additional research. Consequently, the aim of this research was to conduct a bibliometric study to examine trends, indicators, and characteristics in the global scientific production regarding systemic fluoride toxicity. The hypothesis of this study is that the most-cited articles on the topic of 'systemic fluoride toxicity' may differ between the Scopus and Web of Science (WOS) databases due to differences in their search algorithms and indexing methods.

MATERIAL AND METHODS

The study was designed as a bibliometric citation analysis. Original scientific articles, case reports, and reviews published between 2013 and 2023 in medical, dental, environmental sciences, or multidisciplinary journals that contain the term "systemic fluoride toxicity" in the title, abstract, or keywords and are ranked in the top 100 list with the highest number of citations were included. Editorials, letters to the editor, comments, scientific blogs, or technical notes have been excluded. Following these stages, a saved list was generated on Scopus and WOS; the abstracts of the selected studies were reviewed by two researchers (BÇT. and BBKE.) to determine whether the articles were directly related to systemic fluoride toxicity. Duplicates were identified and only one of the articles was included in the list. The data of the articles remained after all these processes were transferred to Microsoft Excel 2016 for Windows (in CSV format) and recorded in RIS format.

Bibliometric indicators used to analyze articles on systemic fluoride toxicity including the top 100 most cited articles in WOS and Scopus separately, top keywords, country of the article, journal subject area, authors, institutions, funding organizations, and citation data were located. The average number of citations was calculated using the formula: "total number of citations ÷ total number of articles". Country co-authorship, co-authorship, and keyword co-occurrence data from Scopus and WOS were easily processed, and visualization maps were created using VOSviewer (version 1.6.16). In the graphs provided by VOSviewer, clusters of different colors are created from the loaded data, and the thickness of the lines between these clusters shows the relative strength of the relationship between them, with a thicker line representing a stronger relationship. The results of bibliometric analyzes were expressed as count (n), count range (n< or <n) and percentage (%).

RESULTS

According to Scopus data, the number of citations of the 100 selected articles varied between 207 and 54. Each of the top five articles in the ranking received more than 150 citations, and each of the top 50 articles received more than 75 citations. The average number of citations per article was 88.71. A complete list of all analyzed articles with their citation counts is presented in **Table 1**. A list of the 100 most cited articles published between 2013 and 2023 in the Scopus database was obtained. According to these results, when we look at the quarterly slice of the journals in which the articles were published, it is seen that Q1; 69% (n=67), Q2; 20% (n=19), Q3; 6% (n=6) and Q4; 5% (n=5) **(Figure 1)**. It is seen that the most cited articles were published in 2014 (n=17), 2015 (n=16) and 2019 (n=16) **(Figure 2)**. It was clearly not possible to comment individually on all the articles in the list but considering the content of the top three most cited articles. The most cited article, which received 207 citations and was published in the Public Health Reports in July-August 2015 by Barbara F. Gooch, was a review of published research on the for community water systems that add fluoride to their water and PHS (Public Health Service) recommended a fluoride concentration of 0.7 mg/L (parts per million [ppm]) to maintain caries prevention benefits and reduce the risk of dental fluorosis [12]. Another article published by Alarcón-Herrera et al., and which received 202 citations, was a study of arsenic and fluoride content, formation process, and groundwater remediation in groundwater of semiarid regions of Latin America [13]. Another article that was obtained by entering keywords into the Scopus search engine and among the top 100 most cited articles was the study published by Delaviz et al. [14] which was conducted in 2014 comparing how the edge integrity of resin composites was affected by bacteria and saliva in the mouth. However, the relationship between the study in question and the subject scope of this study was not found to be significant. When entering keywords related to systemic fluoride toxicity into the Scopus database, the study by Delaviz et al was thought to be listed with the keyword "toxicity" **(Table 1)**.

According to WOS data, the number of citations of the 100 selected articles varied between 7 and 218. Each of the top five articles in the ranking received more than 135 citations, and each of the top 50 articles received more than 25 citations. The average number of citations per article was 38.03. A complete list of all analyzed articles with their citation counts is presented in **Table 2**. The WOS database provides a historical list showing which articles were cited with the topic 'systemic fluoride toxicity' between 2013 and 2023.

When we look at the quarterly slice of the journals in which the articles were published, it is seen that Q1; 43% (n=30), Q2; 29% (n=20), Q3; 21% (n=15) and Q4; 7% (n=5) **(Figure 3)**. According to these results, it is seen that the most cited articles were published in 2017 (n=12), 2020 (n=8) and 2011 (n=8) **(Figure 4)**. On WOS, as opposed to Scopus data, the first among the top three most cited articles was a review of dental fluorosis caused by chronic systemic fluoride toxicity, which received 218 citations in 2011[15]. The second most cited article was a review article on the effects of fluoride on organisms, published in April 2018, which received 168 citations [16]. The other most cited article, published in 2006 as a scientific review of EPA standards, reviews research on the various health effects of fluoride in drinking water [17].

Article Keywords

According to Scopus, the most used keywords are "fluoride exposure, value, groundwater, effect, group, risk", while in WOS they are "skeletal fluorosis, fluoride toxicity, area, source, expression, apoptosis, group" the density of keywords attracted attention **(Figure 5)**.

Affiliation, Authors, and Countries

The ten most productive affiliation in Scopus searches is the Ministry of Education of the People's Republic of China (n=8); then the Tehran University of Medical Sciences (n=7); Shanxi Agricultural University and Neyshabur University of Medical Sciences (n=5 for all); Tongji Medical College Huazhong University; Huazhong University of Science and Technology; and Gonabad University of Medical Sciences (n=4 for all). These were followed by Chinese Academy of Sciences and The University of Burdwan (n=3); Tianjin Centers for Disease Control and Prevention (n=2).

When the ten most productive affiliation in WOS searches are listed; Ohio State University College of Dentistry (n=5); then Quaid I Azam University Faculty of Biological Sciences); and Affiliated Hospital of Guizhou Medical University (n=3 for all); Harvard Medical School Department of Medicine; Huazhong University of Science and Technology School of Public Health; Tongji Medical College of Huazhong University of Science and Technology; Shanghai Stomatology Hospital; and University of Southern California Health Sciences Center (n=2 for all); followed by the Institute of Biological Environment and Rural Sciences at Aberystwyth University (n=1).

The 10 authors with the most publications among the 100 most cited articles on the topic of systemic toxicity of fluoride in Scopus. Yousefi, M. (n= 6) was the most prominent author, followed by Mahvi, A.H. and Mohammadi, A.A. (n=5). In WoS, Choubisa, Shanti Lal was the most prominent author with 9 articles, followed by Suzuki, Maiko with 6 articles and Bartlett, John D. with 5 articles.

In the examination of authorship within the context of the 100 most cited articles addressing systemic fluoride toxicity, as evidenced by Scopus scanning outcomes, China (n=26) emerges as the primary contributor, followed by India (n=23) in the secondary position, and the United States (n=18) in the tertiary. Conversely, in accordance with data sourced from the WOS, India (n=43) assumes a leading role, succeeded by China (n=24) in the secondary position, and the United States (n=19) in the tertiary echelon.

The National Natural Science Foundation of China was the lead funding sponsor of 18 papers, followed by the National Institutes of Health (n=5), Fundamental Research Funds for the Central Universities(n=3) (Scopus). The top funding sponsors of the 100 most cited articles on the systemic toxicity of fluoride include the largest contribution was made by the National Natural Science Foundation of China (n=14), followed by the National Institutes of Health, the National Institute of Dental and Craniofacial Research (NIDCR), and the United States Department of Health and Human Services [(n=7 for all) (WOS)].

When the subject areas of the journals in which the systemic toxicity of fluoride were published were analyzed, "Environmental Sciences" came with a rate of 19.9% in Scopus, followed by "Medicine" with 16.9% and "Biochemistry" with 12.7%. In the 'Dentistry' section, a rate of 6.9% was reported (Scopus)**(Figure 7).** In the scrutiny of the top ten journal subject areas encompassing the 100 most cited articles on the systemic toxicity of fluoride, 'Public Environmental Occupational Health' emerged as the predominant category, featuring 32 articles. It was succeeded by

'Toxicology' with 31 articles and 'Environmental Sciences' with 30 articles (WOS).

Table 1. List of 100 top cited articles on 'Systemic Fluoride Toxicity' between 2013–2023 (Scopus) 2023 Journal Citation Reports (Clarivate Analytics, 2024).
***Source: Journal Citation Reports 2021**
****Source: Journal Citation Reports 2016**

NO	AUTHORS	TITLE	CITE	YEAR	JOURNAL	Q	IF
1	Gooch, B.F.	U.S. public health service recommendation for fluoride concentration in drinking water for the prevention of dental caries	207	2015	Public Health Reports	Q2	3
2	Alarcón-Herrera, M.T.	Co-occurrence of arsenic and fluoride in groundwater of semi-arid regions in Latin America: Genesis, mobility, and remediation	202	2013	Journal of Hazardous Materials	Q1	12.2
3	Delaviz, Y.	Biodegradation of resin composites and adhesives by oral bacteria and saliva: A rationale for new material designs that consider the clinical environment and treatment challenges	192	2014	Dental Materials	Q1	4.6
4	Li, P.	Occurrence and hydrogeochemistry of fluoride in alluvial aquifer of Weihe River, China	191	2014	Environmental Earth Sciences	Q3	2.8
5	Suzuki, M.	Fluoride induces oxidative damage and SIRT1/autophagy through ROS-mediated JNK signaling	177	2015	Free Radical Biology and Medicine	Q1	7.1
6	Srivastava, S.	Fluoride in Drinking Water and Skeletal Fluorosis: A Review of the Global Impact	169	2020	Current Environmental Health Reports	Q1	7.4
7	Ghosh, A.	Sources and toxicity of fluoride in the environment	164	2013	Research on Chemical Intermediates	Q2	2.8
8	Zhang, L.	Probabilistic risk assessment of Chinese residents' exposure to fluoride in improved drinking water in endemic fluorosis areas	159	2017	Environmental Pollution	Q1	7.6
9	Narsimha, A.	Contamination of fluoride in groundwater and its effect on human health: a case study in hard rock aquifers of Siddipet, Telangana State, India	157	2017	Applied Water Science	Q1	5.7
10	Mohammadi, A.A.	Skeletal fluorosis in relation to drinking water in rural areas of West Azerbaijan, Iran	157	2017	Scientific Reports	Q1	3.8
11	Philip, N.	State of the Art Enamel Remineralization Systems: The Next Frontier in Caries Management	148	2019	Caries Research	Q1	2.9
12	Berger, M.M.	ESPEN micronutrient guideline	137	2022	Clinical Nutrition	Q1	6.6
13	Podgorski, J.E.	Prediction Modeling and Mapping of Groundwater Fluoride Contamination throughout India	133	2018	Environmental Science and Technology	Q1	10.9
14	Guissouma, W.	Risk assessment of fluoride exposure in drinking water of Tunisia	131	2017	Chemosphere	Q1	8.1
15	Ashokkumar, P.	Test-strip-based fluorometric detection of fluoride in aqueous média with a BODIPY-linked hydrogen-bonding receptor	129	2014	Angewandte Chemie – International Edition	Q1	16.1
16	Fallahzadeh, R.A.	Spatial variation and probabilistic risk assessment of exposure to fluoride in drinking water	122	2018	Food and Chemical Toxicology	Q1	3.9
17	Tomar, V.	Adsorptive removal of fluoride from water samples using Zr-Mn composite material	111	2013	Microchemical Journal	Q1	4.9
18	Dehbandi, R.	Geochemical sources, hydrogeochemical behavior, and health risk assessment of fluoride in an endemic fluorosis area, central Iran	110	2018	Chemosphere	Q1	8.1

19	Rashid, A.	Fluoride prevalence in groundwater around a fluorite mining area in the flood plain of the River Swat, Pakistan	109	2018	Science of the Total Environment	Q1	8.2
20	Zhang, Q.	Hydrogeochemistry and fluoride contamination in Jiaokou Irrigation District, Central China:Assessment based on multivariate statistical approach and human health risk	107	2020	Science of the Total Environment	Q1	8.2
21	Cao, J.	Effects of fluoride on liver apoptosis and Bcl-2, Bax protein expression in freshwater teleost, Cyprinus carpio	107	2013	Chemosphere	Q1	8.1
22	Clark, M.B.	Fluoride use in caries prevention in the primary care setting	106	2014	Pediatrics	Q1	6.2
23	Jha, S.K.	Fluoride in groundwater: Toxicological exposure and remedies	106	2013	Journal of Toxicology and Environmental Health, Part B	Q1	6.4
24	Mukherjee, I.	Characterization of heavy metal pollution in an anthropogenically and geologically influenced semi-arid region of east India and assessment of ecological and human health risks	103	2020	Science of the Total Environment	Q1	8.2
25	Duangthip, D.	A randomized clinical trial on arresting dentine caries in preschool children by topical fluorides -18-month results	102	2016	Journal of Dentistry	Q1	4.8
26	Thavarajah, W.,	Point-of-Use Detection of Environmental Fluoride via a Cell-Free Riboswitch-Based Biosensor	100	2020	ACS Synthetic Biology	Q1	3.8
27	Zhou, B.-H.	Fluoride-induced oxidative stress is involved in the morphological damage and dysfunction of liver in female mice	100	2015	Chemosphere	Q1	8.1
28	Ahada, C.P.S.	Assessment of Human Health Risk Associated with High Groundwater Fluoride Intake in Southern Districts of Punjab, India	98	2019	Exposure and Health	Q1	4.6
29	KheradPisheh, Z.,	Impact of drinking water fluoride on human thyroid hormones: A case-control study	98	2018	Scientific Reports	Q1	3.8
30	Yu, X.	Threshold effects of moderately excessive fluoride exposure on children's health: A potential association between dental fluorosis and loss of excellent intelligence	96	2018	Environment International	Q1	10.3
31	Choi, A.L.	Association of lifetime exposure to fluoride and cognitive functions in Chinese children: A pilot study	94	2015	Neurotoxicology and Teratology	Q3	2.6
32	Olaka, L.A.	Groundwater fluoride enrichment in an active rift setting: Central Kenya Rift case study	91	2016	Science of the Total Environment	Q1	8.2
33	Nanayakkara, S.,	An integrative study of the genetic, social, and environmental determinants of chronic kidney disease characterized by tubulointerstitial damages in the North Central Region of Sri Lanka	90	2014	Journal of Occupational Health	Q2	2.6
34	Suneetha, M.	Removal of fluoride from polluted waters using active carbon derived from barks of Vitex negundo plant	89	2015	Journal of Analytical Science and Technology	Q3	2.5
35	Na, Y.J.	Dual-channel detection of Cu and F with a simple Schiff-based colorimetric and fluorescent sensor	89	2015	Spectrochimica Acta -Part A: Molecular and Biomolecular Spectroscopy	Q1	4.3
36	Yousefi, M.	Association of Hypertension, Body Mass Index, and Waist Circumference with Fluoride Intake; Water Drinking in Residents of Fluoride Endemic Areas, Iran	88	2018	Biological Trace Element Research	Q2	3.4
37	Gao, H.	Localization of fluoride and aluminum in subcellular fractions of tea leaves and roots	88	2014	Journal of Agricultural and Food Chemistry	Q1	5.7

38	Rahman, M.M.,	Spatiotemporal distribution of fluoride in drinking water and associated probabilistic human health risk appraisal in the coastal region Bangladesh	87	2020	Science of the Total Environment	Q1	8.2
39	Kabir, H.	Fluoride and human health: Systematic appraisal of sources, exposures, metabolism, and toxicity	87	2020	Critical Reviews in Environmental Science and Technology	Q1	11.4
40	Choubisa, S.L.,	Status of industrial fluoride pollution and its diverse adverse health effects in man and domestic animals in India	85	2016	Environmental Science and Pollution Research	-	-
41	Jiang, S.	Fluoride and arsenic exposure impair learning and memory and decreases mGluR5 expression in the hippocampus and cortex in rats	83	2014	PLoS ONE	Q1	2.9
42	Ebrahim, F.M.,	Selective, Fast-Response, and Regenerable Metal-Organic Framework for Sampling Excess Fluoride Levels in Drinking Water	82	2019	Journal of the American Chemical Society	Q1	14.5
43	Ruszkiewicz, J.A.	C. elegans as a model in developmental neurotoxicology	80	2018	Toxicology and Applied Pharmacology	Q2	3.3
44	Fung, M.H.T.,	Arresting dentine caries with different concentration and periodicity of silver diamine fluoride	78	2016	JDR Clinical and Translational Research	Q2	2.2
45	J.M.,	Community water fluoridation and intelligence:Prospective study in New Zealand Broadbent	77	2015	American Journal of Public Health	Q1	9.7
46	Li, Y.	Land-use change caused by anthropogenic activities increase fluoride and arsenic pollution in groundwater and human health risk	75	2021	Journal of Hazardous Materials	Q1	12.2
47	Wickramarathna, S.,	Tracing environmental aetiological factors of chronic kidney diseases in the dry zone of Sri Lanka—A hydrogeochemical and isotope approach	75	2017	Journal of Trace Elements in Medicine, and Biology	Q2	3.6
48	Cao, J.	Protective properties of sesamin against fluoride-induced oxidative stress and apoptosis in kidney of carp (Cyprinus carpio) via JNK signaling pathway	75	2015	Aquatic Toxicology	Q1	4.1
49	González-Horta, C.	A concurrent exposure to arsenic and fluoride from drinking water in Chihuahua, Mexico	75	2015	International Journal of Environmental Research and Public Health	Q1	4.6*
50	Hannig, C.	Influence of a mouthwash containing hydroxyapatite microclusters on bacterial adherence in situ	75	2013	Clinical Oral Investigations	Q1	3.1
51	Craig, L.	Recommendations for fluoride limits in drinking water based on estimated daily fluoride intake in the Upper East Region, Ghana	74	2015	Science of the Total Environment	Q1	8.2
52	Malin, A.J.	Fluoride exposure and kidney and liver function among adolescents in the United States:NHANES, 2013–2016	73	2019	Environment International	Q1	10.3
53	Yadav, K.K.	Human health risk assessment: Study of a population exposed to fluoride through groundwater of Agra city, India	73	2019	Regulatory Toxicology and Pharmacology	Q2	3
54	Bejaoui, I.	Performance of Reverse Osmosis and Nanofiltration in the Removal of Fluoride from Model Water and Metal Packaging Industrial Effluent	73	2014	Separation Science and Technology	Q3	2.4
55	Zhou, Y.	Effects of sodium fluoride on reproductive function in female rats,	73	2013	Food and Chemical Toxicology	Q1	3.9
56	Dehghani, M.	Fluoride contamination in groundwater resources in the southern Iran and its related human health risks	72	2019	Desalination and Water Treatment	Q4	1

57	Suzuki, M.	Sirtuin1 and autophagy protect cells from fluoride-induced cell stress, (2014),	71	2014	Biochimica et Biophysica Acta - Molecular Basis of Disease	Q2	4.2
58	Song, G.H.	Effects of fluoride on DNA damage and caspase-mediated apoptosis in the liver of rats	70	2015	Biological Trace Element Research	Q2	3.4
59	Zango, M.S.	Hydrogeochemical controls and human health risk assessment of groundwater fluoride and boron in the semi-arid North-East region of Ghana	69	2019	Journal of Geochemical Exploration	Q1	3.4
60	Naga Babu, A.	Removal of lead and fluoride from contaminated water using exhausted coffee grounds-based bio-sorbent	69	2018	Journal of Environmental Management	Q1	8
61	Sun, L.	An assessment of the relationship between excess fluoride intake from drinking water and essential hypertension in adults residing in fluoride endemic areas	69	2013	Science of the Total Environment	Q1	8.2
62	Mukherjee, I.	Exploring a multi-exposure-pathway approach to assess human health risk associated with groundwater fluoride exposure in the semi-arid region of east India	68	2019	Chemosphere	Q1	8.1
63	Li, W.	Protective effect of lycopene on fluoride-induced ameloblasts apoptosis and dental fluorosis through oxidative stress-mediated Caspase pathways	68	2017	Chemico-Biological Interactions	Q1	4.7
64	Aravinthasamy, P.,	Geochemical evaluation of fluoride contamination in groundwater from Shanmuganadhi River basin, South India:implication on human health	67	2020	Environmental Geochemistry and Health	Q2	3.2
65	Zhang, J.	Sodium fluoride and sulfur dioxide affected male reproduction by disturbing blood-testis barrier in mice	67	2016	Food and Chemical Toxicology	Q1	3.9
66	Sandoval, M.A.	Fluoride removal from drinking water by electrocoagulation in a continuous filter press reactor coupled to a flocculator and clarifier	67	2014	Separation and Purification Technology	Q1	8.2
67	Affonso, L.N.	Removal of fluoride from fertilizer industry effluent using carbon nanotubes stabilized in chitosan sponge	66	2020	Journal of Hazardous Materials	Q1	12.2
68	Wang, M.	Distribution, health risk assessment, and anthropogenic sources of fluoride in farmland soils in phosphate industrial area, southwest China	66	2019	Environmental Pollution	Q1	7.6
69	Brahman, K.D.	Simultaneously evaluate the toxic levels of fluoride and arsenic species in underground water of Tharparkar and possible contaminant sources: A multivariate study	66	2013	Ecotoxicology and Environmental Safety	Q1	6.2
70	Song, G.H.	Sodium fluoride induces apoptosis in the kidney of rats through caspase-mediated pathways and DNA damage	65	2014	Journal of Physiology and Biochemistry	Q2	3.7
71	Liu, H.	Assessment of relationship on excess fluoride intake from drinking water and carotid atherosclerosis development in adults in fluoride endemic areas, China	65	2014	International Journal of Hygiene and Environmental Health	Q1	4.5
72	Atmaca, N.	Protective effect of resveratrol on sodium fluoride-induced oxidative stress, hepatotoxicity, and neurotoxicity in rats	65	2014	Food and Chemical Toxicology	Q1	3.9
73	Yousefi, M.	Epidemiology of drinking water fluoride and its contribution to fertility, infertility, and abortion:An ecological study in west Azerbaijan province, poldasht county, Iran	64	2017	FLUORIDE	Q4	0.7
74	Muthu Prabhu, S.,	Enriched fluoride sorption using chitosan supported mixed metal oxides beads: Synthesis, characterization, and mechanism	64	2014	Journal of Water Process Engineering	Q1	6.3

75	Chan, L., Mehra, A.,	Human exposure assessment of fluoride from tea (Camellia sinensis L.): A UK based issue?	64	2013	Food Research International	Q1	7
76	Ghaderpoori, M.,	Health risk assessment of fluoride in water distribution network of Mashhad, Iran	63	2019	Human and Ecological Risk Assessment	Q2	3
77	Yadu, B.	Responses of plants to fluoride: An overview of oxidative stress and defense mechanisms	63	2016	FLUORIDE	Q4	0.7
78	Rango, T.	Nephrotoxic contaminants in drinking water and urine, and chronic kidney disease in rural Sri Lanka	63	2015	Science of the Total Environment	Q1	8.2
79	Radfard, M.	Health risk assessment to fluoride and nitrate in drinking water of rural residents living in the Bardaskan City, Arid Region, Southeastern Iran	62	2019	Desalination and Water Treatment	Q4	1
80	Waugh, D.T.	Risk assessment of fluoride intake from tea in the republic of ireland and its implications for public health and water fluoridation	62	2016	International Journal of Environmental Research and Public Health	Q1	4.6*
81	Kubota, R.	Chemical Sensing Platforms Based on Organic Thin-Film Transistors Functionalized with Artificial Receptors	61	2019	ACS Sensors	Q1	8.3
82	Wang, H.	Fluoride-induced oxidative stress and apoptosis are involved in the reducing of oocytes development potential in mice	60	2017	Chemosphere	Q1	8.1
83	Sun, Z.	Fluoride decreased the sperm ATP of mice through inhabiting mitochondrial respiration	60	2016	Chemosphere	Q1	8.1
84	Rasool, A.	Co-occurrence of arsenic and fluoride in the groundwater of Punjab, Pakistan: source discrimination and health risk assessment	60	2015	Environmental Science and Pollution Research	-	-
85	Zhang, S.	Modifying effect of COMT gene polymorphism and a predictive role for proteomics analysis in children's intelligence in endemic fluorosis area in Tianjin, China	60	2015	Toxicological Sciences	Q2	3.4
86	Inkielewicz-Stepniak.	Pharmacological and toxicological effects of co-exposure of human gingival fibroblasts to silver nanoparticles and sodium fluoride	60	2014	International Journal of Nanomedicine	Q1	6.7
87	Bhattacharya, P.,	Health risk assessment of co-occurrence of toxic fluoride and arsenic in groundwater of Dharmanagar region, North Tripur (India)	59	2020	Groundwater for Sustainable Development	Q1	4.9
88	Bossù, M.	Enamel remineralization and repair results of Biomimetic Hydroxyapatite toothpaste on deciduous teeth: An effective option to fluoride toothpaste	59	2019	Journal of Nanobiotechnology	Q1	10.6
89	Mondal, N.K.,	Effect of fluoride on photosynthesis, growth and accumulation of four widely cultivated rice (Oryza sativa L.) varieties in India	59	2017	Ecotoxicology and Environmental Safety	Q1	6.2
90	Hirai, M.,	1-Pyrenyl- and 3-Perylenyl-antimony(V) Derivatives for the Fluorescence Turn-On Sensing of Fluoride Ions in Water at Sub-ppm Concentrations	59	2016	Organometallics	Q2	2.5
91	Singh, N.,	A comparative study of fluoride ingestion levels, serum thyroid hormone & TSH level derangements, dental fluorosis status among school children from endemic and non-endemic fluorosis areas	59	2014	SpringerPlus	Q2	1.13**
92	Qasemi, M.	Non-carcinogenic risk assessment to human health due to intake of fluoride in the groundwater in rural areas of Gonabad and Bajestan, Iran: A case study	57	2019	Human and Ecological Risk Assessment	Q2	3
93	Dharmaratne, R.W.	Exploring the role of excess fluoride in chronic kidney disease: A review	57	2019	Human and Experimental Toxicology	Q3	2.7

94	Das, K.	Dental fluorosis and urinary fluoride concentration as a reflection of fluoride exposure and its impact on IQ level and BMI of children of Laxmisagar, Simlapal Block of Bankura District, W.B., India	57	2016	Environmental Monitoring and Assessment	Q3	2.9
95	Wang, M.	Thyroid function, intelligence, and low-moderate fluoride exposure among Chinese school-age children	56	2020	Environment International	Q1	10.3
96	Tu, W.	Fluoride induces apoptosis via inhibiting SIRT1 activity to activate mitochondrial p53 pathway in human neuroblastoma SH-SY5Y cells	56	2018	Toxicology and Applied Pharmacology	Q2	3.3
97	Samal, A.C.,	A study to investigate fluoride contamination and fluoride exposure dose assessment in lateritic zones of West Bengal, India	56	2015	Environmental Science and Pollution Research	-	-
98	Singh, C.K.	Aqueous geochemistry of fluoride enriched groundwater in arid part of Western India	55	2015	Environmental Science and Pollution Research	-	-
99	Rango, T.	Fluoride exposure from groundwater as reflected by urinary fluoride and children's dental fluorosis in the Main Ethiopian Rift Valley	55	2014	Science of the Total Environment	Q1	8.2
100	Xu, F.	Lycopene alleviates AFB -induced immunosuppression by inhibiting oxidative stress and apoptosis in the spleen of mice	54	2019	Food and Function	Q1	5.1

Table 2. List of 100 top cited articles on fluoride systemic toxicity between 2013–2023 (WOS) (2023 Journal Citation Reports (Clarivate Analytics, 2024)
***Source: Journal Citation Reports 2000**
****Source: Journal Citation Reports 2007**
*****Source: Journal Citation Reports 2013**

NO	AUTHORS	TITLE	CITE	YEAR	JOURNAL	Q	IF
1	DenBesten, P and	Chronic Fluoride Toxicity: Dental Fluorosis.	218	2011	Monographs in Oral Science	-	-
2	Zuo, H.	Toxic effects of fluoride on organisms	168	2018	Life Sciences	Q1	5.2
3	Carton, RJ	Review of the 2006 United States National Research Council report: Fluoride in drinking water	156	2006	FLUORIDE	Q4	0.7
4	Singh, G.	Fluoride distribution and contamination in the water, soil and plants continuum and its remedial technologies, an Indian perspective- a review	151	2018	Environmental Science and Pollution Research	-	-
5	Narsimha, A.	Contamination of fluoride in groundwater and its effect on human health: a case study in hard rock aquifers of Siddipet, Telangana State, India	135	2017	Applied Water Science	Q1	5.7
6	Buzalaf, MAR	Fluoride Metabolism	131	2011	Fluoride and The Oral Environment	-	-
7	Johnston, NR.	Principles of fluoride toxicity and the cellular response: a review	113	2020	Archives of Toxicology	Q1	4.8
8	Susheela, A.	Prevalence Of Endemic Fluorosis with Gastrointestinal Manifestations in People Living in Some North-Indian Villages	110	1993	FLUORIDE	Q4	0.7
9	Guissouma, W.	Risk assessment of fluoride exposure in drinking water of Tunisia	108	2017	Chemosphere	Q1	8.1
10	Sharma, R.	Fluoride induces endoplasmic reticulum stress and inhibits protein synthesis and secretion	94	2008	Environmental Health Perspectives	Q1	10.1
11	Rashid, A.	Fluoride prevalence in groundwater around a fluorite mining area in the flood plain of the River Swat, Pakistan	90	2018	Science of The Total Environment	Q1	8.2
12	Choubisa,	Some observations on endemic fluorosis in	79	1999	Veterinary Research	Q2	1.8

	SL	domestic animals in Southern Rajasthan (India)			Communications		
13	Kabir, H.	Fluoride and human health: Systematic appraisal of sources, exposures, metabolism, and toxicity	77	2020	Critical Reviews in Environmental Science and Technology	Q1	11.4
14	Chandrajit, R.	Geogenic fluoride and arsenic in groundwater of Sri Lanka and its implications to community health	69	2020	Groundwater for Sustainable Development	Q1	4.9
15	Suzuki, M.	Sirtuin1 and autophagy protect cells from fluoride-induced cell stress	68	2014	Biochimica Et Biophysica Acta-Molecular Basis of Disease	Q1	4.2
16	WHITFORD, GM	Acute and Chronic Fluoride Toxicity	68	1992	Journal of Dental Research	Q1	5.7
17	Li, WS.	Protective effect of lycopene on fluoride-induced ameloblasts apoptosis and dental fluorosis through oxidative stress-mediated Caspase pathways	63	2017	Chemico-Biological Interactions	Q1	4.7
18	Das, K.	Dental fluorosis and urinary fluoride concentration as a reflection of fluoride exposure and its impact on IQ level and BMI of children of Laxmisagar, Simlapal Block of Bankura District, WB, India	55	2016	Environmental Monitoring and Assessment	Q3	2.9
19	Chioca, LR.	Subchronic fluoride intake induces impairment in habituation and active avoidance tasks in rats	54	2008	European Journal of Pharmacology	Q1	4.2
20	Keshavarzi, B.	The source of fluoride toxicity in Muteh area, Isfahan, Iran	51	2010	Environmental Earth Sciences	Q3	2.8
21	Choubisa, SL	Osteo-Dental Fluorosis in Domestic Horses and Donkeys in Rajasthan, India	49	2010	FLUORIDE	Q4	0.7
22	Choubisa, SL	Fluoride Toxicosis in Immature Herbivorous Domestic Animals Living in Low Fluoride Water Endemic Areas of Rajasthan, India: An Observational Survey	48	2013	FLUORIDE	Q4	0.7
23	Shivashankara, AR.	A clinical and biochemical study of chronic fluoride toxicity in children of Kheru Thanda of Gulbarga district, Karnataka, India	48	2000	FLUORIDE	Q4	0.7
24	Jha, PK.	Arsenic and fluoride contamination in groundwater: A review of global scenarios with special reference to India	45	2021	Groundwater for Sustainable Development	Q1	4.9
25	Jimenez-Cordova, MI.	Evaluation of kidney injury biomarkers in an adult Mexican population environmentally exposed to fluoride and low arsenic levels	45	2018	Toxicology and Applied Pharmacology	Q2	3.3
26	Choubisa, SL	Status of Fluorosis in Animals	42	2012	Proceedings of The National Academy of Sciences India Section B-Biological Sciences	Q4	0.3
27	Spittle, B	Neurotoxic Effects of Fluoride	42	2011	FLUORIDE	Q4	0.7
28	Choubisa, SL.	Food, Fluoride, And Fluorosis in DomesticRuminants in The Dungarpur District of Rajasthan, India	41	2011	FLUORIDE	Q4	0.7
29	Baunthiyal, M	Physiological And Biochemical Responses of Plants Under Fluoride Stress: An Overview	39	2014	FLUORIDE	Q4	0.7
30	Martínez-Mier	Fluoride: Its Metabolism, Toxicity, and Role in Dental Health	39	2012	Journal of Evidence-Based Integrative Medicine	Q1	3.3
31	Sharma, R.	The Acid Test of Fluoride: How pH Modulates Toxicity	39	2010	Plos One	Q1	2.9
32	Pessan, JP.	Analysis of fingernails and urine as biomarkers of fluoride exposure from dentifrice and varnish in 4- to 7-year-old children	35	2005	Caries Research	Q1	2.9
33	Bucher, Jr.	Results And Conclusions of The National Toxicology Programs Rodent Carcinogenicity Studies with Sodium- Fluoride	35	1991	International Journal of Cancer	Q1	5.7
34	Ribeiro,	Fluoride Induces Apoptosis in Mammalian	34	2017	Anticancer Research	Q4	1.6

	DA.	Cells: In Vitro and In Vivo Studies					
35	Choubisa, SL	Fluorosis in Dromedary Camels in Rajasthan, India, (2010), , 43 (3), pp.194-199	34	2010	FLUORIDE	Q4	0.7
36	Wang, HW.	The MMP-9/TIMP-1 System is Involved in Fluoride- Induced Reproductive Dysfunctions in Female Mice	31	2017	Biological Trace Element Research	Q2	3.4
37	Connett, P	Professionals mobilize to end water fluoridation worldwide	31	2007	FLUORIDE	Q4	0.7
38	Gupta, SK.	Reversal of fluorosis in children	31	1996	Acta Paediatrica Japonica	Q3	0.5*
39	Akiniwa, K	Re-examination of acute toxicity of fluoride	30	1997	FLUORIDE	Q4	0.7
40	Kashyap, SJ.	Fluoride sources, toxicity, and fluorosis management techniques-A brief review	29	2021	Journal of Hazardous Materials	Q1	12.2
41	Saeed, M.	Fluorosis and cognitive development among children (6-14 years of age) in the endemic areas of the world: a review and critical analysis	29	2020	Environmental Science and Pollution Research	-	-
42	Suzuki, M.	Sirt1 overexpression suppresses fluoride-induced p53 acetylation to alleviate fluoride toxicity in ameloblasts responsible for enamel formation	29	2018	Archives of Toxicology	Q1	4.8
43	Prystupa, J	Fluorine-A current literature review. An NRC and ATSDR based review of safety standards for exposure to fluorine and fluorides	29	2011	Toxicology Mechanisms and Methods	Q2	2.8
44	Ponikvar, M	Exposure of Humans to Fluorine and Its Assessment	28	2008	Fluorine and Health: Molecular Imaging, Biomedical Materials and Pharmaceuticals	-	-
45	Gil-Bona, A	Tooth Enamel and Its Dynamic Protein Matrix	27	2020	International Journal of Molecular Sciences	Q1	4.9
46	Sawan, RMM.	Fluoride increases lead concentrations in whole blood and in calcified tissues from lead-exposed rats	26	2010	Toxicology	Q1	4.8
47	Choubisa, SL	A Brief and Critical Review of Endemic Hydrofluorosis in Rajasthan, India	25	2018	FLUORIDE	Q4	0.7
48	Choubisa, SL.	Toxicity Of Fluoride in Cattle of The Indian Thar Desert, Rajasthan, India	25	2012	FLUORIDE	Q4	0.7
49	Choubisa, SL	Natural amelioration of fluoride toxicity (fluorosis) in goats and sheep	25	2010	Current Science	Q3	1.1
50	Nayak, B; Roy, MM.	Health effects of groundwater fluoride contamination	25	2009	Clinical Toxicology	Q2	3
51	Stepec, D	Fluoride in Human Health and Nutrition	24	2019	Acta Chimica Slovenica	Q3	1.2
52	Choubisa, SL	Fluortoxicosis in Diverse Species of Domestic Animals Inhabiting Areas with High Fluoride in Drinking Water of Rajasthan, India	24	2013	Proceedings of The National Academy of Sciences India Section B-Biological Sciences	Q4	0.396
53	Shenoy, PS	Sodium fluoride induced skeletal muscle changes: Degradation of proteins and signaling mechanism	23	2019	Environmental Pollution	Q1	7.6
54	Choubisa, SL	Industrial Fluorosis İn Domestic Goats (Capra Hircus), Rajasthan, India	23	2015	FLUORIDE	Q4	0.7
55	Shahab, S.	Effects Of Fluoride Ion Toxicity on Animals, Plants, And Soil Health: A Review, (2017), 5 (4), pp.393-408.	22	2017	FLUORIDE	Q4	0.7
56	Sahu, BL.	Fluoride Contamination of Groundwater and Toxicities in Dongargaon Block, Chhattisgarh, India	22	2017	Exposure and Health	Q1	4.6
57	Nakamoto, T	Fluoride Exposure in Early Life as the Possible Root Cause of Disease in Later Life, (2018), Journal of Clinical Pediatric Dentistry, 42(5), pp.325-330.	21	2018	Journal of Clinical Pediatric Dentistry	Q2	1.5
58	Schroder, JL	Soil contamination and bioaccumulation of inorganics on petrochemical Sites, (2000),	21	2000	Environmental Toxicology and	Q2	3.6

		Environmental Toxicology and Chemistry, 19 (8), pp.2066-2072.			Chemistry		
59	Miranda, GHN	A systematic review and meta-analysis of the association between fluoride exposure and neurological disorders, (2021),	20	2021	Scientific Reports	Q1	3.8
60	Güner, S	Dental Fluorosis and Catalase Immunoreactivity of the Brain Tissues in Rats Exposed to High Fluoride Pre- and Postnatally	20	2016	Biological Trace Element Research	Q2	3.4
61	Choubisa, SL	Bovine calves as ideal bio-indicators for fluoridated drinking water and endemic osteo-dental fluorosis	20	2014	Environmental Monitoring and Assessment	Q3	2.9
62	Liu, L	Low-to-moderate fluoride exposure in relation to overweight and obesity among school-age children in China	19	2019	Ecotoxicology and Environmental Safety	Q1	6.2
63	Leite, GAS;	Exposure to lead exacerbates dental fluorosis	19	2011	Archives of Oral Biology	Q2	2.2
64	Choubisa, SL	A brief and critical review on hydrofluorosis in diverse species of domestic animals in India	18	2018	Environmental Geochemistry and Health	Q2	3.2
65	Kalisinska, E.	Fluoride concentrations in the pineal gland, brain, and bone of goosander (Mergus merganser) and its prey in Odra River estuary in Poland	18	2014	Environmental Geochemistry and Health	Q2	3.2
66	Schroder, JL	Ecotoxicological risks associated with land treatment of petrochemical wastes.: I.: Residual soil contamination and bioaccumulation by cotton rats (Sigmodon hispidus)	18	2003	Journal of Toxicology and Environmental Health	Q3	1.8**
67	An, D	Poisoning by coal smoke containing arsenic and fluoride	18	1997	FLUORIDE	Q4	0.7
68	MELLA, S	Prevalence of Dental Fluorosis and Its Relation, with Fluoride Content of Communal Drinking-Water	16	1994	Revista Médica De Chile	Q3	0.5
69	Choubisa, SL	Fluoride distribution in drinking groundwater in Rajasthan, India	15	2018	Current Science	Q3	1.1
70	Kobayashi, CAN.	Proteomic Analysis of Urine in Rats Chronically Exposed to Fluoride	15	2011	Journal of Biochemical and Molecular Toxicology	Q2	3.2
71	Ribeiro, DA.	Ultrastructural morphometric analysis of ameloblasts exposed to fluoride during tooth development	15	2006	Journal of Molecular Histology	Q3	2.9
72	Deng, HD.	MDM2-Mediated p21 Proteasomal Degradation Promotes Fluoride Toxicity in Ameloblasts	14	2019	CELLS	Q2	5.1
73	Banerjee, G	Isolation And Characterization of Fluoride Resistant Bacterial Strains from Fluoride Endemic Areas of West Bengal, India: Assessment of Their Fluoride Absorption Efficiency	13	2016	FLUORIDE	Q4	0.7
74	Wei, Y.	iTRAQ-Based Proteomics Analysis of Serum Proteins in Wistar Rats Treated with Sodium Fluoride: Insight into the Potential Mechanism and Candidate Biomarkers of Fluorosis	13	2016	International Journal Of Molecular Sciences	Q1	4.9
75	Zhao, L.	LS8 cell apoptosis induced by NaF through p-ERK and p-JNK - a mechanism study of dental fluorosis	13	2016	Acta Odontologica Scandinavica	Q3	1.4
76	Bloch-Zupan, A	Is the fluoride concentration limit of 1,500 ppm in cosmetics (EU guideline) still up to date?	13	2001	Caries Research	Q1	2.9
77	Schroder, JL.	Soil and vegetation fluoride exposure pathways to cotton rats on a petrochemical-contaminated landfarm	13	1999	Environmental Toxicology and Chemistry	Q2	3.6
78	Job, JT.	Toxic Effects of Fluoride in Intestinal Epithelial Cells and The Mitigating Effect of Methanol Extract of Coconut Haustorium By Enhancing De Novo Glutathione Biosynthesis	12	2021	ENVIRONMENTAL RESEARCH	Q1	7.7

79	Deng, HD.	Histone acetyltransferase promotes fluoride toxicity in LS8 cells	12	2020	Chemosphere	Q1	8.1
80	Spittle, B	Prevention of Fluoride Ion-Induced Iq Loss in Children	12	2017	FLUORIDE	Q4	0.7
81	Moharamzadeh, K	Biocompatibility of oral care products	12	2017	Biocompatibility of Dental Biomaterials	-	-
82	Fujiwara, N.	Curcumin suppresses cell growth and attenuates fluoride-mediated Caspase-3 activation in ameloblast-like LS8 cells	11	2021	Environmental Pollution	Q1	7.6
83	Zeng, XX.	Protections against toxicity in the brains of rat with chronic fluorosis and primary neurons exposed to fluoride by resveratrol involves nicotinic acetylcholine receptors	11	2020	Journal of Trace Elements in Medicine and Biology	Q2	3.6
84	Suzuki, M.	4-Phenylbutyrate Mitigates Fluoride-Induced Cytotoxicity in ALC Cells	11	2017	Frontiers in Physiology	Q2	3.2
85	Gopalakrishnan, SB	Assessment of fluoride-induced changes on physicochemical and structural properties of bone and the impact of Calcium on Its Control in Rabbits	11	2012	Journal of Bone and Mineral Metabolism	Q3	2.4
86	Shanthakumari, D.	Antioxidant defense systems in red blood cell lysates of men with dental fluorosis living in Tamil Nadu, India	11	2006	FLUORIDE	Q4	0.7
87	Liu, J.	Association of Dietary Carotenoids Intake with Skeletal Fluorosis in the Coal-burning Fluorosis Area of Guizhou Province	10	2018	Biomedical and Environmental Sciences	Q2	3
88	Wu, CX.	Changes of DNA repair gene methylation in blood of chronic fluorosis patients and rats	10	2018	Journal of Trace Elements In Medicine and Biology	Q2	3.6
89	Frechero, NM.	Drinking Water Fluoride Levels for a City in Northern Mexico (Durango) Determined Using a Direct Electrochemical Method and Their Potential Effects on Oral Health	10	2013	Scientific World Journal	Q2	1.219***
90	Nelson, EA.	Evidence of Skeletal Fluorosis at the Ray Site, Illinois, USA: a pathological assessment and discussion of environmental factors	9	2019	International Journal of Paleopathology	Q3	1.3
91	Hussain, J.	Fluoride contamination in groundwater of central Rajasthan, India, and its toxicity in rural habitants	9	2013	Toxicological and Environmental Chemistry	Q4	1.1
92	Khandare, A.	Effects Of Smoking, use of Aluminium Utensils, and Tamarind Consumption on Fluorosis in A Fluorotic Village of Andhra Pradesh, India	9	2010	FLUORIDE	Q4	0.7
93	Rafferty, DP.	Fluorosis risks to resident hispid cotton rats on land-treatment facilities for petrochemical wastes	9	2000	Journal of Wildlife Diseases	Q3	1.1
94	Kumar, R.	Bioaccumulation of Fluoride in Plants and Its Microbially Assisted Remediation: A Review of Biological Processes and Technological Performance	8	2021	Processes	Q2	2.8
95	Ji, M.	How pH is regulated during amelogenesis in dental fluorosis	8	2018	Experimental and Therapeutic Medicine	Q3	2.4
96	Jayashree, DE.	A review on fluoride: treatment strategies and scope for further research	7	2020	Desalination and Water Treatment	Q4	1
97	Bhowmik, AD.	A review on fluoride induced organotoxicity and genotoxicity in mammals and zebrafish	7	2019	Nucleus-INDIA	Q4	2.1
98	Tak, Y	Fluoride-Induced Changes in The Antioxidant Defence System in Two Contrasting Cultivars of Triticum Aestivum L.	7	2017	FLUORIDE	Q4	0.7
99	Dhurvey, V	Effect Of Sodium Fluoride on The Structure and Function of The Thyroid and Ovary in Albino Rats (Rattus Norvegicus)	7	2017	FLUORIDE	Q4	0.7
100	Agalakova, NI	Effect of inorganic fluoride on living organisms of different phylogenetic level	7	2011	Journal of Evolutionary Biochemistry and	Q4	0.6

					Physiology			

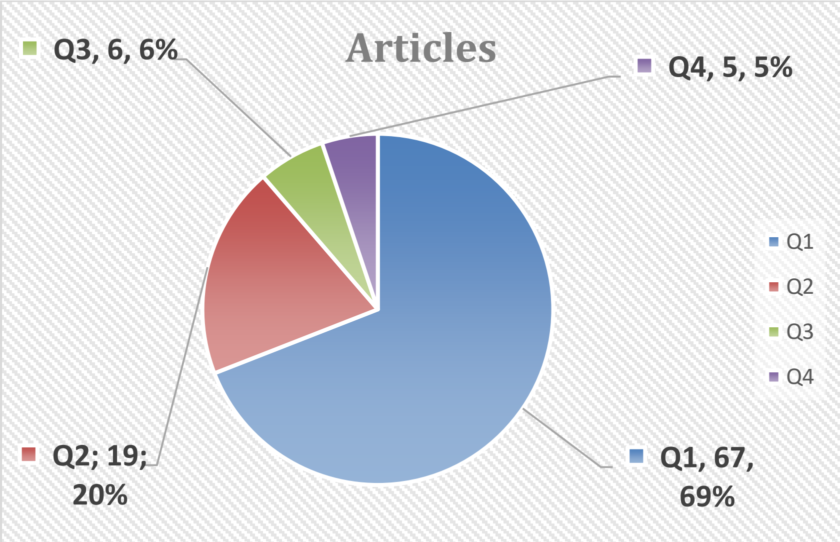

Figure 1. Quartile distribution of journals according to Scopus database.

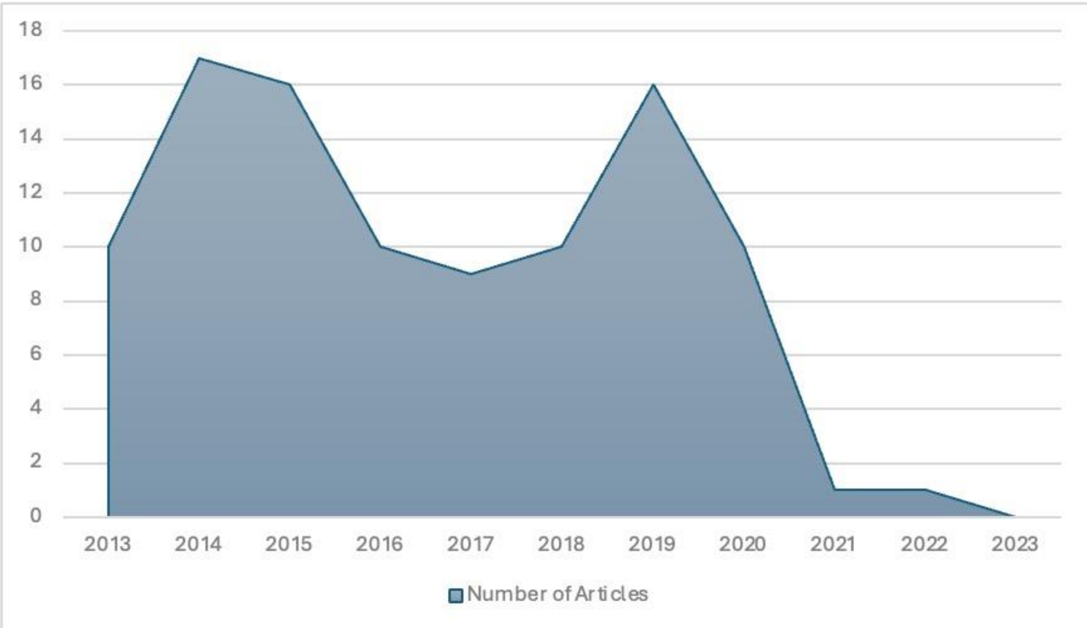

Figure 2. The annual trend of the top 100 most cited articles published between 2013 and 2023 in the Scopus database.

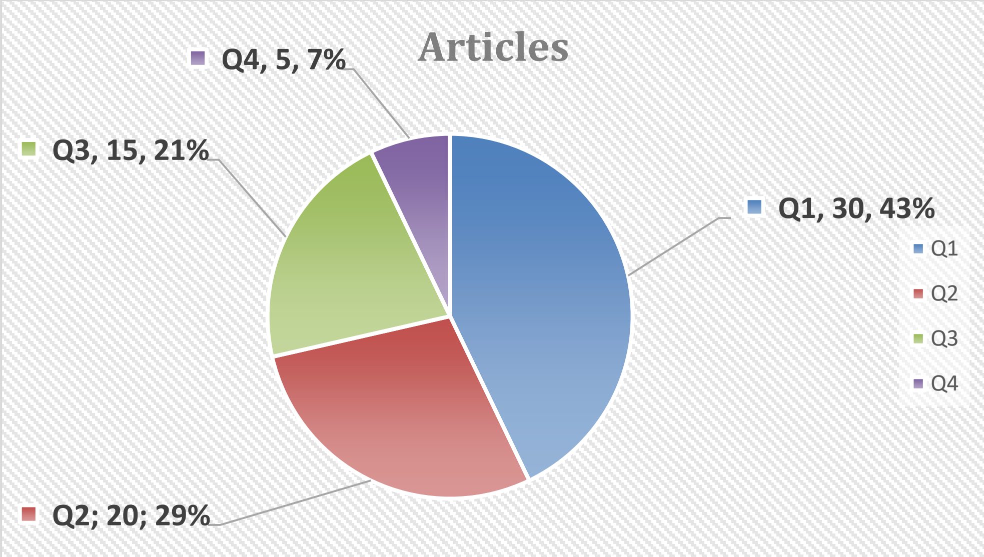

Figure 3. Quartile distribution of journals according to WOS database.

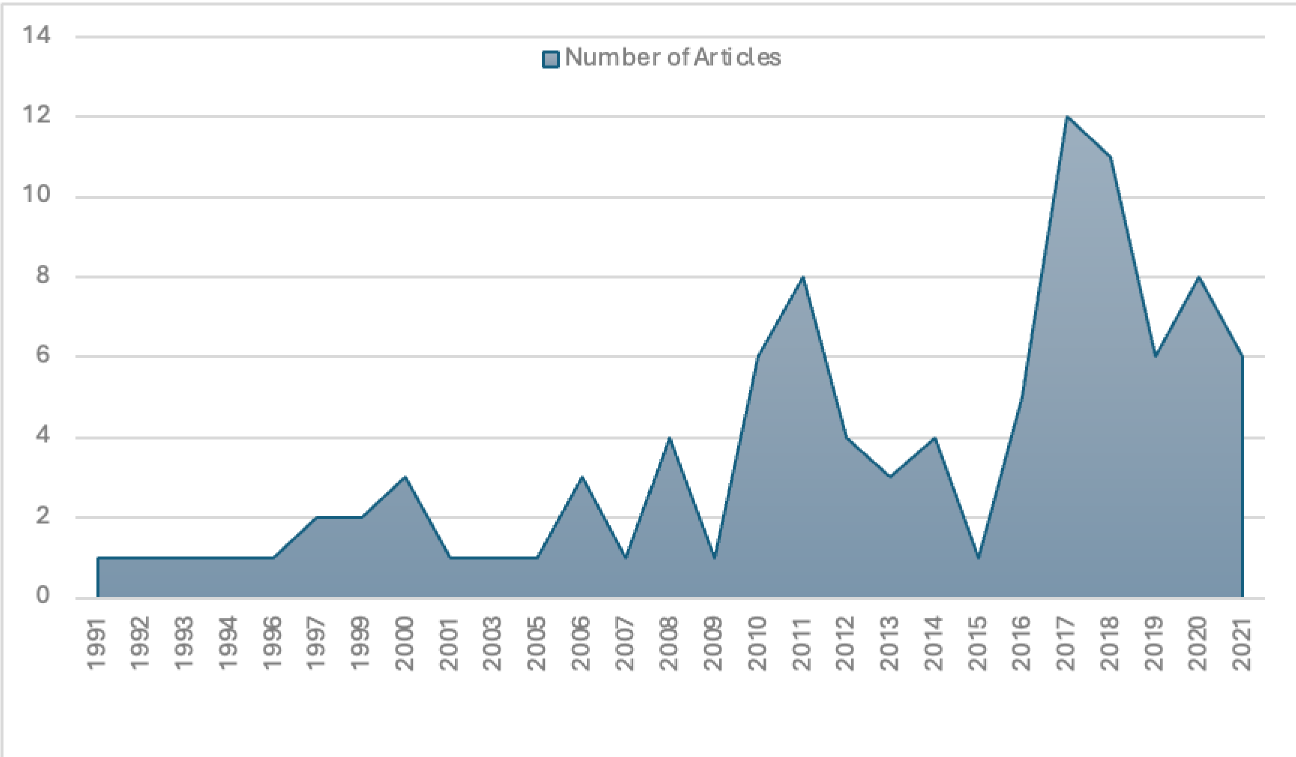

Figure 4. Trend of the top 100 most cited articles in WOS between 2013-2023 by publication year.

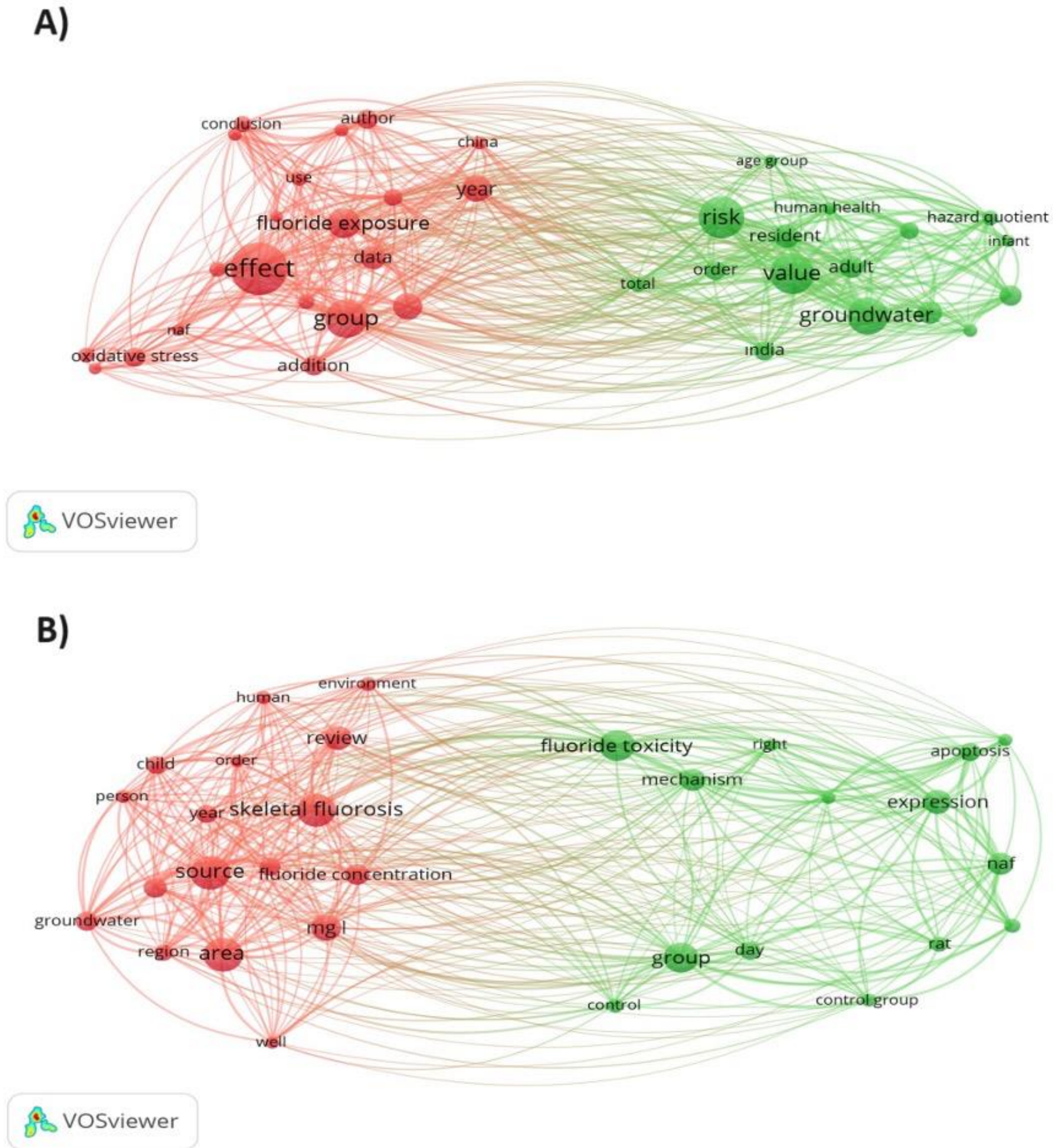

Figure 5. Keyword co-occurrence network of the 100 top-cited articles between 2013–2023. Image produced by VOSviewer. [A) Scopus, B) WOS].

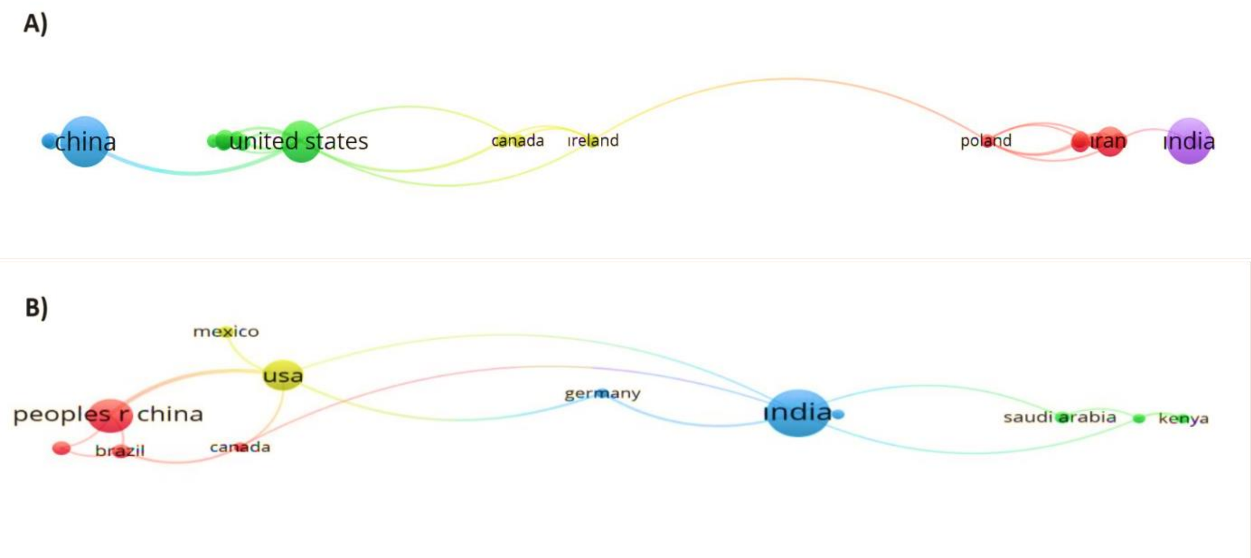

Figure 6. Countrybounds network of the 100 top-cited articles between 2013–2023. Image produced by VOSviewer. [A) Scopus, B) WOS].

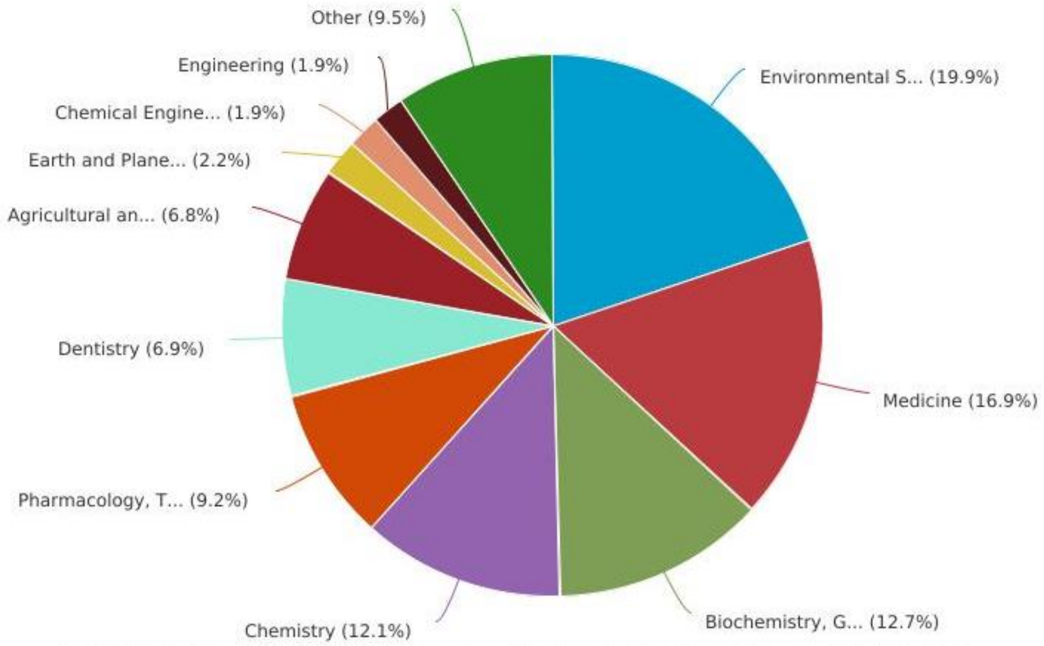

Figure 7. Top ten journal subjects where the 100 most cited articles on the systemic toxicity of fluoride according to Scopus are published.

DISCUSSION

The Scopus database and Web of Sciences were used to list the articles published in the field of systemic fluoride toxicity on January 9, 2024. Scopus is a database that is commonly used for bibliometric analyses and is highly respected in this type of research [11]. This is primarily because the Scopus database covers the entire Medline and includes more than 23,000 indexed journals from medical, dental, and other scientific disciplines. Thereby, it offers a wider coverage of journals compared with other databases such as WOS and Pubmed (11). A second reason is that the data transferred to Microsoft Excel with a few simple steps for bibliometric analysis and data visualization can be easily performed using VOSviewer [10].

This study aimed to identify and analyze the key features of the 100 most cited articles on systemic fluoride toxicity within the WOS and Scopus databases. The gathered information offers valuable insights into the landscape of systemic fluoride toxicity research. Moreover, mapping the most influential articles within the Scopus database serves as a valuable tool for researchers to discern trends and identify gaps in the existing literature on this subject. Citations serve as a measure of the importance of works and are often used to evaluate their impact on the scientific community [18]. Typically, a paper is considered a classic if it has been cited at least 400 times [19]. However, in smaller areas of research, a paper with more than 100 citations can also be considered a classic [20]. In this study, 9 articles exceeded the 100-citation limit in WOS-CC (Web of Science Citation Count), while 27 articles achieved this recognition in Scopus. In the field of bibliometrics, WOS-CC, designed with a focus on citation analysis, is widely regarded as one of the most prestigious databases for assessing scientific quality and impact [21]. Consequently, bibliometric analyses frequently prioritize WOS as the primary database [22,23]. Scopus, while a valuable resource, has the limitation of measuring citations over a relatively shorter period, starting in 1996. Furthermore, Google Scholar presents results organized solely by relevance or publication date and includes citations from various sources such as books and dissertations. This diverse inclusion can be viewed as a limitation, given that these sources may not undergo the same rigorous peer-review process as academic journals [21]. Utilizing a combination of databases can provide a more comprehensive literature review and more accurate citation analysis, thus enhancing the depth and quality of the research. This study is the first to examine fluoride toxicity by bibliometric analysis by comparing Scopus and WOS databases. A list of the 100 most cited articles published between 2013 and 2023 was obtained from the Scopus database. The WOS database provided a historical list showing which articles were cited on the topic of 'systemic fluoride toxicity' between 2013 and 2023. As stated in the hypothesis of this study, the most cited articles on the topic of 'systemic fluoride toxicity' were found to differ between Scopus and Web of Science (WOS) databases due to differences in search algorithms and indexing methods.

The most cited article, which received 207 citations and was published in the Public Health Reports in July-August 2015 by Barbara F. Gooch, was a review of published research on the community water systems which were fluoride added to their water supplies and and PHS (Public Health Service) recommended a fluoride concentration of 0.7 mg/L (parts per million [ppm]) to maintain caries prevention benefits and reduce the risk of dental fluorosis [12]. On WOS, as opposed to Scopus data, the most cited article was a review of dental fluorosis caused by chronic systemic fluoride toxicity, which received 218 citations in 2011 [15]. In the hierarchy of scientific evidence, systematic reviews rank the highest, while randomized control studies rank the second level [24]. In the light of this information, when the most cited articles in Scopus and WOS are examined, it was seen that the top articles were review articles. Previous bibliometric reviews investigating systemic fluoride toxicity were reviewed. A bibliometric analysis evaluated worldwide scientific production on the toxic effects of fluoride between 2011 and 2020. All metadata in the Scopus database were evaluated [25]. Another study described fluoride in the context of oral health, between the years 1997 and 2017 [26].

The findings from network analyzes were also remarkable. Regarding co-occurrence, as clearly seen in Figures 5, "fluoride exposure, groundwater, risk, effect, area, fluoride toxicity, fluoride concentration" were the most used keywords in original research articles regarding systemic fluoride toxicity. Other keywords that attracted attention were apoptosis, expression, oxidative stress, and skeletal fluorosis. The variety of these words is not surprising; These articles were written on systemic fluoride toxicity. The words oxidative stress and expression stood out as words that attract attention. The results of the article published in 2015 and received 177 citations according to the Scopus database; showed that fluoride-induced ROS production may play a protective role by activating SIRT1/autophagy. It has been stated that increasing ROS-mediated JNK signaling without associated mitochondria and DNA damage may offer a new strategy for treatments to prevent dental fluorosis and stands out as a remarkable study [27]. Molecular biology-based approaches are promising for other studies and further research is needed.

In this bibliometric analysis, an examination of the 100 most cited articles in the field of systemic fluoride toxicity revealed that India, China, and the USA emerge as the leading countries in conducting such studies, based on data from Scopus and WOS databases. Considering that fluorine ranks as the 13th most common element in the Earth's crust, with an approximate abundance of 0.3 g/kg, and fluorosis, resulting from excessive fluoride ingestion, is a prevalent global issue affecting numerous countries across Asia, Africa, Australia, and South America, it is logical that studies predominantly originated from these regions [28,29]. Given the extensive impact of fluorosis, especially evident in India over the past six decades, the need for further research seems evident. Water fluoridation (WF) is recognized by the Centers for Disease Control and Prevention (CDC) as one of the top ten public health achievements of the 20th century. However, A study conducted in the Dashtestan region of Bushehr Province, Iran, aimed to investigate the potential correlation between fluoride concentration in groundwater and the prevalence of dental caries in children aged 6–11 years. While fluoride levels in drinking water ranged from 0.99 to 2.50 mg/L, the results revealed no significant association between fluoride concentration and dental caries in the studied villages [37]. In Iran, where fluoride levels in water are known to be high, it is recommended that fluoride content in bottled drinking water be closely monitored to prevent adverse reactions to fluoride intake from water or tea consumption, due to increased awareness of the toxic effects of high fluoride intake, especially in children [38]. However, discussions about WF continue. In a bibliometric analysis published in 2023, data for the study were taken from the WOS from 1950 to 2020. A total of 1,008 articles were published. The United States published the largest number of articles (30). Our examination discerns that the United States stands among the foremost nations in the realm of extensively cited studies concerning fluoride's implications for oral health. This observation accords with analogous bibliometric investigations spanning diverse branches of both medicine and dentistry [31–34]. This is thought to reflect the United States' economic commitment and increasing commitment to research and development, facilitated by factors such as a competent workforce, government financial support, the presence of numerous research institutions, and active participation in exchanges between foreign students and research scholars [35].

Additionally, it was noted that the numerous clusters or groups comprising researchers, institutions, and nations contributing to or retrieving articles on systemic fluoride toxicity were markedly small, exhibiting minimal to absent collaboration among them. Various factors, such as language barriers and restricted funding, could account for the prevailing absence of extensive collaborations in systemic fluoride toxicity research [36]. Recent studies on fluoride toxicity have increasingly focused on environmental factors, genetic predispositions, and toxicological effects. This shift reflects the growing recognition that the health impacts of fluoride exposure are multifactorial and may vary based on individual susceptibility and environmental conditions. Consequently, there is a pressing need for more in-depth investigations into the mechanisms through which fluoride interacts with various biological systems, as well as studies that examine the long-term health consequences of chronic fluoride exposure in diverse populations. This study was limited to the period between 2013 and 2023 for several key reasons. Firstly, this decade has seen a significant increase in research focused on systemic fluoride toxicity, with notable advancements in both the quantity and quality of studies published. This period also corresponds with a rise in global debates surrounding the potential health impacts of fluoride, particularly in relation to its systemic toxicity. As concerns about the safety of fluoride exposure have grown, numerous studies have emerged, employing more sophisticated research methods and analytical techniques. Furthermore, more recent studies are better able to reflect the evolving understanding of the topic, informed by both scientific progress and public discourse. By focusing on this 10-year period, the study aims to provide a bibliometric analysis that captures the most relevant and up-to-date findings, while also reflecting the broader scientific and societal discussions surrounding fluoride toxicity. This study has several limitations. The bibliometric analysis was based solely on data from the Scopus and Web of Science (WOS) databases. Incorporating additional databases, such as SciFinder, PubMed, and Google Scholar, could have enabled the inclusion of a broader range of articles and provided further insights into the topic.

CONCLUSIONS

This study is the first to examine fluoride toxicity by bibliometric analysis by comparing Scopus and WOS databases. The current citation analysis sheds light on current publications on systemic fluoride toxicity and will assist researchers interested in this topic by saving significant effort and time in finding appropriate article referrals. İt is suggested to add bibliometric citation analysis has been extensively employed in fields of environmental sciences and medicine to assist researchers in gaining a comprehensive understanding of the subject and identifying specific areas of popular interest for further investigations. For future studies, it is suggested to evaluate highly cited fluoride toxicity articles indexed in other databases.

ACKNOWLEDGMENTS

This study was presented at the 30th International Congress of the Turkish Society of Pedodontics, held from October 17 to 20, 2024.

FUNDING

Not applicable

CONFLICT OF INTERESTS

None

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