

Global Research Trends in Beta-Blocker Poisoning: A Bibliometric Analysis of Scopus-Indexed Literature from 2020 to 2026

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DOI: <https://doi.org/10.51244/IJRSI.2026.1309000177>

Received: 27 September 2026; Accepted: 02 October 2026; Published: 16 October 2026

ABSTRACT

Background: Beta-blocker poisoning is an important clinical toxicological emergency that may cause severe cardiovascular and neurological complications. Despite advances in the management of beta-blocker toxicity, the recent scientific landscape of this field has not been sufficiently characterized using bibliometric methods.

Objective: This study aimed to evaluate publication trends and the distribution of authors, institutions, countries, document types, and research areas in the literature on beta-blocker poisoning between 2020 and 2026.

Methods: A bibliometric analysis was conducted using the Scopus database. Publications were retrieved using the search strategy title-abs-key (beta-blocker and poisonings) and pubyear > 2019 and pubyear < 2027. The retrieved literature was evaluated according to publication year, authors, institutional affiliations, countries/territories, document types, subject areas, and funding sponsors

Results: A total of 58 publications were identified. Annual scientific output fluctuated during the study period, with the highest number of publications recorded in 2022 (n=12), followed by 2025 (n=11). Scopus - Analyze search results Original articles constituted 69.0% of the literature, followed by reviews (13.8%) and book chapters (6.9%). Medicine was the predominant subject area (59.5%), followed by pharmacology/toxicology-related disciplines (17.6%). Scopus - Analyze search results J.B. Cole was the most productive author displayed in the Scopus analysis, while Minnesota Poison Control was the leading affiliation. Scopus - Analyze search results The United States showed the greatest country-level contribution, while the United Kingdom, Australia, France, Canada, China, Germany, Iran, Turkey, and Japan were also represented.

Conclusion: Research on beta-blocker poisoning between 2020 and 2026 demonstrated sustained but fluctuating scientific activity, with a predominance of original medical research and substantial contributions from the United States. The international distribution of publications indicates broad scientific interest in this clinically important toxicological condition. Future studies incorporating broader databases and network-based bibliometric techniques may provide further insight into collaboration patterns, influential research themes, and emerging areas of beta-blocker poisoning research.

Keywords: Beta-blocker poisoning; beta-blocker toxicity; drug overdose; clinical toxicology; bibliometric analysis; Scopus; poisoning.

INTRODUCTION

Beta-blocker poisoning, though relatively uncommon, poses significant clinical challenges due to its potential for severe morbidity and mortality. The incidence of beta-blocker poisoning is reported to be between 1% and 3% of all poisonings requiring intensive care, with propranolol being the most frequently implicated agent[1,2]. The demographic most affected includes women, often with a history of psychiatric disorders and previous suicide attempts[3]. In older adults, the risk is compounded by polypharmacy and

neurocognitive decline, which can exacerbate the hypotensive and bradycardic effects of beta-blockers[4]. Clinical manifestations of beta-blocker overdose typically include bradycardia, hypotension, and in severe cases, seizures and altered mental status[5,6]. Management strategies for beta-blocker toxicity are varied and often involve multiple interventions. High-dose insulin euglycemic therapy has shown promise in improving hemodynamic parameters and reducing mortality, although its efficacy compared to catecholamines and other inotropic agents remains under investigation[7,8]. Glucagon is considered a first-line antidote for symptomatic bradycardia and hypotension, while intravenous lipid emulsion therapy and veno-arterial extracorporeal membrane oxygenation are reserved for refractory cases[9,10]. The use of activated charcoal and gastric lavage is common in the initial management, although their effectiveness in isolation is difficult to ascertain due to concurrent treatments[11,12].

Despite ongoing research activity, the recent literature on beta-blocker poisoning has not been comprehensively characterized from a bibliometric perspective. Mapping this literature may provide a clearer understanding of how the field has evolved, which researchers and institutions have contributed most prominently, and which themes have attracted increasing scientific attention. Moreover, identifying collaboration patterns and research trends may facilitate the development of new partnerships and help investigators recognize areas requiring further clinical and experimental study.

Therefore, the present study aimed to conduct a comprehensive bibliometric analysis of Scopus-indexed publications on beta-blocker poisoning published between 2020 and 2026. Specifically, we sought to evaluate temporal publication trends, document characteristics, leading authors, institutions and countries, and the thematic structure of the literature. By mapping the recent scientific landscape of beta-blocker poisoning research, this study aims to identify major research patterns, knowledge gaps, and potential directions for future investigations.

MATERIALS AND METHODS

Study Design and Data Source

This study was designed as a descriptive bibliometric analysis to evaluate recent scientific literature on beta-blocker poisoning. Bibliographic data were obtained from the Scopus database (Elsevier), which provides comprehensive coverage of peer-reviewed literature across medicine, pharmacology, toxicology, and related disciplines. The analysis was restricted to publications indexed between 2020 and 2026. The supplied Scopus dataset contained 58 documents within this period. Scopus - Analyze search results

Search Strategy

A systematic search was performed in Scopus using terms related to beta-blockers and poisoning. The search strategy documented in the Scopus analysis was: title-abs-key (beta-blocker and poisonings) and pubyear > 2019 and pubyear < 2027. Thus, the search covered publications from January 2020 through 2026 in which the specified terms occurred in the title, abstract, or keywords. Scopus - Analyze search results

Eligibility Criteria

Publications retrieved through the predefined Scopus query were considered eligible for the bibliometric analysis. The dataset included different document types rather than being restricted to original research articles. Scopus classified the retrieved records as articles, reviews, book chapters, letters, notes, conference papers, and editorials. Scopus - Analyze search results No additional document-type restriction is evident from the supplied Scopus output.

Data Extraction

Bibliographic characteristics were obtained from the Scopus analysis interface. The variables available for evaluation included publication year, authors, institutional affiliations, countries or territories, document

types, subject areas, and funding sponsors. Annual publication output was recorded to assess changes in scientific productivity over time. Author-, institution-, and country-level data were evaluated to characterize the principal contributors to the literature. The Scopus output also provided information on the distribution of publications across subject areas and document types. Scopus - Analyze search results

Bibliometric Analysis

Descriptive bibliometric methods were used to characterize the retrieved literature. Annual scientific production was evaluated according to the number of documents published each year. Author productivity, institutional contribution, and country-level scientific output were examined using publication frequencies. Document types and subject areas were summarized as frequencies and percentages where available.

Statistical Analysis

Bibliometric findings were summarized using descriptive statistics. Categorical variables were expressed as frequencies and percentages, and temporal changes in publication output were evaluated descriptively according to publication year. Because the primary objective was to map and characterize the scientific literature rather than test a clinical hypothesis, inferential statistical analyses were not required.

RESULTS

A total of 58 Scopus-indexed documents related to beta-blocker poisoning were identified for the period from 2020 to 2026. The annual distribution demonstrated fluctuations in scientific productivity throughout the study period. Nine publications were recorded in 2020, followed by six in 2021 [Figure 1]. Publication output increased markedly in 2022, reaching 12 documents, the highest annual number during the analyzed period. Seven publications were identified in both 2023 and 2024, followed by a second increase to 11 publications in 2025. Six documents were indexed in 2026.

Analysis of document types showed that original articles constituted the majority of publications (69.0%), followed by reviews (13.8%) and book chapters (6.9%). Letters and notes each accounted for 3.4%, whereas conference papers and editorials each represented 1.7% of the literature. Regarding subject categories, medicine was the predominant research field (59.5%), followed by pharmacology/toxicology-related disciplines (17.6%) and environmental science (6.8%). Smaller proportions were distributed across biochemistry/genetics, chemistry, nursing, social sciences, engineering, immunology, and other disciplines [Figure 2].

The author analysis demonstrated that J.B. Cole had the highest publication output among the authors represented in the dataset. Other contributors included A.L. Chiew, K.Z. Isoardi, A.M. Arens, J. Archer, D. Cao, J.N. Corcoran, I.R. Drennan, R.S. Hoffman, and E.J. Lavonas. Institutional analysis showed that the Minnesota Poison Control organization had the greatest number of publications. Other contributing institutions included Prince of Wales Hospital, Guy's and St Thomas', King's College London, NYU Grossman School, Princess Alexandra Hospital, UNSW Sydney, the University of Minnesota, Université Laval, and East Carolina College [Figure 3].

Geographical analysis revealed an international distribution of research activity. The United States was the most frequently represented country, with approximately 16 publications according to the Scopus chart, followed by the United Kingdom and Australia. France, Canada, China, Germany, Iran, Turkey, and Japan also contributed to the literature, demonstrating participation from North America, Europe, Asia, and Oceania [Figure 4].

DISCUSSION

Beta-blockers, also known as β -blockers, are a class of medications that antagonize β -adrenergic receptors, which are part of the G protein-coupled receptor family, to inhibit the effects of catecholamines like

epinephrine and norepinephrine. This action reduces heart rate, myocardial contractility, and oxygen demand, making them effective in treating various cardiovascular conditions such as hypertension, angina, arrhythmias, and heart failure[13,14]. There are three generations of β -blockers: nonselective, cardioselective (β 1-selective), and those with additional vasodilatory properties, which may block α 1-receptors or activate β 3-receptors[15]. Cardioselectivity, particularly β 1-adrenoceptor selectivity, is crucial as it minimizes adverse effects like cold extremities and exacerbation of asthma, which are mediated by β 2-receptor blockade[16]. Despite their benefits, β -blockers can cause side effects such as bradycardia, fatigue, and central nervous system effects, especially in high-fat soluble variants like propranolol, which can cross the blood-brain barrier[17]. They are not recommended as first-line therapy for hypertension in the absence of specific indications, as newer guidelines suggest other classes like ACE inhibitors or calcium channel blockers may offer better outcomes[8]. However, they remain a cornerstone in managing heart failure, arrhythmias, and other cardiovascular diseases [18]. In pregnancy, labetalol is preferred for managing hypertension, though the safety profile of β -blockers in maternal and neonatal health requires further study[19].

The multidisciplinary characteristics of beta-blocker poisoning research were also evident. Medicine represented the largest subject category, accounting for 59.5% of publications, while pharmacology/toxicology-related disciplines constituted 17.6%. Environmental science and several other fields made smaller contributions. Scopus - Analyze search results This distribution is consistent with the clinical nature of beta-blocker toxicity while also demonstrating contributions from disciplines beyond clinical medicine [20].

Author and institutional analyses revealed a relatively concentrated group of active contributors. J.B. Cole was the most productive author in the analyzed dataset, while other recurrent contributors included A.L. Chiew, K.Z. Isoardi, A.M. Arens, J. Archer, D. Cao, J.N. Corcoran, I.R. Drennan, R.S. Hoffman, and E.J. Lavonas. The Minnesota Poison Control organization showed the highest publication output among the affiliations displayed in the Scopus analysis [21]. These findings highlight the contribution of specialized toxicology and poison-control centers to the development of the literature.

Geographically, the research field demonstrated international participation, although publication activity was unevenly distributed. The United States was the leading contributor in the Scopus country analysis, followed by countries including the United Kingdom and Australia. France, Canada, China, Germany, Iran, Turkey, and Japan were also represented.

The presence of researchers from several geographical regions indicates international interest in beta-blocker poisoning, although the distribution shown in the dataset suggests that research production is concentrated in a relatively small number of countries [22].

Beta-blocker poisoning, though not exceedingly common, poses significant risks due to its potential for severe morbidity and mortality. The clinical presentation of beta-blocker overdose can include hypotension, bradycardia, seizures, and altered mental status, with the severity often depending on the specific beta-blocker involved and the presence of co-ingestants[23,24]. Propranolol is frequently implicated in such poisonings, accounting for a significant proportion of cases, and is associated with more severe outcomes when combined with other beta-blockers[25].

Management strategies for beta-blocker toxicity are varied and often involve multiple interventions. High-dose insulin euglycemic therapy has shown promise in improving hemodynamics and reducing mortality, although its superiority over catecholamines and other inotropes remains uncertain[26]. Glucagon, while traditionally used, offers only minor hemodynamic improvements[27]. More invasive treatments, such as veno-arterial extracorporeal membrane oxygenation, are considered in severe cases unresponsive to conventional therapies[28].

Overall, the bibliometric findings characterize beta-blocker poisoning as a relatively focused but internationally investigated research area. The predominance of original articles and medical publications

indicates an active clinical research orientation. At the same time, the limited overall number of publications and fluctuations in annual output suggest opportunities for further research. Future bibliometric studies incorporating citation networks, keyword co-occurrence, co-authorship patterns, and thematic evolution could provide a more detailed understanding of the intellectual and collaborative structure of this research field; these analyses are not documented in the supplied Scopus output and therefore cannot be interpreted from the present dataset.

LIMITATIONS

Several limitations should be considered when interpreting these findings. First, the analysis was based exclusively on Scopus; consequently, relevant publications indexed only in Web of Science, PubMed, Google Scholar, or other databases may not have been captured. Second, the search strategy used the specific expression title-abs-key (beta-blocker and poisonings), which may have excluded relevant studies using alternative terminology for beta-blocker toxicity or overdose.

Scopus - Analyze search results Third, bibliometric indicators reflect publication activity and should not be interpreted as direct measures of scientific quality or clinical importance. Finally, the supplied dataset contains aggregate Scopus analyses rather than complete record-level citation and keyword-network data. Therefore, citation impact, co-citation networks, co-authorship networks, keyword co-occurrence, and thematic evolution could not be comprehensively assessed.

CONCLUSION

This bibliometric analysis identified 58 Scopus-indexed publications on beta-blocker poisoning between 2020 and 2026, with the greatest annual output occurring in 2022. Original articles and publications classified within medicine predominated, while the United States showed the greatest country-level contribution in the Scopus analysis.

The findings demonstrate sustained international scientific interest in beta-blocker poisoning but also show a relatively limited and fluctuating publication volume. Broader database coverage and network-based bibliometric analyses may further clarify research collaborations, influential themes, and emerging directions in beta-blocker poisoning research.

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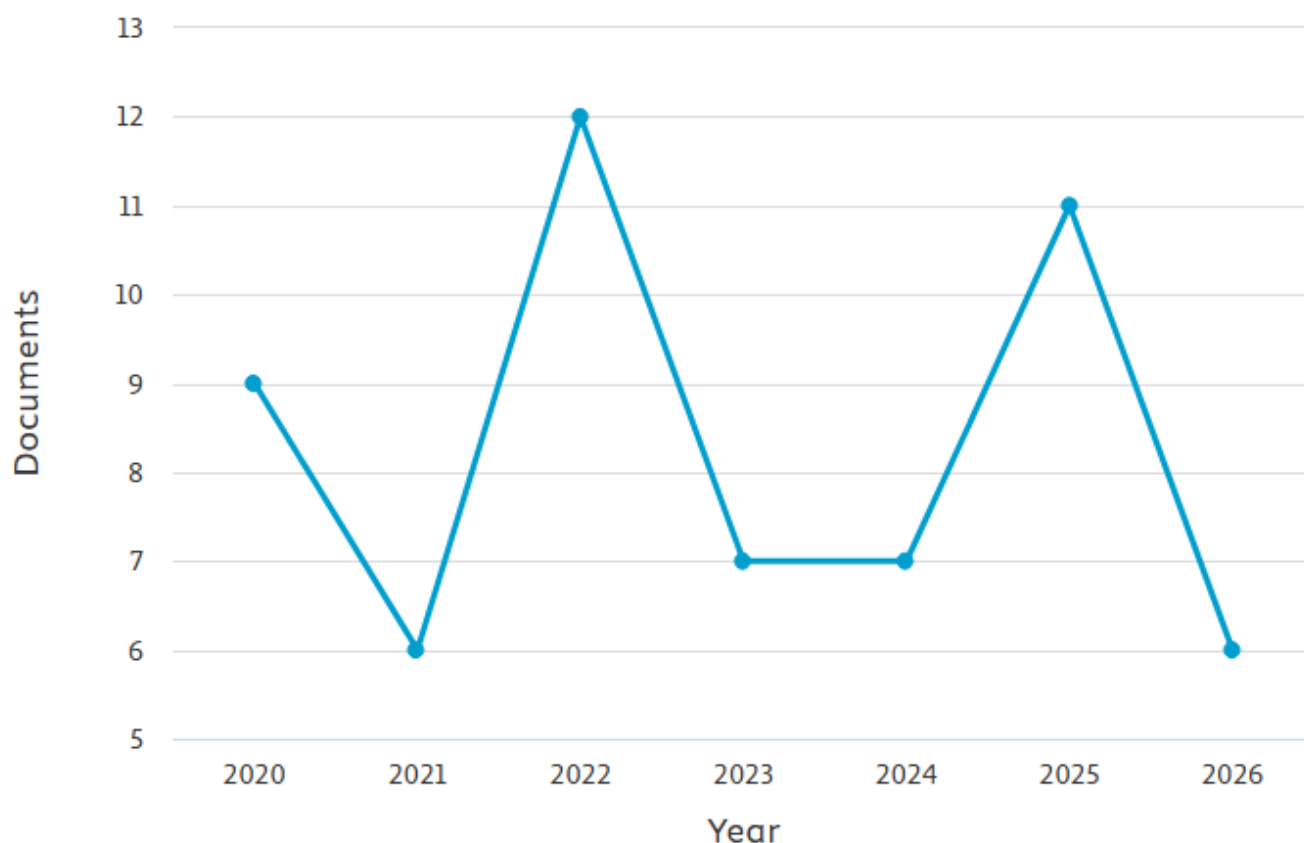


Figure 1. documents by the years

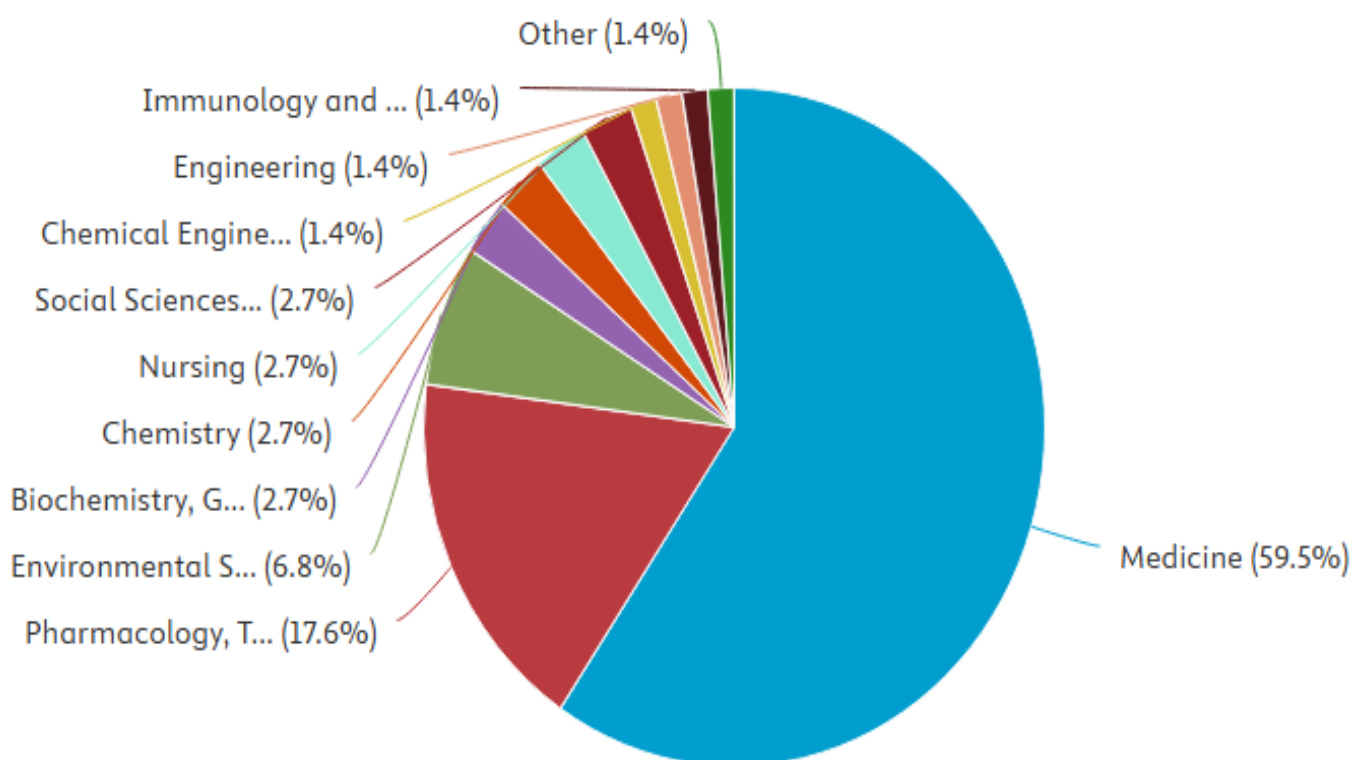


Figure 2. Document by the subject area

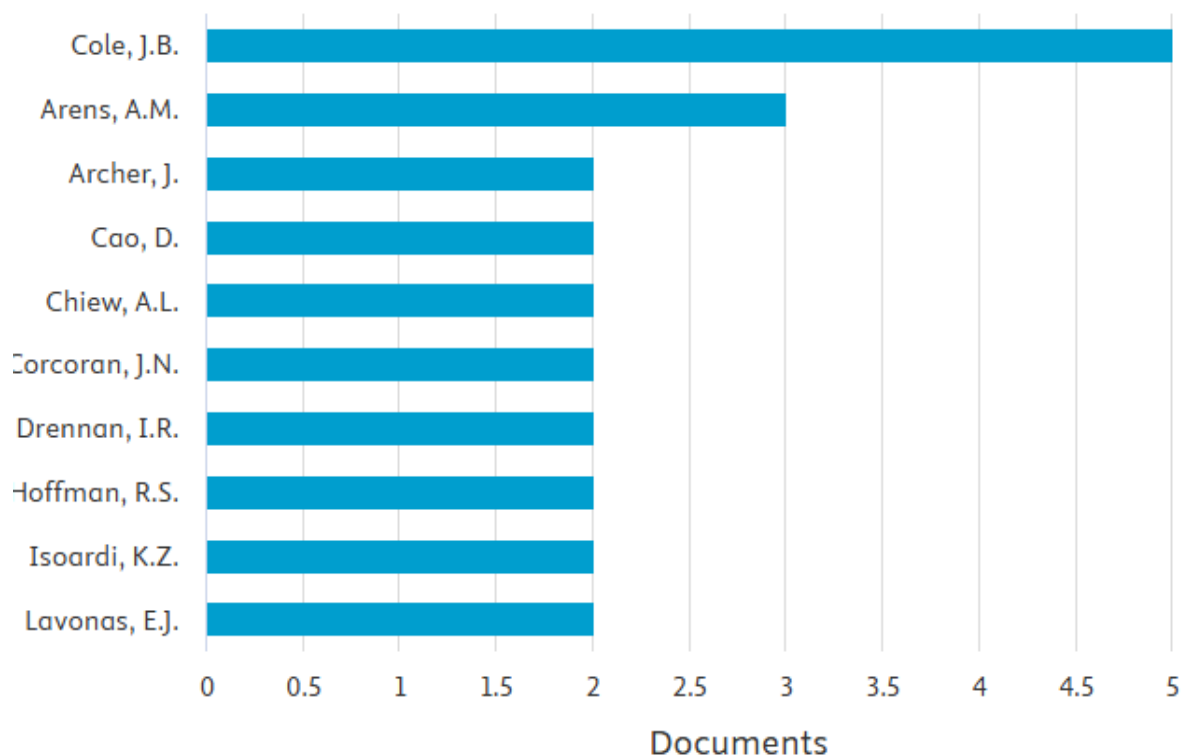


Figure 3. Documents by the authors

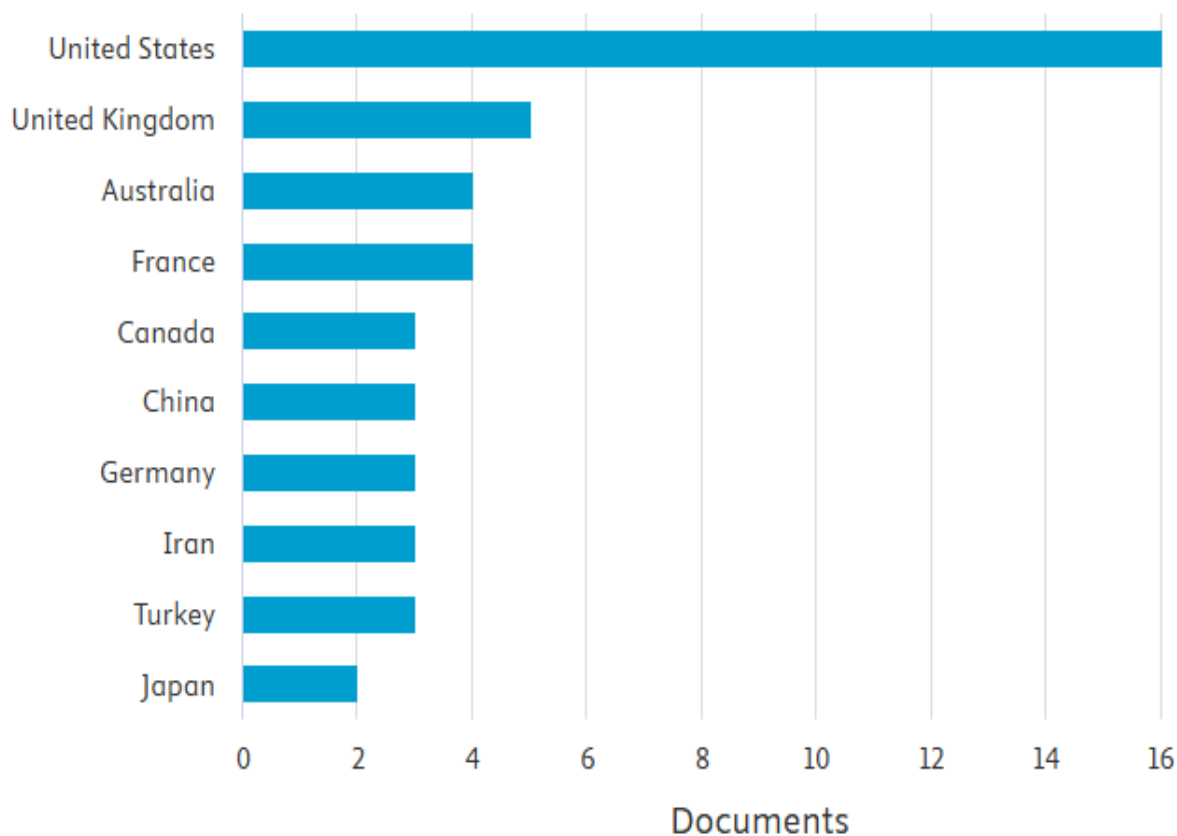


Figure 4. Documents by the country