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Original article

BIBLIOMETRIC ANALYSIS OF THEMES AND TRENDS IN ORGANOPHOSPHORUS POISONING RESEARCH WITH TEXT MINING.

Dr. Avinash J. Pujari[a,*], Bidhan Dolai[b]

[a] *Department of Forensic Medicine and Toxicology, MAEER MIT Pune's MIMER Medical College, Talegaon (D), Pune 410507, India.*
[b] *Central Library, MAEER MIT Pune's MIMER Medical College, Talegaon (D), Pune 410507, India.*

Abstract

Background:

Organophosphorus poisoning is a global health concern.This study uses an integrated strategy to assess the research landscape, combining quantitative analysis of publishing trends with automated extraction of information from text data.

Methodology:

R-based biblioshiny is used for integrated text mining and bibliometrics on organophosphorus poisoning research. Search query is filtered from language, publication type, and date to ensure relevant and recent articles. RStudio and biblioshiny package is used for data retrieval and analysis.

This research article thematic direction analyses associations between acetylcholinesterase and animals, insects, zebrafish, and humans in forensic medicine and toxicology covering the period from 2013 to 2022.

Results:

The data provided presents trends in organophosphorus poisoning research topics, including frequency, temporal distribution, and prominence. Notable trends include early focus on pralidoxime, atropine, and suicide attempts in 2014-2015, shifting towards pesticides, organophosphate poisoning, humans, and compounds in later years. Different age groups and retrospective studies are widely explored in research.

conclusion:

The integrated strategy of text mining and bibliometrics employed in this study has provided a wealth of valuable insights into the research landscape of organophosphorus poisoning.

Keywords: Bibliometrics, Text mining, Organophosphorus Poisoning, Theme analysis, Topic Trends,
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1. Introduction:

Organophosphorus poisoning, which is brought on by exposure to pesticides, industrial chemicals, and chemical warfare agents, is a serious concern for worldwide public health [18]. Knowing the current state of research on organophosphorus poisoning is essential for spotting knowledge gaps, new trends, and prospective intervention areas. Text mining and bibliometrics have become effective methods in recent years for analysing massive amounts of literature, extracting insightful knowledge, and providing a thorough grasp of study

* Corresponding author.
Email address: dravipujari@gmail.com (Dr. Avinash J. Pujari)

patterns and trends [8].

In this study, offer a text mining and bibliometrics-based integrated strategy to assessing the research landscape on organophosphorus poisoning [12]. While bibliometrics is the quantitative examination of publishing trends, citation networks, and other bibliographic data, text mining is the automated extraction of information from unstructured text data [5]. Combining these two methods will help us grasp the research environment on organophosphorus poisoning in a more comprehensive and data-driven way[17].

2. Materials and Methods:

The methodology for using R-based biblioshiny for an integrated approach towards understanding the research landscape on organophosphorus poisoning with text mining and bibliometrics typically involves using the R programming environment, specifically RStudio, along with relevant packages in R. RStudio is an integrated development environment (IDE) for R, providing a user-friendly interface for coding, data analysis, and visualization.The latest stable version of RStudio 1.4.1564 and biblioshiny package is used to retrieve data.

The search query includes "organophosphorus poisoning" in the title/abstract, specifies "english" as the language, filters for "journal article" as the publication type, and restricts the publication date to January 2013 to December 2023. This ensures that the retrieved articles are recent, written in English, published in scholarly journals, and directly related to the topic of organophosphorus poisoning, allowing for a comprehensive analysis of the current research landscape in this field.

"organophosphorus poisoning"[Title/Abstract] AND "english"[Language] AND "journal article"[Publication Type] AND 2013/01/01:2022/12/31[Date - Publication]

3. Data analysis and interpretation:

The literature review was conducted using data spanning from 2013 to 2022, comprising 131 documents collected from 96 sources, including journals, books, and other publications . The annual growth rate was found to be 1.18%, indicating a steady increase in publications related to organophosphorus poisoning over time. The average age of the documents was 5.28 years, suggesting a recent research landscape.

In the research article, an in-depth analysis of the table reveals interesting patterns and associations between acetylcholinesterase, animals, insects, zebrafish, and humans over different time periods from 2013 to 2022 and times divided into two clusters that are 2013-2018 and 2019 to 2022(Nabipour Afrouzi et al.). The WIIInclusion Index (II) are used as measures of relevance, while occurrences and stability index (SI) are used as measures of occurrence and stability of the associations, respectively. The association between acetylcholinesterase and animals shows a moderate WII of 0.46, indicating moderate relevance, and an II of 0.06, indicating low occurrence. The keywords associated with acetylcholinesterase in relation to animals include cholinesterase reactivators, cholinesterase inhibitors, oximes, butyrylcholinesterase, organophosphorus compounds, and nerve agents(Rodríguez-Gracia et al.). This suggests that acetylcholinesterase is commonly studied in the context of animal models and their response to these compounds. The association between acetylcholinesterase and insects, specifically organophosphates, shows a lower WII of 0.17, indicating lower relevance, but a higher II of 0.14, indicating higher occurrence(Hou et al.). This suggests that acetylcholinesterase is relatively less studied in relation to insects compared to animals, but when studied, the focus is mainly on the effects of organophosphates. Animals, particularly mice and zebrafish, show varying levels of relevance and stability in their associations. The association between animals and humans has a moderate WII of 0.42, indicating moderate relevance, and an II of 0.09, indicating moderate occurrence. The association between animals and zebrafish, however, has a high WII of 1.00, indicating high relevance and a high II of 1.00, indicating a high occurrence(Nunes Lopes et al.). This suggests that zebrafish, as a model

Table 1: **Thematic Evolutions**

From	**To**	**Words**	Weighted Inclusion Index	Inclusion Index	Occurrence	Sstability Index
acetylcholinesterase–2013-2018	animals–2019-2022	Acetyl cholinesterase; cholinesterase reactivators; cholinesterase inhibitors; oximes; butyryl cholinesterase; organophosphorus compounds; nerve agents	0.46	0.06	11	0.03
acetylcholinesterase–2013-2018	insecticides–2019-2022	organophosphates	0.17	0.14	4	0.04
animals–2013-2018	animals–2019-2022	animals; mice	0.42	0.09	14	0.04
animals–2013-2018	zebrafish–2019-2022	zebrafish	1.00	1.00	3	0.09
humans–2013-2018	animals–2019-2022	antidotes; c pralidoxime compounds	0.07	0.06	12	0.02
humans–2013-2018	humans–2019-2022	humans; organophosphate poisoning; male; adult; female; young adult; adolescent; middle aged; suicide, attempted; acute disease; poisoning; retrospective studies; aged; cholinesterases; emergency service, hospital	0.83	0.05	37	0.02
humans–2013-2018	insecticides–2019-2022	atropine; insecticides; prognosis; prospective studies	0.39	0.14	9	0.02
humans–2013-2018	pesticides–2019-2022	pesticides	1.00	1.00	8	0.03

organism, is commonly used in research related to animals. In contrast, humans show lower relevance and occurrence in their associations with animals(Durrani et al.; Chen et al.). The association between humans and animals has a low WII of 0.07, indicating low relevance, and a low II of 0.06, indicating low occurrence. This suggests that the relevance of animals in the context of human studies is relatively low, with limited occurrences in the literature. The association between humans and humans has a high WII of 0.83, indicating high relevance, but a low II of 0.05, indicating low occurrence. The keywords associated with humans include organophosphate poisoning, male, adult, female, young adult, adolescent, middle aged, suicide attempted, acute disease, poisoning, retrospective studies, aged, cholinesterases, and emergency service, hospital. This suggests that while the relevance of humans in human studies is high, the occurrences of these

associations are relatively low(Kirubalingam et al.)

The analysis provides information on the relevance and occurrence of associations between acetylcholinesterase and different entities, such as animals, insects, zebrafish, and humans. This can help researchers in forensic medicine and toxicology identifies relevant associations that are commonly studied in the literature, and focus their research efforts accordingly. For example, the findings may highlight the importance of animal models, particularly mice and zebrafish, in studying the effects of acetylcholinesterase and related compounds, and guide researchers in designing experiments or studies using these models.

The analysis can provide insights into the research trends and priorities in the field of forensic medicine and toxicology related to acetylcholinesterase. The differences in relevance, occurrence, and stability of associations across different entities can highlight areas of higher or lower research interest, and help researchers understand the evolving dynamics of these associations over time. This can guide researchers in identifying emerging research areas, identifying gaps in knowledge, and designing studies that align with current research trends.researchers in forensic medicine and toxicology to explore and contribute to areas that are less well-represented in the literature, and generate new knowledge or insights in these areas. The analysis may reveal limited research on the association between humans and animals or insects, indicating potential gaps in understanding the relevance and occurrence of these associations in forensic medicine and toxicology studies.

The findings from the analysis, such as the keywords associated with different associations, can provide researchers with valuable information for designing studies, selecting appropriate methodologies, and interpreting study results. The keywords associated with humans, such as organophosphate poisoning, age-specific groups, and emergency services, hospital, can guide researchers in designing studies related to clinical aspects, demographics, and poisoning incidents in the context of acetylcholinesterase.

The findings from the analysis may raise new research questions or hypotheses for further investigation in the field of forensic medicine and toxicology. The differences in relevance, occurrence, and stability of associations between different entities may prompt researchers to investigate the underlying factors influencing these associations, such as environmental factors, genetic factors, or methodological variations, and their implications in Forensic Medicine and Toxicology studies.

3.1. ***Time slice 1 (2013-2018)***

The details provided pertain to the first cluster, which is framed by the years 2013 to 2018, and focuses on clustering and centrality measures for various keywords or terms. The "Cluster" column represents the keyword or term that is being analyzed. The "CallonCentrality" and "CallonDensity" columns represent centrality and density measures according to Callon's algorithm, respectively. The "RankCentrality" and "RankDensity" columns represent the ranking of the centrality and density measures, respectively. The "ClusterFrequency" column represents the frequency or occurrence of the keyword or term in the analyzed dataset."Animals" has a CallonCentrality of 2.951002371, CallonDensity of 93.14574315, RankCentrality of 2, RankDensity of 3, and a ClusterFrequency of 38."Acetylcholinesterase" has a CallonCentrality of 5.965277778, CallonDensity of 83.94171782, RankCentrality of 4, RankDensity of 2, and a ClusterFrequency of 72."Humans" has a CallonCentrality of 4.312409293, CallonDensity of 124.9505961, RankCentrality of 3, RankDensity of 4, and a ClusterFrequency of 244."Paraoxon" has a CallonCentrality of 0, CallonDensity of 50, RankCentrality of 1, RankDensity of 1, and a ClusterFrequency of 2.

The research findings based on the details provided is the enhanced understanding of the research landscape related to organophosphorus poisoning. The clustering and centrality measures, such as Callon Centrality, Callon Density, Rank Centrality, Rank Density, and Cluster Frequency, can help researchers identify key con-

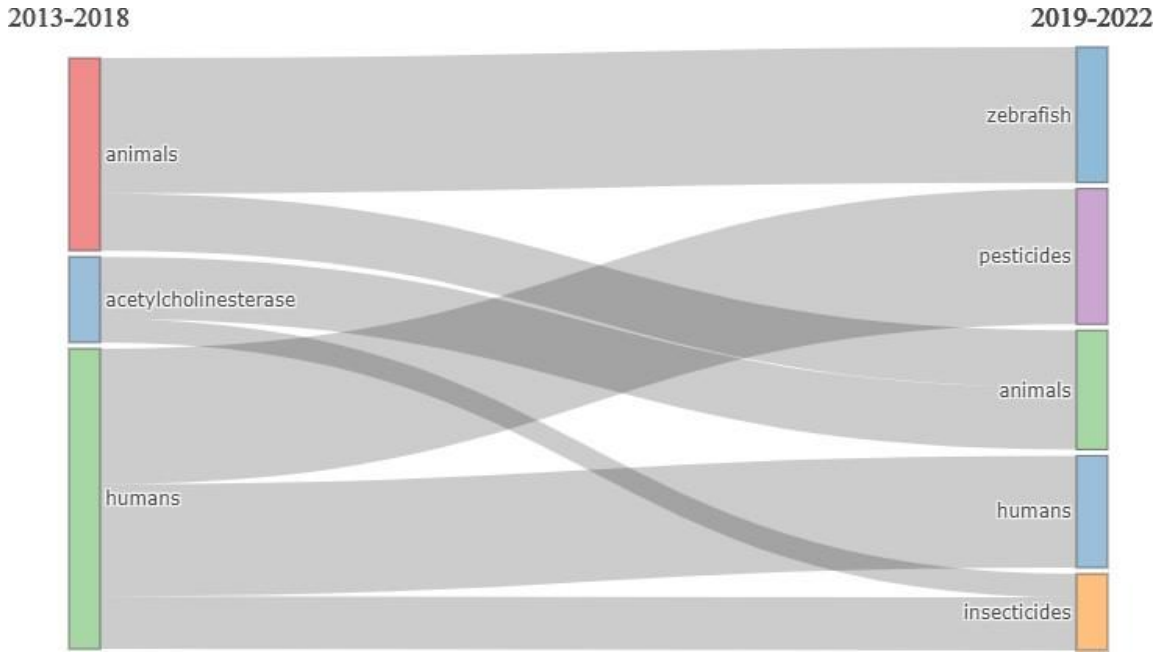

Figure 1: **Thematic Evolutions of 2013-2022**

cepts, relationships, and patterns within the research literature.

3.2. ***Time slice 2 (2019-2022)***

The details provided pertain to the first cluster, which is framed by the years 2019 to 2022, and focuses on clustering and centrality measures for various keywords.The details provided are related to the clustering analysis of different terms or keywords. The cluster includes keywords such as chickens, humans, animals, pesticides, insecticides, protein binding, and zebrafish. The details include measures such as Callon Centrality, Callon Density, Rank Centrality, Rank Density, and Cluster Frequency for each of these keywords. For example, humans have a Callon Centrality of 4.605273035, Callon Density of 95.95328495, Rank Centrality of 7, Rank Density of 6, and Cluster Frequency of 161, indicating their significance in the cluster analysis. Other keywords like chickens, animals, insecticides, protein binding, and zebrafish also have their respective measures in the cluster.

The topic trends presented in the provided data highlight the frequency and temporal distribution of various topics related to organophosphorus poisoning. The data shows the number of occurrences of each topic (freq) and provides information on the years when each topic was most prominent (year_q1), the median year of prominence (year_med), and the year when the topic was least prominent (year_q3).

Some notable trends in the data include the relatively high frequency of topics such as pralidoxime compounds, atropine, and suicide attempts in the early years (2014-2015), indicating a significant research focus on these areas during that time. Over the years, there has been a shift towards topics such as pesticides, organophosphate poisoning, humans, and organophospho-

Table 2: **Clustering**

Cluster	CallonCentrality	CallonDensity	RankCentrality	RankDensity	Cluster Frequency
animals	2.951002371	93.14574315	2	3	38
acetylcholinesterase	5.965277778	83.94171782	4	2	72
humans	4.312409293	124.9505961	3	4	244
paraoxon	0	50	1	1	2

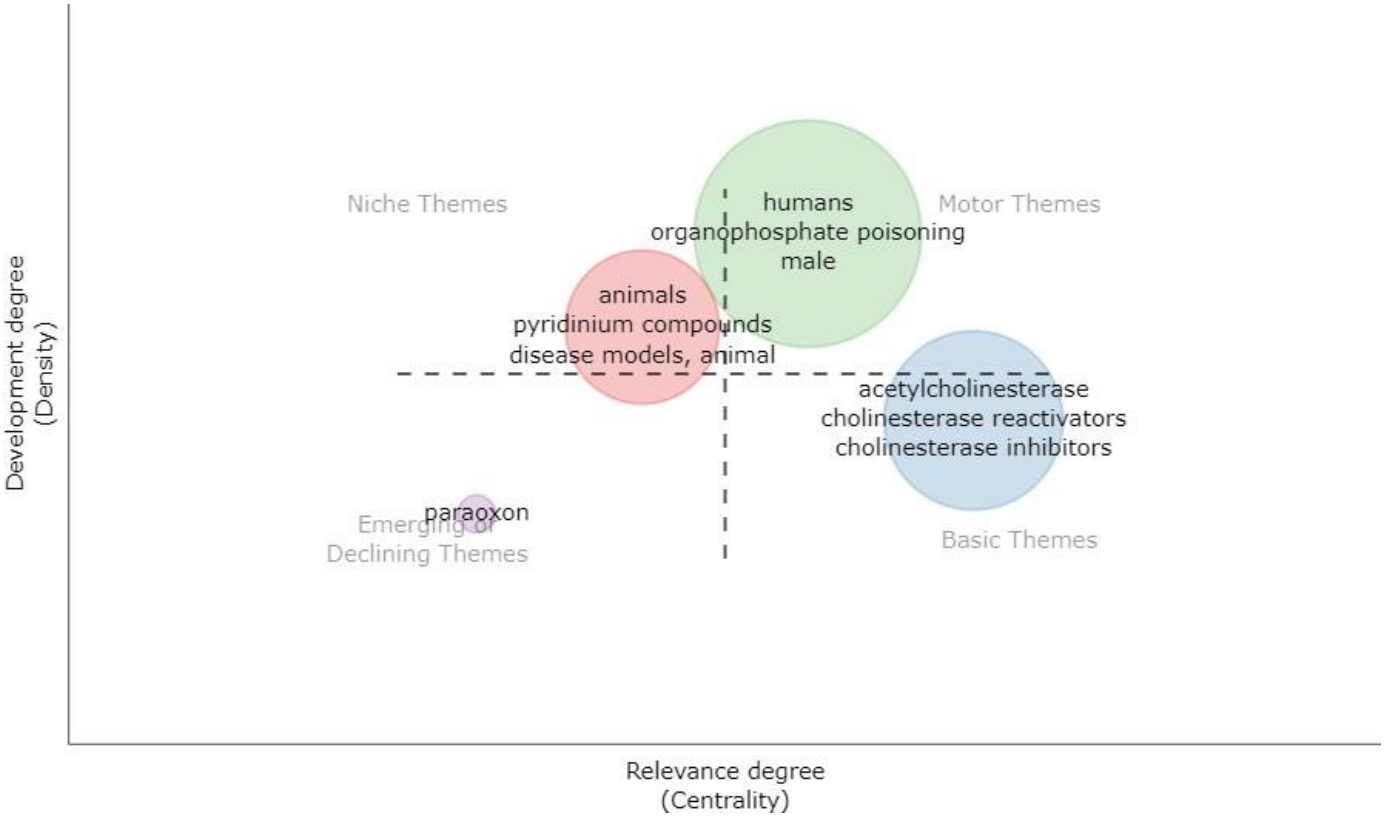

Figure 2: **Time slice 1 (2013-2018)**

Table 3: **Clustering**

Cluster	CallonCentrality	CallonDensity	RankCentrality	RankDensity	ClusterFrequency
chickens	0.333333333	58.33333333	4	5	5
humans	4.605273035	95.95328495	7	6	161
animals	3.048712798	98.77399324	6	7	82
pesticides	0	33.33333333	2	1	3
insecticides	2.234444444	57.14285714	5	4	23
protein binding	0	50	2	2.5	2
zebrafish	0	50	2	2.5	2

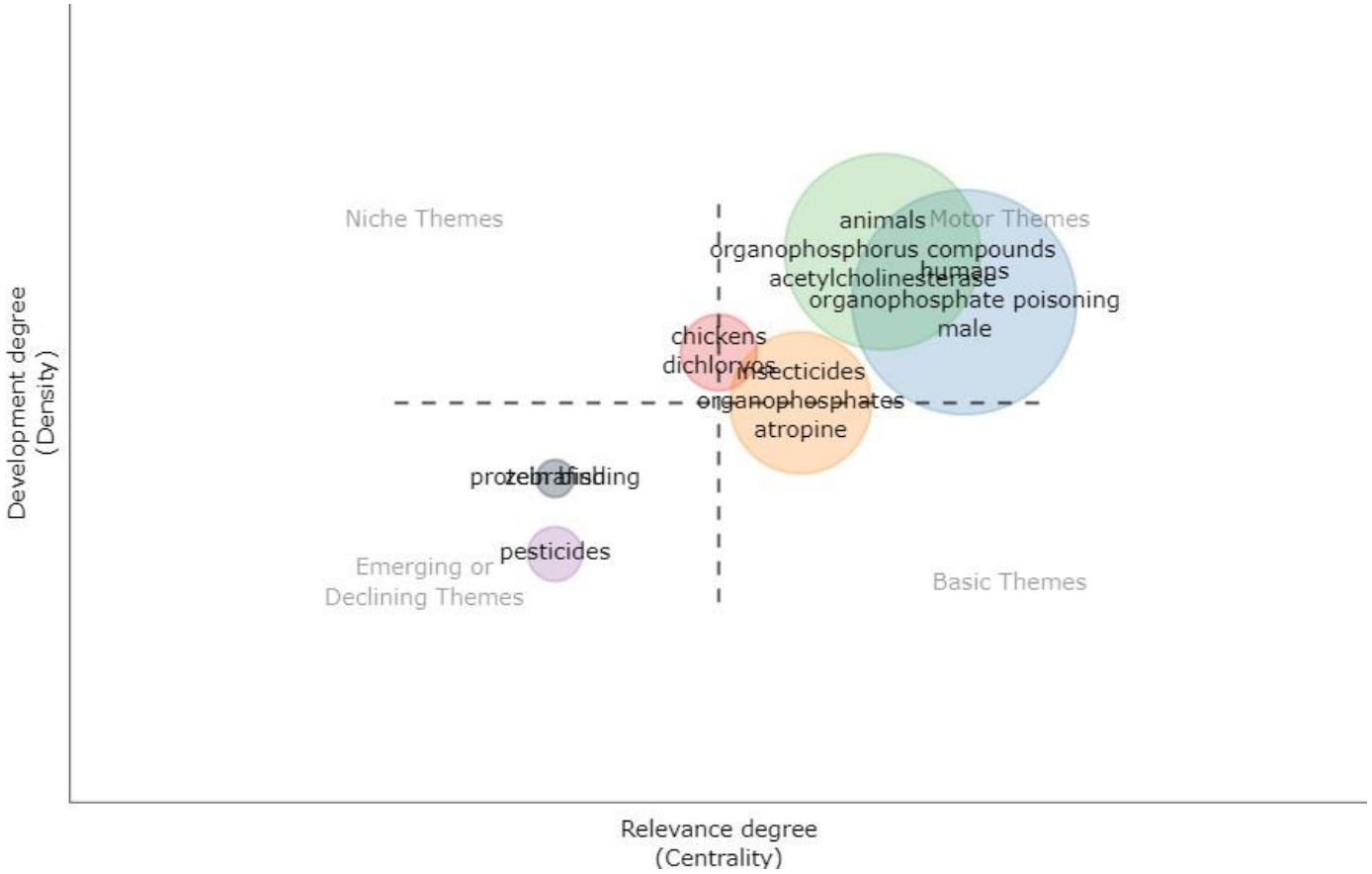

Figure 3: **Time slice 2 (2019-2022)**frameworks. The cluster analysis can help researchers identify potential research directions or areas that have been relatively underexplored or overlooked. This can guide researchers in identifying research gaps and opportunities for further investigation or innovation in the field of study.

rus compounds, with these topics becoming more prominent in the research landscape in the later years (2018-2020).

Additionally, the data suggests that studies involving different age groups, such as adolescents, adults, males, females, and young adults, have been widely explored in the research on organophosphorus poisoning. Retrospective studies, as indicated by the topic "retrospective studies," have also been a notable focus of research in this field.

4. Limitations:

This study has a number of drawbacks. First off, the analysis could not be sufficiently thorough since the data are drawn just from the PubMed database. Second, because we only looked at English-language literature, the analysis is in some ways incomplete. Only 118 articles that were written in English language were taken place (Han et al.; Xiao). Additionally, even while professional bibliometric analysis tool of biblioshiny provides objective analysis, different researchers may have various viewpoints on the same content, making bias inevitable (Peter et al.).

5. Conclusion:

In conclusion, the integrated strategy of text mining and bibliometrics employed in this study has provided a wealth of valuable insights into the research landscape of organophosphorus poisoning. By analysing a large volume of literature, this study has identified notable trends, relevance, and occurrence of associations in the field, which can guide future research endeavours.priorities and emerging research areas in the field, and under-

Table 4: **Topics Trends:**

Topic	freq	year_q1	year_med	year_q3
pralidoxime compounds	8	2014	2014	2018
atropine	12	2014	2015	2017
suicide, attempted	7	2014	2015	2018
length of stay	5	2014	2015	2017
antidotes	16	2014	2016	2018
adolescent	10	2014	2016	2020
chlorpyrifos	5	2015	2016	2017
adult	28	2015	2017	2020
pesticides	11	2014	2017	2018
pyridinium compounds	5	2015	2017	2018
humans	70	2015	2018	2020
organophosphate poisoning	61	2015	2018	2020
male	35	2015	2018	2020
animals	30	2016	2019	2020
female	29	2015	2019	2020
young adult	16	2016	2019	2020
organophosphorus compounds	13	2018	2020	2021
organophosphates	9	2017	2020	2021
retrospective studies	9	2017	2020	2021

scores the need for researchers to stay updated with the evolving landscape of organophosphorus poisoning research.

Additionally, the prominence of retrospective studies in the research landscape of organophosphorus poisoning is emphasized, indicating the significance of historical data and studies in shaping the current understanding of the field. This underscores the importance of considering past research and contextual factors in interpreting and utilizing the findings of organophosphorus poisoning studies.

Overall, this research contributes to a comprehensive and data-driven understanding of organophosphorus poisoning, providing valuable insights into research trends, knowledge gaps, and prospective intervention areas.

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7. Ethical Clearance:

NA.

8. Conflict of Interest:

NA.

9. Funding:

NA

10. Author and contributor –ship declaration:

NA.

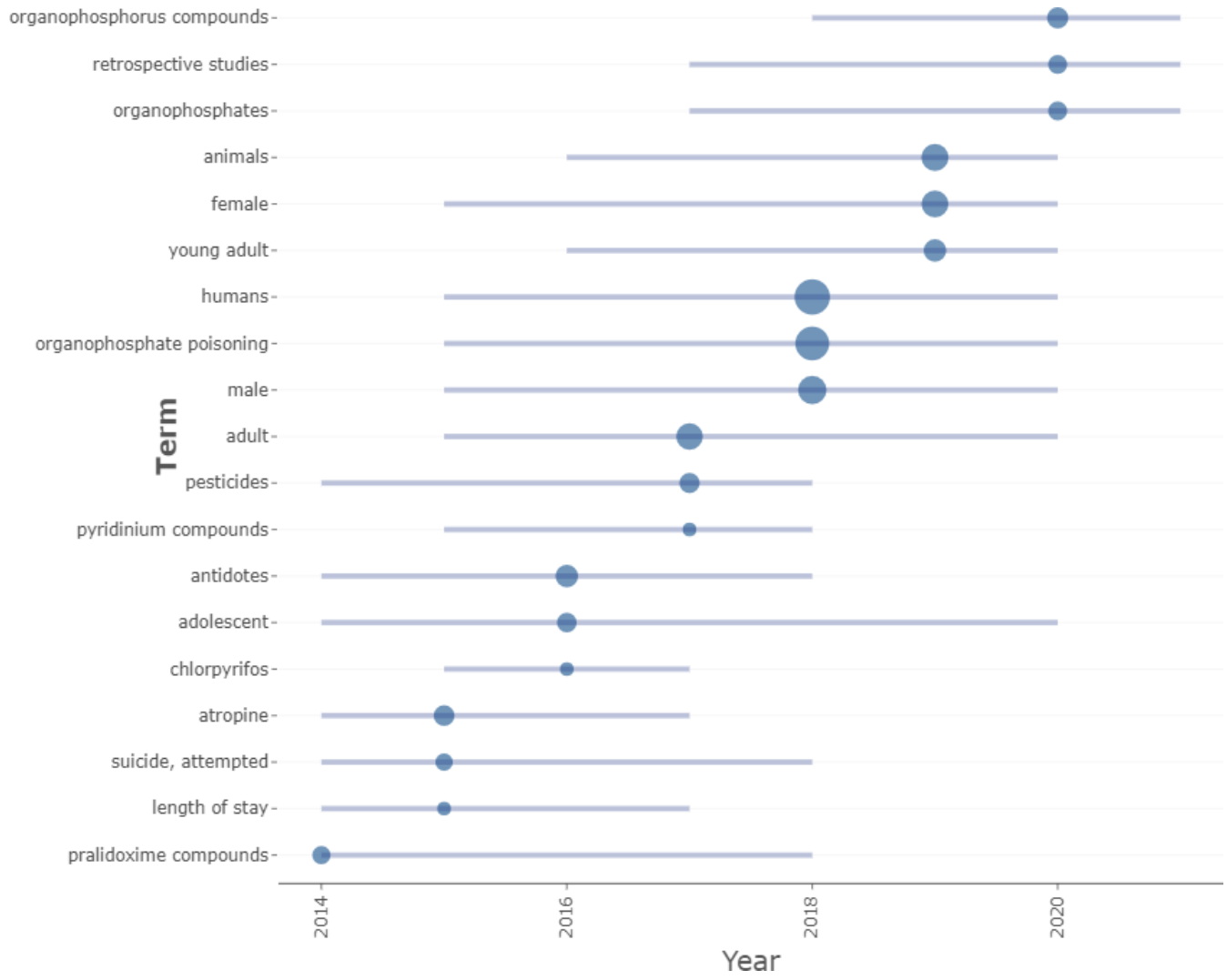

Figure 4: **Topics Trends**

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Author biography

Dr. Avinash J. Pujari MD (Forensic Medicine and Toxicology), Associate Professor, Department of Forensic Medicine and Toxicology, MAEER MIT Pune's MIMER Medical College, Talegaon (D), Pune 410507, India.

Bidhan Dolai M.Phil. (Library and information Science), Assistant Librarian, Central Library, MAEER MIT Pune's MIMER Medical College, Talegaon (D), Pune 410507, India.