

Global a Decade of Dengue Fever and *Aedes* Mosquitoes Research Analysis on Trends and Hotspots in Dengue Transmission Risk

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ABSTRACT

A comprehensive review was conducted of international studies on dengue fever and its transmission vector, *Aedes* mosquitoes, spanning the past decade. Through the analysis of research trends and the visualization of key content, this review facilitated a swift comprehension of the research landscape in this field for future researchers. Articles published from 2014 to 2023 in the Web of Science Core Collection, pertaining to dengue fever and *Aedes* mosquitoes, were aggregated for analysis. VOSviewer software was employed to construct visualization network maps, depicting keyword co-occurrence, country collaboration, institution collaboration and the source journal within these two research domains; then, used Citespace 6.4.R1 software and R packages to summarize bursts of keyword citations and the h-index of journals. Furthermore, Prism software was utilized to generate bar charts illustrating the number of articles published annually in each field over the decade. Following a thorough literature retrieval and screening process, a total of 17,009 articles were identified in the “dengue fever” research area, with 2,010 keywords, 110 countries, 957 institutions and 272 journals meeting the inclusion criteria. Similarly, in the “*Aedes* mosquitoes” research area, 12,518 articles were found, with 1,745 keywords, 107 countries, 685 institutions and 192 journals qualifying for the study. Notably, both “dengue”, “*Aedes Aegypti*” and “*Aedes Albopictus*” ranked among the top ten most frequent keywords in their respective fields, the top three countries in terms of the number of published articles in the two fields were exactly the same, four research institutions featured prominently in the top ten for the number of articles published in each field and a considerable number of journals have a high overlap in focus between the two fields. Additionally, Avg. citations and h-index were not proportional to the number of articles. Dengue fever has attracted considerable international attention, and the research interest in its transmission vector, *Aedes* mosquitoes, follows a similar trend, highlighting the pivotal role of *Aedes* mosquitoes in the transmission of dengue fever.

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Between 2014 and 2023, the research progress of the two fields influenced each other, and their research progress was also caused by a combination of various factors. Exploring the hidden mysteries within can help relevant researchers better understand the dynamics of the field and filter useful information.

Keywords: Dengue fever; *Aedes* mosquitoes; Research trends; Visualization network maps; International contributions

INTRODUCTION

Dengue fever, a mosquito-borne disease transmitted by the Dengue Virus (DENV) through the *Aedes* mosquitoes vector, demonstrated rapid spread, high incidence rates, and widespread vulnerability, particularly impacting Southeast Asia, the Western Pacific, and the Americas (Georgiades, Proestos, Lelieveld, & Erguler, 2023). The occurrence of outbreaks was intrinsically linked to factors such as population expansion, deficient public health infrastructures, and inadequate mosquito control strategies (Silva, Santos, & Martins, 2020; Rajapakse, Wattedgama, Weeratunga Sigera, & Fernando, 2018). Presently, dengue stands as one of the most widespread mosquito-borne infectious diseases worldwide. Over the past half-century, there has been a dramatic 30-fold increase in global infection cases (Dieng et al, 2022), posing a grave threat to public health and incurring substantial economic losses, thus garnering extensive attention and concern from the international community. The transmission mechanism of DENV entailed *Aedes* mosquitoes ingesting blood from infected individuals, facilitating the virus's entry into their midgut where it proliferated. The virus crossed the midgut barrier to invade the salivary glands, ultimately being transmitted to new hosts via saliva during subsequent blood meals (Bifani, Siriphanitchakorn, & Choy, 2022). The global ubiquity of dengue fever was not solely dependent on the efficient transmission and reproduction of *Aedes* mosquitoes but also exhibited a notable correlation with factors like ecological environmental shifts and population movement (Aliaga-Samanez et al, 2021).

Aedes mosquitoes, recognized as a highly invasive mosquito species, exhibited adaptability to a range of climatic conditions, earning it a place among the most dangerous invasive mosquito species globally (Lühken, Brattig, & Becker, 2023; Mordecai et al, 2019). Warm and humid environments were particularly conducive to the growth and reproduction of *Aedes* mosquitoes (Liu et al, 2023; Laporta et al, 2023; Iwamura, Guzman-Holst, & Murray, 2020). Within an optimal temperature range, as temperatures rose, the growth cycle of *Aedes* mosquitoes shortened, and their reproduction rates accelerated (Couper et al, 2021; Lahondère, & Bonizzoni, 2022), creating favorable conditions for the dissemination of dengue fever. As the global outbreak of dengue fever continued to expand, the disease and its transmission vector, *Aedes* mosquitoes, garnered increasing attention from various sectors of society, stimulating researchers from diverse countries to actively pursue related studies. This paper sought to comprehensively analyze the research literature on dengue fever and *Aedes* mosquitoes published between 2014 and 2023. Through the visualization of literature keywords and sources, network maps of keyword co-occurrence, country collaboration, and institution collaboration were constructed, offering a visual depiction of the research dynamics and cooperation trends concerning this tropical disease, dengue fever and its transmission vector, *Aedes* mosquitoes, on a global scale over the past decade.

MATERIALS AND METHODS

Literature Inclusion and Exclusion

The Web of Science Core Collection (WoS Core Collection) database was utilized as the primary resource for conducting literature retrieval. For the field pertaining to dengue fever, a search strategy incorporating the keywords “Dengue” or “Dengue virus” was implemented to facilitate the literature search process. Simultaneously, to explore research concerning *Aedes* mosquitoes, the keyword “*Aedes*” was employed for retrieval purposes.

Specific inclusion criteria were established: the publications considered were limited to those published within the timeframe of 2014 to 2023, thereby encompassing research outcomes from the preceding decade. The document type selected was “Article,” ensuring that all literature included was in the English language. Articles were chosen on the basis of their close alignment with particular themes, encompassing a wide range of research content related to symptoms, diagnosis, treatment, prevalence, and prevention and control of the subject matter.

Exclusion criteria were also defined: all non-scholarly literature was excluded from consideration. In instances where multiple publications of the same study were identified, only one was retained for inclusion. Following the screening process, the eligible literature was exported in “Plain Text File” format, with the “Full Record and Cited References” content recorded, thus providing a comprehensive and accurate foundation of literature for subsequent in-depth analysis.

Literature Data Processing and Analysis

The VOSviewer software (Bukar et al, 2023) was employed to filter and categorize literature pertaining to the transmission risk of dengue fever. An analysis of annual publication counts was carried out on the literature spanning from 2014 to 2023, with the aim of gaining insights into the evolutionary trends within this research domain. Adhering to the default parameters of the software, keywords with a frequency of occurrence exceeding ten instances, as well as countries, institutions and journals with over ten published articles, were selected for analysis. Based on the refined dataset, visualization analyses were conducted to examine keyword co-occurrence, country collaboration, institutional collaboration, and journals co-citation shedding light on the underlying connections among keywords, research foci, international collaboration networks, the collaborative landscape, and hot academic journals and their impact among research institutions. In the resultant visualization network graph, the size of the nodes served as a direct indicator of their frequency of occurrence. A larger node signified that the content represented by the node was more prevalent in the research corpus. The lines interconnecting the nodes depicted the associative relationships between pairs of nodes. The presence of a line between two nodes implied that the content they represented exhibited a co-occurrence or collaborative relationship within the research context (Zhang, Ye, Bai, Wang, & Wang, 2022). In the Overlay visualization, the closer the node color is to blue, the closer the average citation or publication year is to 2014, while the closer the node color is to yellow, the closer the average citation or publication year is to 2015. At the same time, analyze the relationship

between the number of published articles and citation counts, calculating the average citations (Avg. citations) per article published by countries, institutions, and journals.

Using Citespace 6.4.R1 software to conduct burst analysis on keywords from articles published between 2014 and 2023, the red bars indicate the years of keyword eruptions, facilitating an analysis of changes in research focus within the field over the decade.

By downloading the Bibliometrix package in RStudio, and using the Biblioshing web interface to analyze the h-index of various countries and institutions. The h-index can help measure the quality of articles and their level of attention(Shah, & Jawaid, 2023).

This article used VOSviewer as the main analytical software, supplemented by CiteSpace and Bibliometrix to enrich the analysis perspectives and content, showcasing research hotspots and forms of international collaboration from different aspects.

RESULTS

Annual Time Distribution

Employing the search strategy with “Dengue” or “Dengue virus” as keywords, a total of 17,009 pertinent articles were retrieved. Similarly, the keyword “*Aedes*” resulted in the retrieval of 12,518 articles. Over the decade spanning from 2014 to 2023, an analysis of the annual publication counts of articles pertaining to dengue fever and *Aedes* mosquitoes revealed a remarkable consistency in their publication trends. Specifically, the number of research articles focused on dengue fever surpassed those on *Aedes* mosquitoes in each year. Upon further examination, it was evident that both categories of articles demonstrated a steady upward trajectory in the years preceding 2020. Notably, the publication counts of articles related to dengue fever and *Aedes* mosquitoes attained their respective historical highs in 2020 and 2021. Nevertheless, since 2021, this growth trend has undergone a shift, with the number of published articles commencing a gradual decline. It is noteworthy that the extent of this decline is relatively modest when compared to the growth trend observed prior to 2020 (Fig. 1).

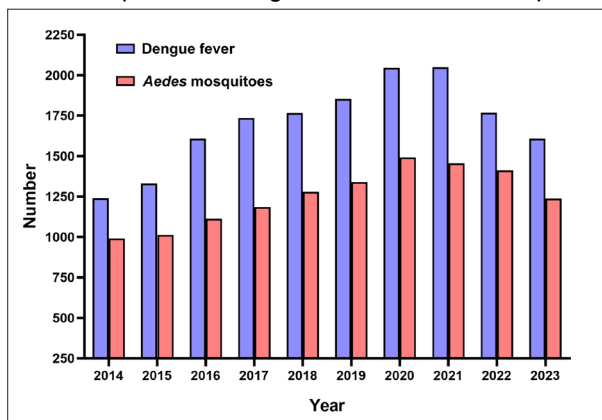


Figure 1. The number of published literatures on dengue fever and *Aedes* mosquitoes from 2014 to 2023.

Keyword Co-occurrence Analysis

In the research realm of dengue fever, a total of 2,010 keywords met the analysis criteria, among which the keyword ranked first in usage frequency is “dengue fever”, which appeared 9,060 times, followed by “infection” and “*Aedes aegypti*”; In the research realm of *Aedes* mosquitoes, there are 1,745 keywords used more than ten times, with the most frequently appearing keyword being “*Aedes aegypti*,” which appeared 3,227 times, and the second and third ranked keywords are “dengue fever” and “Culicidae” (Table 1). Using VOSviewer to construct keyword co-occurrence network diagrams and overlay visualizations (Fig. 2), the co-occurrence relationships of keywords and the average year of their appearance can be intuitively analyzed. Additionally, Citespace is used to analyze the mutations of keywords in both fields from 2014 to 2023 (Fig. 3), highlighting the 25 keywords with the most significant changes.

Table 1. Top ten keywords occurrences in articles on dengue fever and *Aedes* mosquitoes.

Rank	Dengue fever		<i>Aedes</i> mosquitoes	
	Keywords	Occurrences	Keywords	Occurrences
1	dengue	9060	<i>Aedes aegypti</i>	6105
2	infection	2948	mosquito	3227
3	<i>Aedes aegypti</i>	2569	dengue	2852
4	transmission	1514	Culicidae	2632
5	mosquito	1503	<i>Aedes albopictus</i>	2603
6	virus	1488	Diptera	1544
7	chikungunya	1374	vector	1527
8	<i>Aedes albopictus</i>	1373	transmission	1334
9	zika virus	1326	infection	1139
10	fever	1303	chikungunya	1033

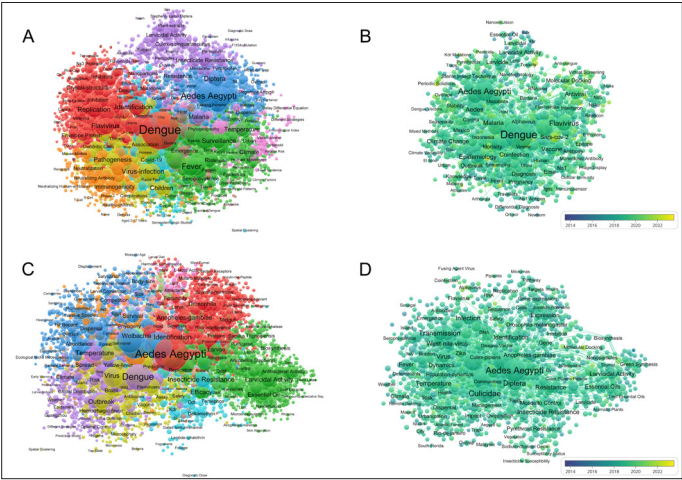


Figure 2. Visualize network and Overlay visualization of keywords in the research field of dengue fever and *Aedes* mosquitoes in 2014-2023. a) keywords co-occurrence visualize network of dengue fever; b) keywords overlay visualize network of dengue fever; c) keywords co-occurrence visualize network of *Aedes* mosquitoes; d) keywords overlay visualize network of *Aedes* mosquitoes.

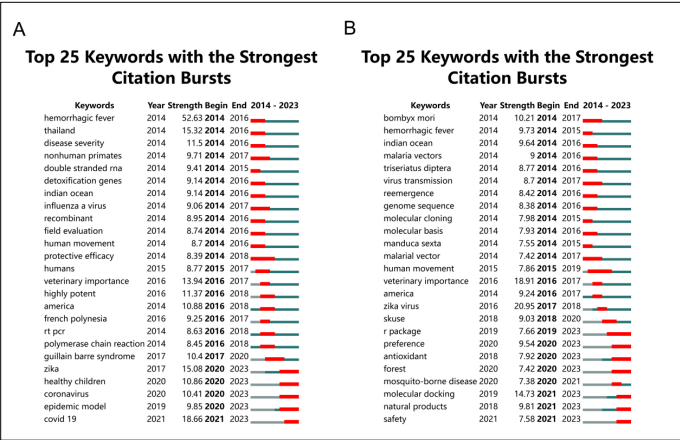


Figure 3. Top 25 keywords with the strongest citation bursts of dengue fever and *Aedes* mosquitoes in 2014-2023. a) keywords bursts of dengue fever; b) keywords bursts of *Aedes* mosquitoes.

Country Co-occurrence Analysis

There were 110 countries selected for analysis in the field of Dengue fever, and 107 countries were selected for analysis in the field of *Aedes* mosquitoes research. In terms of the countries that significantly contributed to dengue fever research and were ranked among the top ten based on the number of published articles, the United States emerged as the leader with 5,109 articles. Regarding the countries that notably contributed to *Aedes* research and were ranked in the top ten based on the number of published articles, the United States once again topped the list with 4,213 articles, the country with the second-highest number of published articles is Brazil, followed by China in third place (Table 2). It is noteworthy that the top three countries in terms of the number of published articles were the same in both fields. In addition to listing the top ten countries by number of publications, the VOSviewer software was used to construct country collaboration network maps for the two fields, and an overlay visualization was also created to more intuitively display the average publication year of articles from each country (Fig. 4).

Table 2. Top ten countries in terms of the number of published articles in the field of dengue fever and the *Aedes* mosquitoes.

Rank	Dengue fever			Aedes mosquitoes		
	Country	Documents	Avg. citations	Country	Documents	Avg. citations
1	USA	5109	31.47	USA	4213	23.56
2	China	2340	21.44	Brazil	1634	20.18
3	Brazil	2304	22.78	China	1291	21.66
4	India	1754	15.45	India	1104	19.66
5	England	1355	37.64	England	895	29.52
6	France	1161	35.42	France	887	26.8
7	Australia	959	28.15	Australia	701	27.62
8	Thailand	949	25.69	Italy	583	28.74
9	Singapore	782	31.81	Germany	505	22.29
10	Malaysia	732	17.63	Mexico	494	13.26

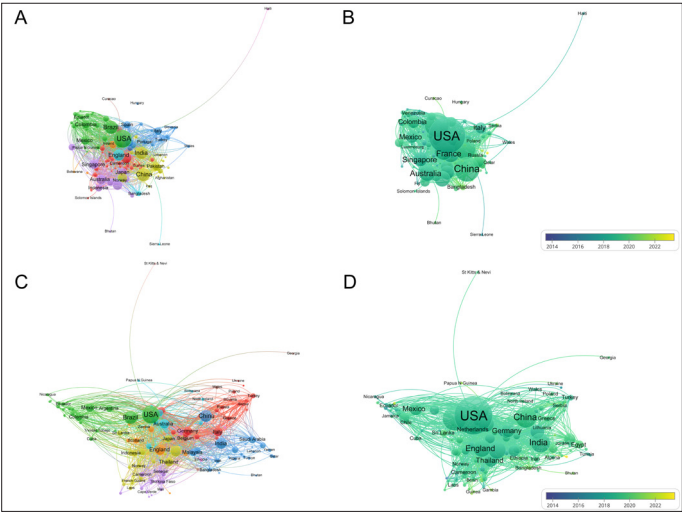


Figure 4. Visualize network and Overlay visualization of countries in the research field of dengue fever and *Aedes* mosquitoes in 2014-2023. a) countries co-occurrence visualize network of dengue fever; b) countries overlay visualize network of dengue fever; c) countries co-occurrence visualize network of *Aedes* mosquitoes; d) countries overlay visualize network of *Aedes* mosquitoes.

Institutional Co-occurrence Analysis

At the institutional level, there were 957 institutions that have published at least ten articles in the field of Dengue fever research, and 685 institutions that have published ten or more articles in the field of *Aedes* mosquitoes. The contributed to dengue fever research and published the largest number of articles were led by Mahidol University, with a total of 550 articles, following closely were the Oswaldo Cruz Foundation and the University of São Paulo. The top ten institutions that made notable contributions to *Aedes* mosquitoes research and published the highest number of articles were headed by the University of Florida, with 367 articles, while the Oswaldo Cruz Foundation and the Institut Pasteur also made significant contributions in the field of *Aedes* mosquitoes (Table 3).

Table 3. Top ten institutions in terms of the number of published articles in the field of dengue fever and the *Aedes* mosquitoes.

Rank	Dengue fever			Aedes mosquitoes		
	Institution	Documents	Avg. citations	Institution	Documents	Avg. citations
1	Mahidol Univ	550	31.11	Univ Florida	367	18.75
2	Fundacao Oswaldo Cruz	549	28.15	Fundacao Oswaldo Cruz	356	22.91
3	Univ Sao Paulo	444	23.2	Inst Pasteur	271	41.22
4	Univ Oxford	420	54.8	Univ Sao Paulo	265	23.07
5	Natl Univ Singapore	345	27.22	King Saud Univ	206	24.04
6	Inst Pasteur	344	49.97	Ctr Dis Control & Prevent	179	26.65
7	Minist Hlth	328	33.66	Univ Montpellier	177	14.18
8	Ctr Dis Control & Prevent	291	23.6	Univ Calif Davis	172	41.6
9	Univ Texas Med Branch	278	38.37	Ars	161	19.65
10	Univ Malaya	275	15.31	London Sch Hyg & Trop Med	160	29.96

To better illustrate the interaction relationships among institutions, VOSviewer was used to construct an interaction network map, and the Overlay Visualization function of the software was employed to display the average publication year of articles by each institution (Fig. 5).

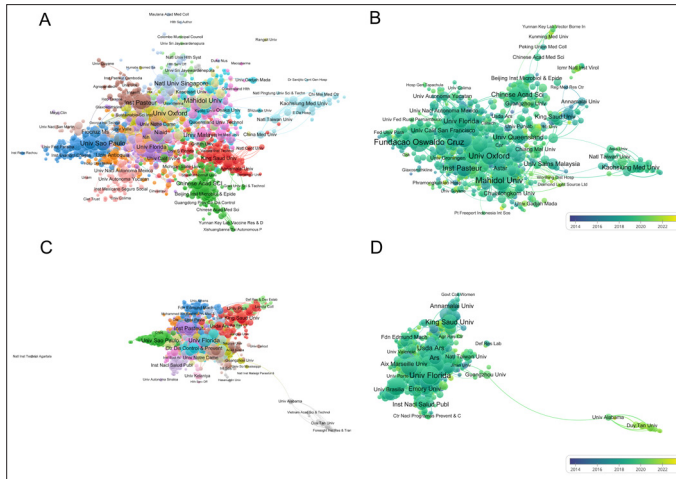


Figure 5. Visualize network and Overlay visualization of institutions in the research field of dengue fever and *Aedes* mosquitoes in 2014–2023. a) institutions co-occurrence visualize network of dengue fever; b) institutions overlay visualize network of dengue fever; c) institutions co-occurrence visualize network of *Aedes* mosquitoes; d) institutions overlay visualize network of *Aedes* mosquitoes.

Journals Published Analysis

In the journal analysis, 272 journals were included in the dengue fever field, and 192 journals were included in the *Aedes* mosquitoes field. PLOS Neglected Tropical Diseases published the most articles in the dengue fever research field from 2014 to 2023, with 1,056 articles, followed by PLOS One and Scientific Reports. In the field of *Aedes* mosquitoes research, the journal with the most published articles was Parasites & Vectors, which has published a total of 739 articles in ten years. PLOS Neglected Tropical Diseases and Journal of Medical Entomology also rank high in terms of the number of articles published in this field (Table 4). To demonstrate the co-citation relationships between journals, a network map was drawn using VOSviewer software, where the lines in the map represent citation relationships between two journals. Additionally, an Overlay visualization showing the change in the number of articles published by journals over the years was created (Fig. 6). We also used the Bibliometrix package downloaded through R and the Biblioshiny web interface, and the h-index of journals was calculated (Table 4).

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Table 4. Top ten journals in terms of the number of published articles in the field of dengue fever and the *Aedes* mosquitoes.

	Rank	Source	Documents	Avg. citations	H-index
Dengue fever	1	PLoS Negl Trop Dis.	1056	27.6	70
	2	PLoS One.	683	20.84	53
	3	Sci Rep.	477	24.56	52
	4	Am. J. Trop. Med. Hyg.	390	16.1	37
	5	Parasit Vectors.	387	19.12	42
	6	viruses-basel	343	8.46	25
	7	J Virol.	294	39.64	60
	8	J Med Entomol.	246	13.75	28
	9	Acta Trop.	231	17.06	33
	10	BMC Infect Dis.	211	18.81	32
<i>Aedes</i> mosquitoes	1	Parasit Vectors.	739	20.31	51
	2	PLoS Negl Trop Dis.	713	30.53	64
	3	J Med Entomol.	605	11.88	35
	4	PLoS One.	510	22.87	48
	5	Sci Rep.	408	21.49	44
	6	Acta Trop.	315	16.89	35
	7	J Am Mosq Control Assoc.	308	6.08	18
	8	Insects.	270	9.3	23
	9	Parasitol Res.	193	32.36	43
	10	viruses-basel	166	10.52	21

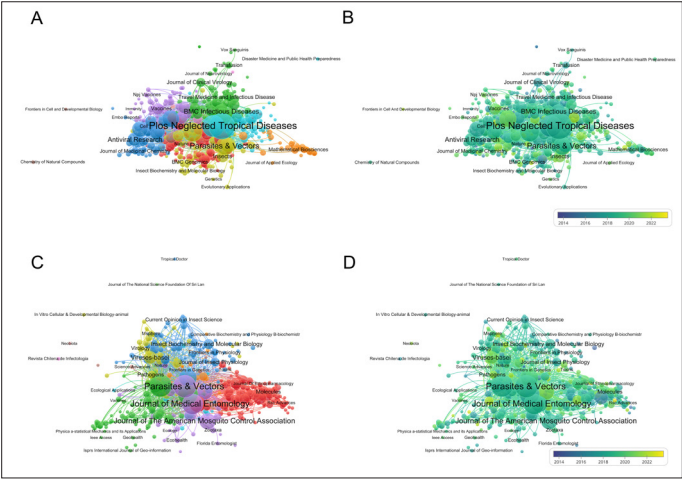


Figure 6. Visualize network and Overlay visualization of journals in the research field of dengue fever and *Aedes* mosquitoes in 2014-2023. a) journals co-citation visualize network of dengue fever; b) journals overlay visualize network of dengue fever; c) journals co-citation visualize network of *Aedes* mosquitoes; d) journals overlay visualize network of *Aedes* mosquitoes.

DISCUSSION

Dengue fever, distinguished by its extensive prevalence and elevated incidence rate, coupled with the formidable invasive capacity of its vector, *Aedes* mosquitoes, posed significant challenges to prevention and control efforts, thereby garnering considerable

attention from nations globally towards this tropical disease(Pourzangiabadi, Najafi, Fallah, Goudarzi, & Pouladi, 2025). In the present study, textual information was transformed into visual representations through the construction of network graphs and bar charts, enhancing the intuitiveness of the content(Liu, Lang, Hao, Hu, & Li, 2023).

During the keyword-related analysis, *Aedes aegypti*, mosquito, and *Aedes albopictus* emerged as the third, fifth, and eighth most frequent terms, respectively, in dengue fever-related literature. Within *Aedes*-related literature, dengue fever ranked third in frequency, and when the analysis was restricted to disease-related keywords, dengue fever secured the top position in *Aedes*-related literature. This underscores the intimate association between the onset and transmission of dengue fever and *Aedes* mosquitoes, with both entities constituting research hotspots within their respective domains. Furthermore, *Aedes aegypti* and *Aedes albopictus*, belonging to the *Aedes* genus, exhibit the broadest global distribution, and their migration and proliferation play a pivotal role in facilitating the transmission of dengue fever(Näslund et al, 2021). Additionally, the top ten keywords in both research areas encompassed "Infection" and "Transmission," indicating that factors influencing the transmission of dengue fever constitute a focal point in dengue fever research. Consequently, the growth, reproduction, distribution, and migration of *Aedes* mosquitoes, as the transmission vector of dengue fever, all exert an impact on the dissemination of the disease(Kolimenakis et al, 2021; Shah, & Gupta, 2022). The transmission modes and influencing factors of infectious diseases, beyond just dengue fever, have consistently been a research hotspot for scientists. Comprehending these aspects can aid in intercepting the epidemic of infectious diseases through intermediary pathways.

An examination of the annual count of articles published on dengue fever and *Aedes* mosquitoes over the past decade revealed a largely consistent trend in article numbers, signifying a closely intertwined research focus on dengue fever and *Aedes* mosquitoes. Nevertheless, the number of articles on dengue fever surpassed that of *Aedes*-related articles, suggesting that scientists also concentrate on other aspects, such as dengue fever treatment, when investigating dengue fever(Kok et al, 2023). Research on the sudden bursts of keyword citations within a field over a certain period can help researchers understand special events affecting the study subject, such as the impact of disease outbreaks on the subject, the application of new experimental ideas to the subject, and the connections between human activities and the subject. The top 25 keywords with bursts in citations were arranged according to the year of their outbreak, providing a more intuitive display of the changing patterns of emerging keywords over time. It is worth noting that there were overlaps in the emerging keywords between the two fields, and the years in which they appeared were generally consistent. For example, keywords such as hemorrhagic fever, Indian ocean, human movement, veterinary importance, America, and zika indicate that the two fields were strongly related, indirectly showing, over the past decade, the transmission patterns of dengue fever and *Aedes* mosquitoes, the main affected regions, the resulting disease symptoms, and the diseases that drew attention in a short period of time. Through the bursts of keyword citations analysis. In the field of dengue fever, the keywords that

undergo mutations were more concentrated on the disease itself. For example, the symptoms of guillain barre syndrome (GBS) were discovered in 2015 as a complication of dengue fever, sparking a wave of research (Lima, Bachur, & Aragão, 2019). Similarly, for susceptible populations of dengue fever, such as healthy children, there have been corresponding bursts of research. Since the immune system in children is not fully developed, their resistance to the dengue fever virus is relatively weak. In today's era of big data, establishing epidemic models for diseases helps to better understand their epidemiological trends and provides technical support for subsequent prevention and control work. Compared with the style of bursts of keyword citations in the dengue fever field, the bursts of keyword citations in the *Aedes* mosquitoes field were concentrated in the area of biotechnology, such as genome sequence, molecular cloning, and molecular basis. Similarly, some bioinformatics analysis-related keywords have also burst, such as R package and molecular docking, indicating that molecular-level research on *Aedes* mosquitoes has gradually become popular over the past decade. The publication count of articles on dengue fever and *Aedes* mosquitoes peaked in 2020 and 2021, with a generally increasing trend in related article publications prior to 2020, aligning with the annual rise in dengue fever cases and public health literacy. Following the outbreak of COVID-19 in 2020, reduced personnel mobility led to a decreasing trend in dengue fever cases. Simultaneously, the prevalence of COVID-19 redirected international attention away from dengue fever, impacting the number of research articles on dengue fever and *Aedes* mosquitoes (Chen et al, 2022; Khan et al, 2022). This phenomenon can also be seen from the bursts of keyword citations in dengue fever. In 2020, the keyword COVID-19 suddenly appeared, attracting the attention of many researchers. Despite the influence of COVID-19, the article count in the fields of dengue fever and *Aedes* mosquitoes remains substantial, indicating that dengue fever continues to spread globally and holds considerable influence, with researchers sustaining a certain level of attention towards it. To date, under the dual impact of temperature increases due to the El Niño phenomenon and fragile public health systems post-COVID-19, hot and humid climatic conditions and inadequate sanitation have accelerated the growth and reproduction of *Aedes* mosquitoes, diminished the immune resistance of the population, and created conducive conditions for the prevalence of dengue fever (Akinsulie, & Idris, 2024; Sarker, Roknuzzaman, Haque, Islam, & Kabir, 2024). The year 2023 witnessed the highest number of reported dengue fever cases (Haider, Hasan, Onyango, & Asaduzzaman, 2024), and with a lag in article publication, it is reasonable to anticipate a significant surge in the number of articles on dengue fever, reaching a peak in 2024 and 2025.

An analysis of the country origins of articles related to dengue fever and *Aedes* mosquitoes over the past decade disclosed that the top seven countries encompass the United States, China, Brazil, India, the United Kingdom, France, and Australia. This highlights that these seven countries occupy a leading position internationally in research on both topics and demonstrates a strong correlation between dengue fever and *Aedes* mosquitoes research. Among the top seven countries, three are tropical, and China and the United States possess tropical territories, providing a

geographical advantage in researching dengue fever and *Aedes* mosquitoes. The United Kingdom and France had extensive colonial histories in the last century, with colonies in numerous tropical countries, thus possessing a foundation for research on dengue fever and *Aedes* mosquitoes. Dengue fever ranks among the top ten tropical diseases globally, and hot and humid environmental factors favor the growth and reproduction of its vector, *Aedes* mosquitoes (Drakou et al, 2020; de Souza, & Weaver, 2024; Brown, Pascual, Wimberly, Johnson, & Murdock, 2023). Tropical regions abound in case numbers and *Aedes* mosquitoes samples, which are prerequisites for the smooth progression of research on both. Therefore, robust research technology is not the decisive factor influencing research on dengue fever and *Aedes* mosquitoes; environmental factors suitable for the growth of *Aedes* mosquitoes and the transmission of dengue fever also influence research levels in various countries (Reinhold, Lazzari, & Lahondère, 2018). However, Avg. citations did not increase with the number of publications. The Avg. citations of articles from different countries in two fields were calculated to evaluate the quality of published articles from each country. In both fields, the country with the highest Avg. citations was England. England has a long history and is the birthplace of the Industrial Revolution, and its scientific research began earlier than most other countries in the world, so the research in both fields also started early, laying the foundation for the development of these two fields. Meanwhile, France and Australia also rank among the top four in Avg. citations in both fields. France, located in Europe, also experienced rapid development during the Industrial Revolution, and its scientific research began earlier than in most other countries. China ranks within the top three in terms of the number of articles, making a notable contribution to international research on dengue fever and *Aedes* mosquitoes over the past decade. This reflects the considerable attention dengue fever and *Aedes* mosquitoes have garnered domestically and demonstrates the progress and high level of China's research capabilities.

By compiling the number of articles published by various institutions in the fields of dengue fever and *Aedes* mosquitoes research and ranking the institutions accordingly, it was revealed that four institutions secured positions within the top ten for both fields: Oswaldo Cruz Foundation (Brazil), University of São Paulo (Brazil), Institut Pasteur (France), and Centers for Disease Control and Prevention (USA). These four institutions occupy a leading position internationally in research on the transmission of dengue fever by *Aedes* mosquitoes, and the overlap of prominent institutions in both research fields indicates a high degree of correlation between the two research areas. Among them, Oswaldo Cruz Foundation and University of São Paulo, situated in tropical regions, possess a geographical advantage in researching dengue fever and *Aedes* mosquitoes, with abundant *Aedes* mosquitoes samples and dengue fever cases. Institut Pasteur and Centers for Disease Control and Prevention, equipped with advanced research conditions, hold significant positions in this research field despite the much lower number of dengue fever cases in temperate regions compared to tropical areas, relying on their strong scientific and technological foundations. We calculated the Avg. citations of articles published by institutions in two fields to evaluate

the public attention received by the institutions' articles. Among them, Inst Pasteur (France) ranked within the top three in both fields, while the other institutions ranked in the top three in each field are from the USA and England. This indicates that the research level of institutions in a field also depends on the scientific research level of their country, showing that a country's emphasis on a field and its scientific strength can also influence the research development of domestic institutions.

In the statistics of journal sources across two fields, six journals overlap among the top ten journals ranked by the number of published articles. These journals focus primarily on research related to tropical diseases and their transmission vectors. Different journals also have specific research emphases; for example, the journal that has published the most articles on dengue fever was PLoS Negl Trop Dis., which focuses on tropical diseases, whereas the journal that has published the most articles on *Aedes* mosquitoes was Parasit Vectors. PLoS Negl Trop Dis. ranked second in the number of *Aedes*-related articles, indicating that *Aedes* mosquitoes play a crucial role in the transmission of tropical diseases. Not limited to the spread of dengue fever, the activity of *Aedes* mosquitoes is also a risk factor for the spread of tropical diseases. In analyzing journal sources, the number of published articles can represent a journal's position in a research field; more articles indicate that the journal's focus and research direction are a better match. However, relying solely on the number of articles is insufficient for a comprehensive evaluation of a journal's quality. Therefore, we used the h-index to evaluate the top ten journals in both fields based on the number of published articles. The journal with the highest h-index in both fields was PLoS Negl Trop Dis., indicating that the articles published in this journal received more attention and possessed a higher quality. Additionally, the journals PLoS One and Sci Rep. also had relatively high h-indices in both fields, while J Virol in the dengue fever field and Parasit Vectors in the *Aedes* mosquitoes field ranked high in their respective fields' h-indices. The h-index analysis helped identify authoritative journals within a profession, providing a reference for researchers in the field when selecting literature and facilitating the progress of research work.

This study synthesized international research on dengue fever and its vector, *Aedes* mosquitoes, over the past decade, aggregated article keywords, and visualized research hotspots. On one hand, it facilitated a review and exploration of the research field, and on the other hand, it aided in identifying new research hotspots and broadening research perspectives within a short period. The publication status of articles by countries and institutions was presented in the form of network graphs, alongside a summary of annual article counts, providing readers with an intuitive understanding of international research in this domain.

Conflict of Interest

The co-authors declare that they have no conflict of interest.

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