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Review Article

A Systematic Review of Trends and Methods for Chikungunya Detection from 2002 to 2023

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Abstract *- The mosquito-borne Chikungunya virus represents a global challenge due to ineffective preventive measures and unhealthy behaviors. This study underscores the urgency of effectively addressing this disease and developing robust prevention and control strategies at the global level. Its spread has increased markedly in recent decades, especially in the Americas and Peru. This study was based on a comprehensive review of the literature related to diagnostic methods and electronic devices for the detection of the Chikungunya virus. We use the Scopus platform and apply filters to identify relevant articles and papers. The results indicate steady growth in research on the diagnosis of the virus, with a peak of 156 publications in 2021. The United States and India led research into Chikungunya detection methods. In addition, international collaborations and a diversity of document types were identified, highlighting the breadth of approaches in this area. Funding for the research came from national and international institutions, highlighting the importance of developing effective detection methods, including biosensors and electrochemical techniques. It is concluded that it is essential to continue with an exhaustive review of articles in other databases, such as Web of Science, and to explore more effective detection methods in order to improve the detection and control capacity of the disease.*

Keywords *- Chikungunya, Diagnosis, Detection methods, Review, Electronic devices.*

1. Introduction

In recent decades, communicable diseases have gained great relevance around the world due to the precariousness of effective measures for their prevention, in addition to the population maintaining unhealthy behaviors that encourage the spread and strengthening of the risks present in the environment. In this sense, people living in geographical areas prone to epidemiological outbreaks are more vulnerable to infections caused by vectors, some of which are even pandemic potential [1] The disease caused by the Chikungunya virus has had a great impact on society due to its dynamic spread over the last 5 years [2]. The World Health Organization states in [3] that at the beginning of 2023, 113,447 cases of chikungunya were reported in the Americas, reporting 51 (0.05%) deaths, which is interpreted as a figure 4 times higher compared to the data for 2022, with only 21,887 cases identified and 8 (0.04%) deaths; Consequently, the increase in these percentages demonstrates a high epidemiological capacity and has surprised the research community. In Peru, as of March 2023, 593 people with chikungunya have been reported, an amount that represents 11 times more than the cases counted in 2022, where Piura has been one of the departments with the highest prevalence with 67 (69% of the total) cases reported. Chikungunya (CHIKV) is one of the endemic diseases transmitted by the Aedes Aegypti and Albopictus mosquitoes, a vector that also produces highly dangerous diseases such as dengue and yellow fever [4]. That is why it is necessary to be alert to the symptoms generated by acquiring this type of virus in the body [2]. Some of the identifiable symptoms are high fever, joint pain, headache and muscles, skin rashes, and fatigue [5]. Unlike dengue, chikungunya, once diagnosed in humans, allows the development of antibodies that protect people who acquire the virus for the first time [6]. In this sense, it is appropriate to make a comparison between chikungunya and dengue, analyzing the similarities and differences of these viral diseases [7]. First, the two diseases are endemic because they remain dormant in certain regions and are transmitted by the same vector [8]. Likewise, dengue and chikungunya present similar symptoms in the initial stage of the viral cycle, expressed in the human body with intense headaches, joint pains and fever. For this reason, clinical diagnosis is difficult [9]. On the other hand, the development of chikungunya symptoms in the host is experienced with greater intensity and

for a longer period of time than dengue [10], although the latter can produce internal bleeding in the most severe cases [11]. Finally, the causative agent that produces chikungunya belongs to the genus Alphavirus, and the one that generates dengue is part of the Flaviviruses [12]. When exploring the preventive axis of the disease, it is identified that repellents and insecticides are often used as measures to control the virus [13], substances that do not ensure complete protection against exposure. In addition, there are few resources for the detection of chikungunya, and this situation complicates clinical care regarding its pathology [14], a condition motivated by the dependence on defined antibodies in the human body that is not easily seen in the first days of infection, making detection tests null and false negatives [15]. In addition, these devices are scarce and often very expensive, making them even more difficult to access [16]. That is why, for the early diagnosis of chikungunya in humans, it is necessary to know the current reality in which detection methods using electronic devices are found since this disease is highly dangerous if timely precautions are not taken for the treatment of the symptoms presented [17].

The chikungunya virus and its spread affected millions of people worldwide, [18] presenting data on the diagnosis of this virus, variations in geographic location, and travel history; it is mentioned that serological tests are common for the detection of chikungunya, although their evaluation and availability limit them. The objective of this study is to develop and evaluate antibody detection methods for diagnosing Chikungunya by establishing the effectiveness of two tests, such as the enzyme-linked immunoassay of IgM capture treated in the E2 protein and ELISA. On the other hand, the research body worked with 2 MAC-ELISA and DAS-ELISA assays as a protein to use E2 of the virus, using three reference sera on single dilutions; they worked with 225 samples where 20% of the total came out positive, and the rest negative using RT-PCR and IFA for the determination of sensitivity, specificity and accuracy with the assays mentioned in the first instance. Accordingly, data such as test repeatability within 10%-20%, a sensitivity of 60% and 52.5% and a specificity of 96.2% and 96.8% were yielded for MAC-ELISA and DAS-ELISA, respectively, when compared with RT-PCR. In conclusion, it was successfully developed and standardized after the respective E2-based assays of CHIKV, and the IgM antibody could be fully detected in CHIKV within a period of 3 hours.

The advances made during 2023 are favoring the development of new systems for the detection of the Chikungunya virus; in [19], it is stated that this progress should be focused on emerging countries where there are no reports on the immunodetection of chikungunya antigen worked on electrochemical paper. Therefore, its purpose is the development of a biosensor based on nanocomposites to detect this virus, providing a cost-effective, fast, sensitive and suitable diagnostic platform. They were in charge of fabricating Ag-ZnO nanocomposites together with chemical methods using the FTIR, UV-Vis analysis, scanning electron microscopy, EDX and X-ray analysis; all of these have served to form compatibility in screen printed paper electrodes, which function is the voltammetric detection with 0.5 mM of ferro/ferricyanide as a redox pair, it was subjected to an evaluation in which its detection and response time is calculated. The results of the sensor demonstrated a dynamic range in detection (1ng/ml-100 μg/ml), its limit in a range of 1 ng/ml and a response time was 25 seconds, in addition to having a shelf life of only 30 days. It was concluded that this PBIS-based biosensor is a cost-effective and effective detector for the Chikungunya virus in resource-poor communities.

The medical area faces a great challenge in managing chikungunya; in [14], the need for effective technological development for the diagnosis of the infection is highlighted. The goal is to develop a detection tool based on the first symptoms, and it will also be able to propose an algorithm to help the medical community with the diagnosis. This study is cross-sectional as it uses a bivariate analysis in the identification of clinical variables related to this infection. In addition, when calculating this data, a low area on the ROC curve is detected in the determination of a cut-off value and evaluation of the performance of this tool. When occupied with 295 patients infected with chikungunya, the following data were obtained: the ROC curve shows a cut-off >= 5.5, a sensitivity of 64.4%, specificities 87.4% and a positive predictive value of 85.5% and an accuracy of 75%.

An investigation on the detection and diagnosis of CHIKV is based on the development of a quantitative loop-mediated isothermal amplification assay (RT-LAMP) to obtain rapid detection in serum samples from those presenting acute phase [20]. The main objective is the development of an effective detection and diagnosis method for this virus, demonstrating its usefulness in serum samples. The methodology used consists of the development and optimization of an RT-LAMP assay. To satisfy the demonstration, SYBR GREEN I is used. In terms of amplification, a water bath is used at 63°C for one hour to observe the color change. The results showed a linear relationship in a range of 2 × 108 to 2 × 102 copies, with a high sensitivity worked with 21 cases. It is concluded that RT-LAMP is a tool that has provided great support and has accurate results in rapid and real-time detection. The purpose of this study is to evaluate previous publications and carry out a systematic review to witness the reality of technological devices as methods of detection of the Chikungunya virus in the human body, helping the research community to develop new detection devices with ease of access for low-income and vulnerable people. Scoping Review is a type of systematic review that explores big data in the field of research [21]. In addition, it fulfills the purpose of diversifying the literature that is available [22]. This review involves identifying the main question of the study [23], searching different databases

[24], mapping the findings obtained [25] and giving recommendations for further research [26]. Thanks to this, the methodology to be developed is carried out in order to collect all the necessary information about those devices that help detect the Chikungunya virus with greater sensitivity and specificity. After obtaining the results of the databases used, they will be graphed in Vosviewer and a Scopus extension worked with Python where they will be represented through pie charts, linear graphs and bibliometric networks. At the end of analysing the results, it will be possible to observe a section of discussion, conclusion and recommendations aimed at those research communities, opening the way to new developments about the early detection of Chikungunya virus.

2. Pathophysiology of Chikungunya Virus Infection

The infection caused by the Chikungunya virus (CHIKV) presents a significant public health challenge due to its rapid spread and associated complications. Transmitted by Aedes aegypti and Aedes albopictus mosquitoes, CHIKV can cause severe symptoms such as high fever, intense joint pain, headaches, muscle pain, skin rashes, and fatigue. These symptoms, though initially similar to dengue, tend to be more prolonged and intense in the case of Chikungunya. The virus multiplies in dermal fibroblasts after the bite of an infected mosquito and rapidly disseminates through the lymphatic and blood systems, causing significant inflammation in joints and other tissues. The development of specific antibodies against CHIKV confers lasting immunity, unlike dengue, where reinfection can result in more severe disease forms.

However, early detection of the virus remains a challenge due to the similarity of initial symptoms to other febrile illnesses and the limited availability of sensitive diagnostic methods. In terms of prevention and control, using repellents and insecticides, along with eliminating mosquito breeding sites and conducting public awareness campaigns, are crucial measures to reduce virus transmission. Nonetheless, the lack of resources and technology in many affected regions limits the effectiveness of these measures. Recent research has shown promising advances in detection technologies, such as the IgM capture enzyme-linked immunosorbent assay (MAC-ELISA) and ELISA, as well as isothermal amplification methods like RT-LAMP. Despite these advancements, there is a need to develop more accessible and affordable diagnostic technologies to improve early detection and disease management, especially in low-resource communities.

3. Methods

3.1. Scoping Review

To carry out this study, the methodological approach known as Scoping Review was adopted [21]. This methodological strategy is dedicated to systematically exploring and mapping the literature related to diagnostic methods and electronic devices designed for the detection of the Chikungunya virus [27]. The choice of this type of review is justified by its broad exploratory scope, which allows the identification of the approaches, methods and devices existing in the literature, which contributes to obtaining a comprehensive view [28].

In addition, as mentioned in [29], the continued relevance of Chikungunya and the constant development of new devices for human diagnostics make the Scoping Review methodology uniquely suited to provide a solid foundation for current trends [30]. On the other hand, this methodology provides a wide source of information, including reports, studies, reviews, patents and other relevant documents [31], thus ensuring a more accurate and complete view of the objective of our research [22].

3.2. Flow Chart

The graphical diagram presented in Figure 1 systematically visualizes the procedure corresponding to the proposed methodology [21]. It is recognized that a flowchart constitutes the graphical representation of any procedure, detailing the steps and decisions that will be executed throughout the study [32]. Additionally, the usefulness of this scheme as a useful graphic tool [32] is highlighted, evidencing the clarity and improvement in the understanding of the processes related to the search for information on diagnostic methods and devices for the detection of the Chikungunya virus [27].

Table 1. Description of scopus

Components	Description
Search bar	Write keywords, titles, authors or other terms related to the study.
Search filter	Refine results using filters by year, document type, author, source, and affiliation.
Search Result	Display in an ordered list.
Links to full-text	Provide direct links to the text.
Charts and metrics	Offer citation metrics
Export of results	Export search results in two formats: CSV or BibTeX.
Alerts and tracking	Set up notifications about new research.
Analysis tools	Provide analytical tools.

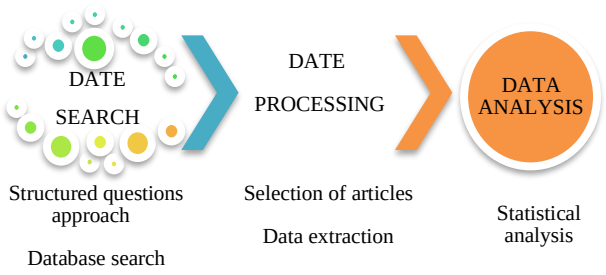

Fig. 1 Methodology scoping review

3.3. Searching for Information

There are several database platforms designed for the exploration of information in the research environment [33]. Scopus stands out as one of these platforms, classified bibliographically and dedicated to the scientific and academic environment [34]. This tool makes it easy to search for various types of research documents, such as articles, journals, conferences, patents, and books [35]. It should be noted that the Scopus interface is characterized by its great dynamism [34]. That is why we proceed to analyze each of its components, as detailed in Table 1.

3.4. Information Selection and Filtering

Scopus presents categories based on publications, including those designated as Open Access [34]. This classification imposes certain restrictions on Scopus users during reading [34]. Full and unrestricted access is granted to publications classified as All Open Access [36]. In the case of Gold Open Access, there are no restrictions, but the authors bear the costs of publication [37]. On the other hand, Green Open Access implies that authors publish in institutional repositories or specific journals [38]. In addition, Bronze Open Access refers to open-access articles in private-access journals [39]. Exploration in Scopus shows persistent use of Boolean connectors to profile searches based on specified terms [40]. According to [41], this database facilitates advanced searches using connectors such as AND, OR, and AND NOT, which allow search terms to be combined and refined. The AND connector combines two or more terms, restricting the results to specific ones [42]. Unlike AND, the OR connector expands search results [43].

During the search process, documents such as scientific articles and papers are specifically selected as they provide primary information [21]. These documents provide primary and experimental studies, as well as details on diagnostic methods and their originality [31]. Documents and articles are preferable due to their greater timeliness compared to reviews [44], being essential to obtain specificity about the methods and electronic devices used in the detection of Chikungunya [27]. It is crucial to perform a manual filter to ensure the quality and accuracy of the review [45], avoiding selection biases [46] and ensuring the alignment of the search with the established objectives [23].

3.5. Information Extraction and Processing

After conducting a thorough investigation of the information, Scopus facilitates the export of data by generating CSV and BibTeX files [47]. In the context of this study, a CSV file, as indicated in [48], is understood as a simple format used to store data in lists, spreadsheets, and databases, where information is usually separated by commas (,) or semicolons (;). On the other hand, a BibTeX file is defined, according to [49], as a resource for the management and organization of bibliographic references from Scopus or other databases through personalized searches. This file contains detailed information on bibliographic references, such as articles, papers or books [35]. The graphical representation of the data is done using VosViewer, a technological tool that offers visualizations of networks and nodes with the most relevant key terms [50]. Scopus also incorporates specific extensions for generating charts in pie charts, bar charts, and line charts [51].

3.6. Statistical Analysis

At this stage, it is essential to delineate the time interval of the years under review in order to gather accurate information to support the purpose of the investigation. In the present study, a specific evaluation of the indexed publications from 2002 to 2023 is required, given that a notable increase has been observed since the first selected years. In this context, various datasets, such as the temporal distribution of publications over the period in question [52], are analysed in response to developments in this area. In the same way, different types of documents are examined, covering various sources of study, among which the analysis of sponsors stands out, essential to identify how many entities are willing to invest in research [53]. On the other hand, the analysis of the number of publications carried out by each country is of great value to understand in which geographical areas the research is concentrated [54]. Finally, cluster maps generated by interconnecting keywords present in more than one document are used, providing a visual representation of the interrelationships between terms [55].

4. Results

4.1. Searching for Information

(TITLE-ABS-KEY (chikungunya) AND TITLE-ABS-KEY (virus) OR TITLE-ABS-KEY (PCR) OR TITLE-ABS-KEY (fever) OR TITLE-ABS-KEY (elisa) OR TITLE-ABS-KEY (epidemic) OR TITLE-ABS-KEY (arbovirus) OR TITLE-ABS-KEY (SENSITIVITY) OR TITLE-ABS-KEY (specificity) OR TITLE-ABS-KEY (infection) OR TITLE-ABS-KEY (disease AND outbreak) OR TITLE-ABS-KEY (polymerase) OR TITLE-ABS-KEY (detection) OR TITLE-ABS-KEY (methods) OR TITLE-ABS-KEY (diagnosis) OR TITLE-ABS-KEY (genotype) OR TITLE-ABS-KEY (serology) OR TITLE-ABS-KEY (headache) OR TITLE-ABS-KEY (molecular AND diagnosis) OR TITLE-ABS-KEY (human)) AND PUBYEAR > 2004 AND PUBYEAR < 2024 AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "re") OR LIMIT-TO (DOCTYPE, "le") OR LIMIT-TO (DOCTYPE, "ch") OR LIMIT-TO (DOCTYPE, "cp"))

4.2. Information Selection and Filtering

In Table 2, we will begin by indicating that the number of files found is 9701 contents, thanks to the exclusion of certain documents as editorials. Errata books, retractions, dat papers in conference review that do not have a significant academic weight are to be considered in this review that aims to analyze the reality of the objective so far.

Table 2. Description of Scopus

Document Type	Amount
Article	7,187
Review	1,721
Letter	497
Editorial	311
Book chapter	289
Note	256
Conference paper	188
Short survey	121
Erratum	55
Book	14
Retracted	4
Data paper	4
Conference review	2

That is why the accepted documents are articles, reviews, letters, book chapters, notes, conferences and short communications, the latter content for passing the 100 academic documents admitted by the scopus database.

4.3. Information Extraction and Processing

The evolution of the number of publications on the detection of the Chikungunya virus using technological devices shows variations over the years. Figure 2 shows that in 2023, the last year recorded, there was a slight decrease compared to the previous year, from 864 to 796 publications. Despite this, it is essential to note that the figure of 796 publications is still remarkable, indicating a persistent interest in research in this area. If we look back at the previous decade, there is a progressive increase from 2013 to 2021, reaching a maximum of 985 publications in 2021.

This increase suggests a growing recognition of the importance of technological devices in the detection of the Chikungunya virus, serving as a basis for analyzing the evolution and future direction of research in this area. Given this trend, the proposed systematic review study could benefit from addressing the changing research landscape and identifying emerging patterns and gaps in the existing literature. In addition, when considering the goal of improving access to viral screening for vulnerable and low-income people, literature analysis could help identify potential gaps in accessibility, orienting research towards more inclusive and affordable solutions.

Figure 3 shows that the Oswaldo Cruz Foundation tops the list with 403 publications, followed by the Institut Pasteur in Paris with 312 and the CNRS Centre National de la Recherche Scientifique with 259. These state-of-the-art institutions demonstrate a great involvement in research on the detection of the Chikungunya virus using technological devices. In the academic field, the University of São Paulo stands out with 229 publications, followed by other renowned institutions such as The University of Texas Medical Branch at Galveston, Centers for Disease Control and Prevention, Aix Marseille Université and Inserm, all of which contribute significantly to the body of knowledge in this field. Analysing affiliations, it can be deduced that there is a global collaboration in research, with institutions in various countries, such as Brazil, France, the United States, India and Singapore, playing crucial roles. This diverse and collaborative approach can prove beneficial in addressing the challenges related to Chikungunya virus detection from varied perspectives and enriching the development of affordable devices for vulnerable and under-resourced communities.

Figure 4 shows that Weaver, S.C. is the most productive researcher in the field of Chikungunya virus detection using technological devices, with a total of 119 publications. He is followed by Failloux, A.B. with 91 and Merits, A. with 82. These scientists have played a crucial role in generating knowledge in this area, contributing considerably through their numerous works. In general, it is observed that a group of researchers led by Weaver, S.C., Failloux, A.B. and Merits, A., has led the research, showing outstanding participation in the scientific production.

However, there is also a wider distribution of authors who have contributed significantly, such as Ng, L.F.P., Diamond, M.S., Mahalingam, S., among others. This numerical analysis highlights the diversity of experts involved in the study of technological devices for the detection of the Chikungunya virus, which indicates a solid scientific basis to address the challenges posed by the objective of the article, especially with regard to the development of new devices accessible to low-income and vulnerable populations.

Figure 5 shows a wide range of documents related to the detection of the Chikungunya virus using technological devices. Most publications are classified as articles, with a total of 6,665 records indicating a thorough and detailed approach to research. In addition, the presence of reviews (1704) and letters (485) indicates continued interest and active debate in the scientific community on this specific topic.

This quantitative analysis reflects the diversity of approaches and perspectives that contribute to the development of effective detection methods. In terms of distribution by type of article, articles clearly predominate, highlighting the importance of more extensive and detailed research in the field of Chikungunya virus detection.

However, the presence of reviews and letters also indicates significant attention to the synthesis and discussion of existing information, a crucial aspect of informing future research and advances in the development of accessible devices for vulnerable communities. This diverse landscape of document types suggests a comprehensive and collaborative approach to addressing the challenges associated with the detection of the Chikungunya virus.

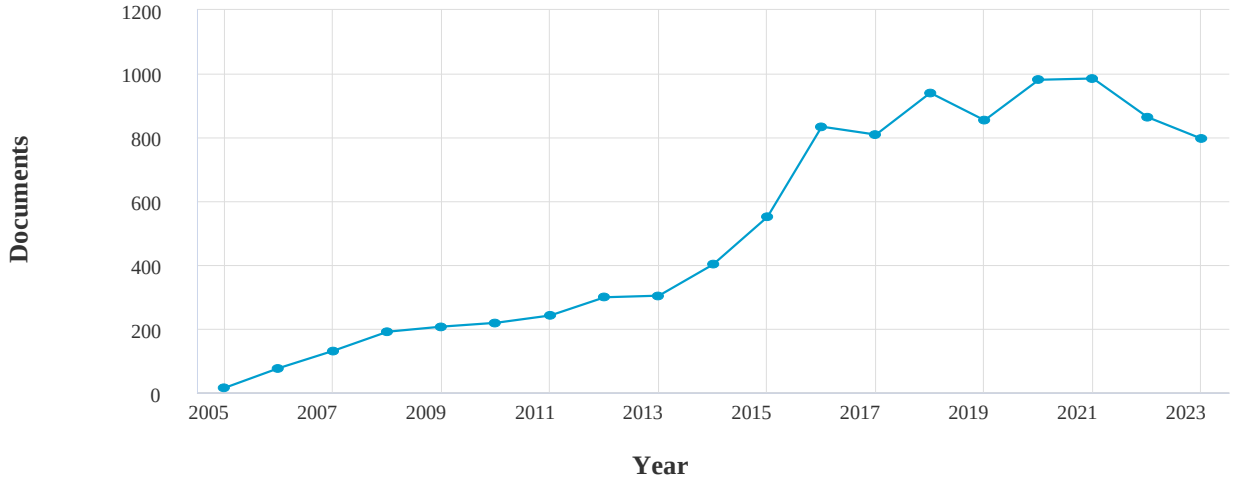

Fig. 2 Documents by year

Compare the document counts for up to 10 affiliations.

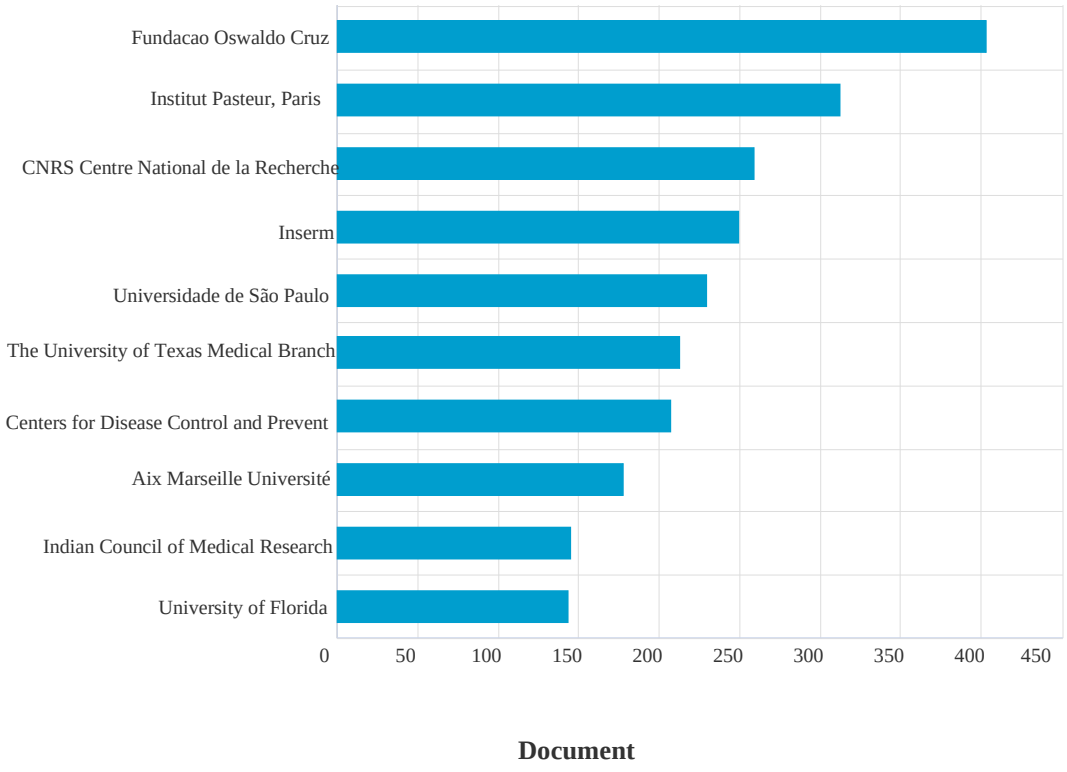

Fig. 3 Documents by affiliation

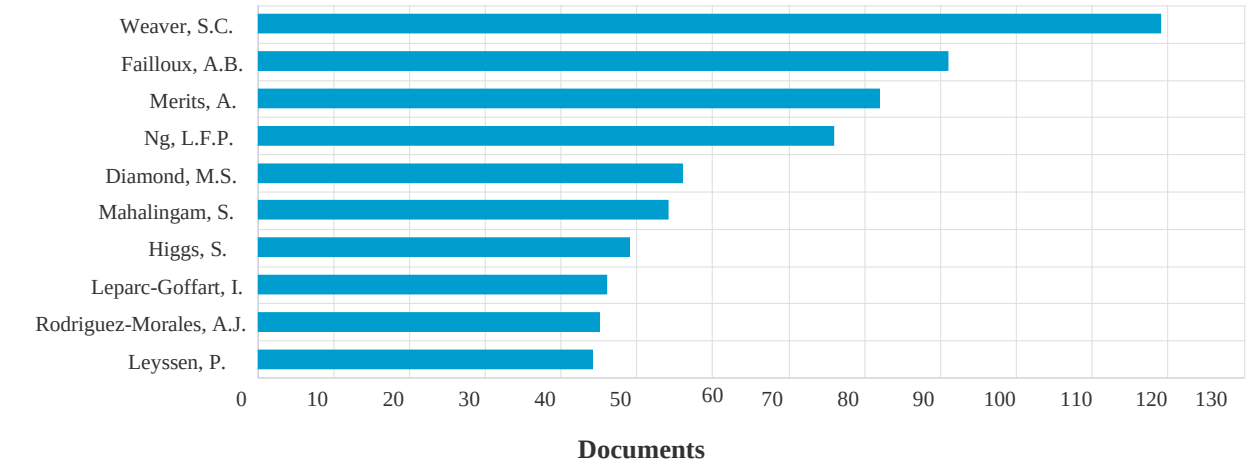

Fig. 4 Documents by author

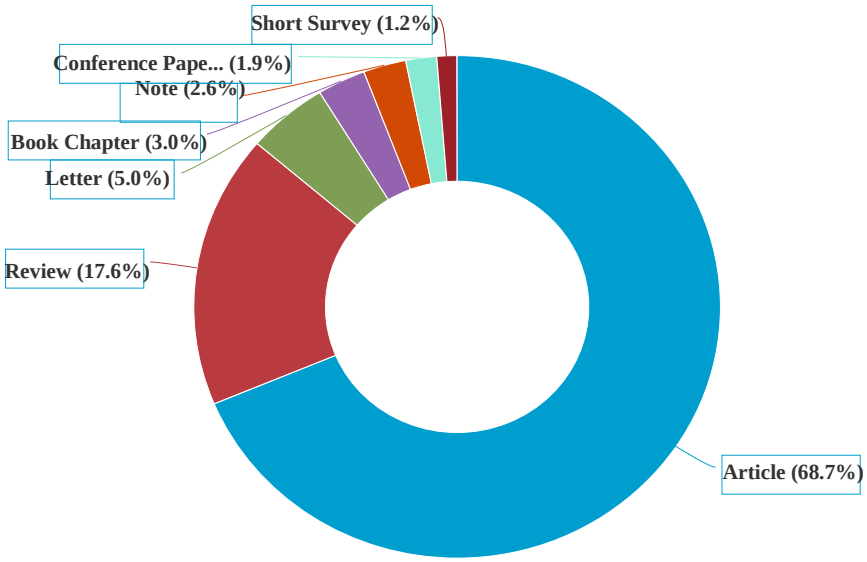

Fig. 5 Documents by type

Figure 6 shows research related to the detection of the Chikungunya virus using technological devices in various countries and territories. The United States tops the list with 2,750 publications, followed by India (1,443) and Brazil (1,283), highlighting the importance of these countries in the field of research. This distribution reflects a global trend in the exploration of detection methods, with the active participation of European, Asian and Latin American nations. It is interesting to note the inclusion of resource-constrained countries, such as Bangladesh, Indonesia, and Nigeria, which supports the study's motivation to develop devices accessible to low-income people.

In terms of regional concentration, there is a significant presence in North and South America, Europe and Asia. The numerical data demonstrate the geographical diversity of the research but also point to opportunities to encourage the participation of African countries and some regions in Asia. Despite having a limited number of publications, the inclusion of countries such as Zimbabwe and Mauritania highlights the comprehensiveness of research in the context of Chikungunya virus detection. This quantitative analysis provides a detailed view of the geographic distribution of research, supporting the need for integrative approaches in the development of sensing devices.

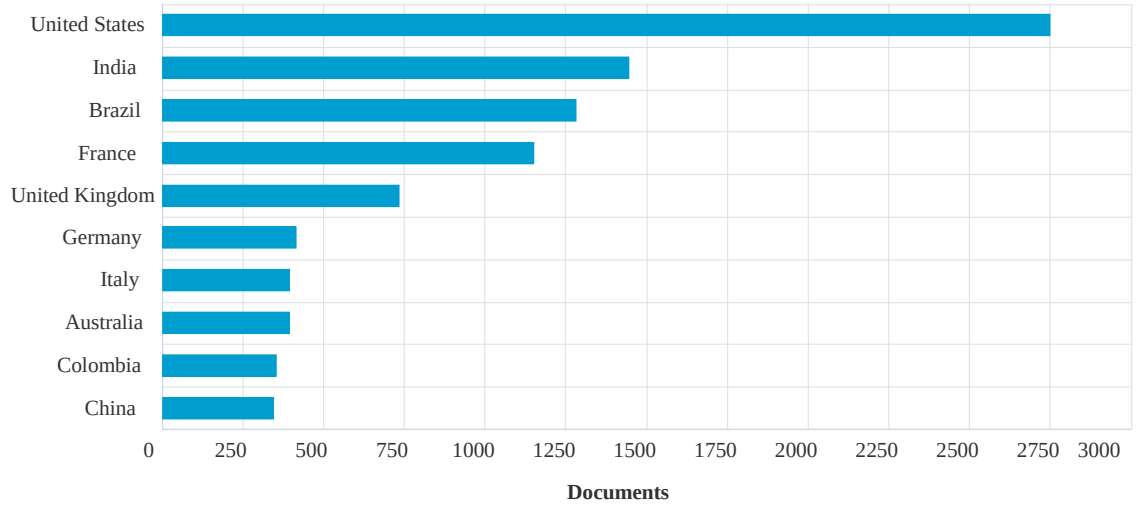

Fig. 6 Documents by country or territory

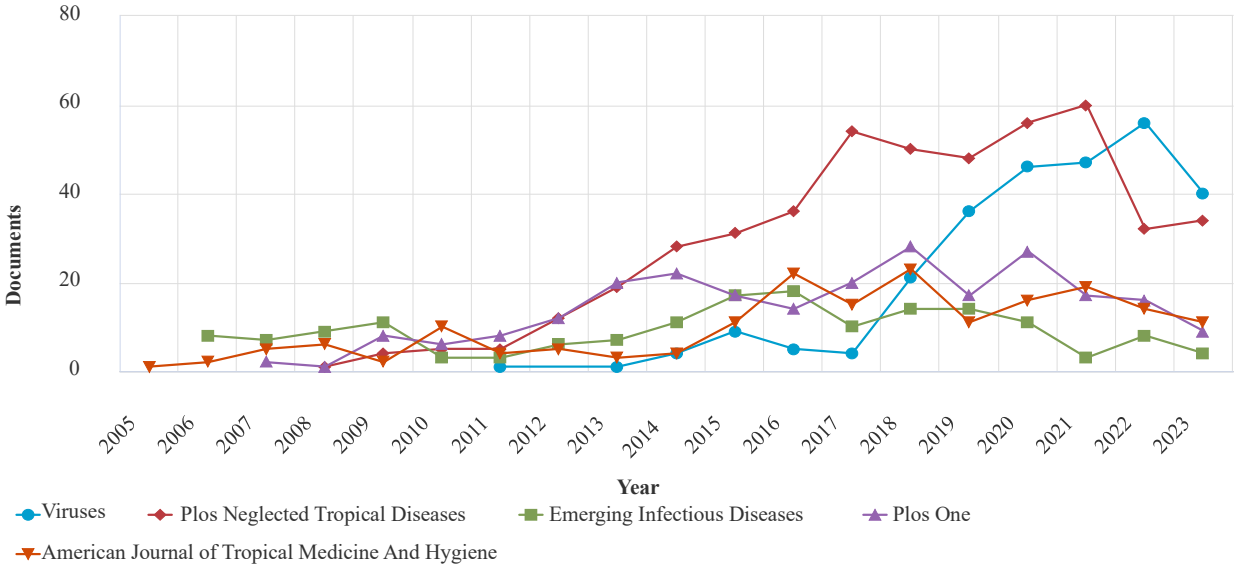

Fig. 7 Compare sources and view CiteScore, SJR, and SNIP data

In Figure 7, the systematic analysis of scientific publications related to technological devices for the detection of the Chikungunya virus reveals a considerable number of papers, with a total of 475 articles from Plos Neglected Tropical Diseases, followed by Viruses with 270 and Plos One with 244.

This review indicates a marked interest in research on detection methods, highlighting the importance of understanding and countering the spread of the virus. In addition, there is a diverse distribution in the journals that deal with the topic, indicating a broad interdisciplinary collaboration. The American Journal of Tropical Medicine and Hygiene, Emerging Infectious Diseases and Parasites And Vectors also stand out, with 184, 164 and 150 articles, respectively. This overview suggests a variety of approaches and methods employed in research, which could be valuable for the development of new detection technologies more accessible to vulnerable communities.

An examination of the numerical data shows that the study has strong financial support from a variety of national and international institutions. Major sponsors include the National Institute of Allergy and Infectious Diseases (725), the National Institutes of Health (714) and the National Council for Scientific and Technological Development (428).

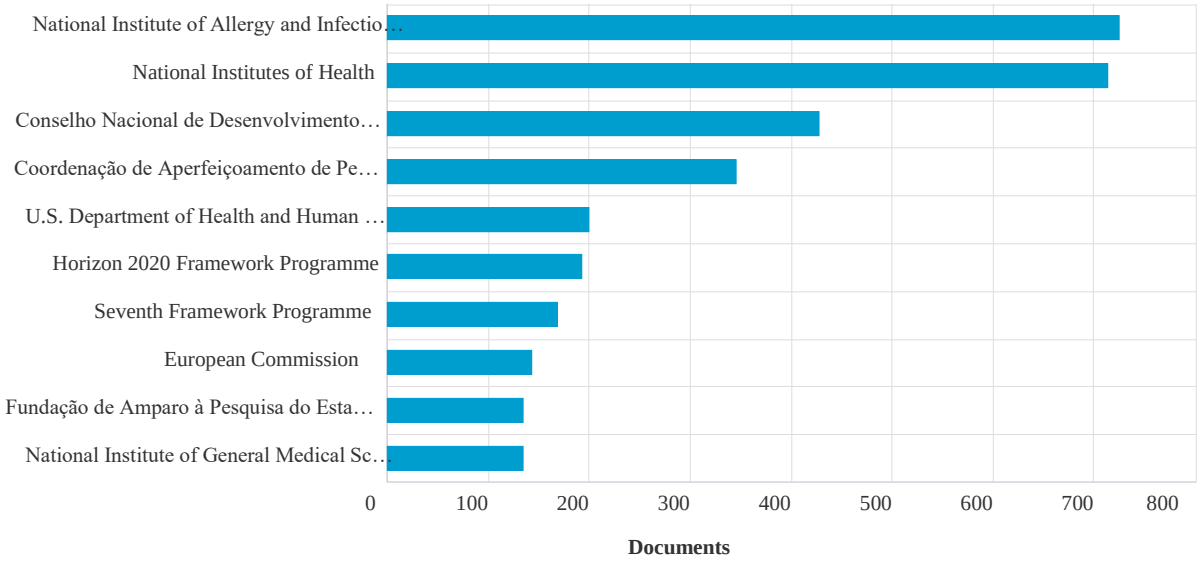

Fig. 8 Compare the document counts for up to 10 funding sponsors

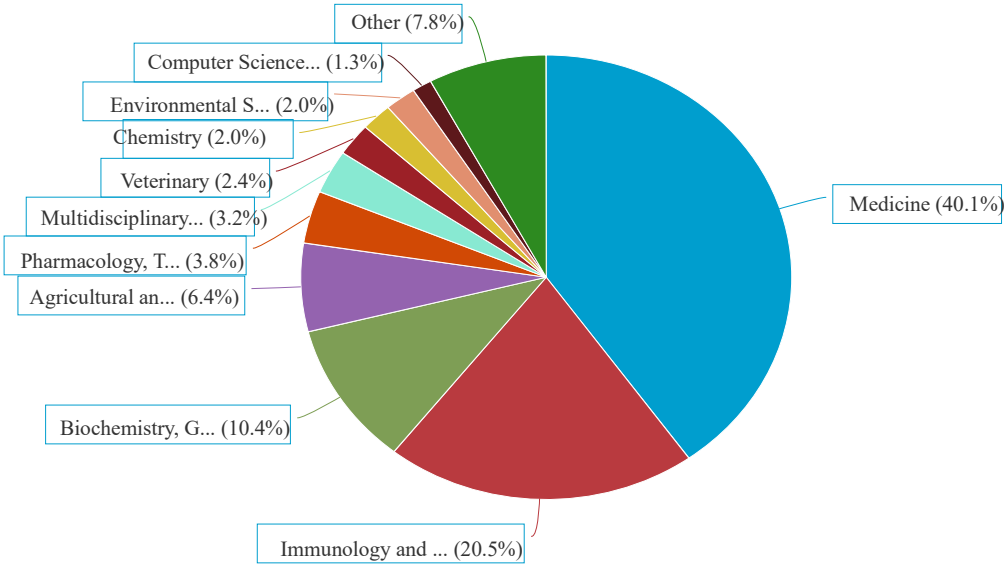

Fig. 9 Documents by subject area

These figures reflect strong interest and support, both nationally and globally, for research into the detection of the Chikungunya virus using technological devices. The diversity of sponsors suggests significant collaboration between various entities, which could contribute to the generation of more accessible and efficient solutions. In terms of the geographical distribution of the funds, the active participation of Brazilian institutions stands out, such as the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (346), the Fundação de Amparo à Pesquisa do Estado de São Paulo (135) and the Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro (120). This regional approach could have important implications for the development of screening devices tailored to the specific conditions of the local population. In addition, the presence of international bodies, such as the United States Department of Health and Human Services (200) and the World Health Organization (51), underscores the global relevance of research in this field and can foster international collaboration and knowledge sharing.

Figure 9 highlights the relevance and importance of medical research in the detection of the Chikungunya virus, evidenced by a total of 6453 publications in this main thematic area. Immunology and Microbiology also appear as significant disciplines, with 3299 publications highlighting the

connection between the immune response and the detection of viral diseases. In addition, Biochemistry, Genetics and Molecular Biology, with 1675 publications, demonstrates the importance of understanding the molecular and genetic aspects associated with the detection of viruses. In terms of distribution by discipline, the presence of medical and biological sciences stands out, indicating a multidisciplinary approach to research on the detection of the Chikungunya virus. Crucially, the presence of informatics, with 209 publications, underlines the increasing integration of technology in this field, supporting the evaluation of technological devices as detection methods. This disciplinary diversity highlights the need for collaboration between experts from different fields to develop devices accessible to people with few resources and in vulnerable situations.

5. Discussion

The comparison between Chikungunya and dengue [7] underscores the importance of early identification of symptoms, as both share similarities in the early stages. However, Chikungunya presents with more intense and long-lasting symptoms, emphasizing the importance of more accurate diagnostic methods. Current detection methods face challenges, such as antibody dependency [15], which can lead to false negatives. The proposed systematic review addresses the critical need to develop more accessible screening technologies for vulnerable communities [21]. The technological advances presented in the studies [18] [19] highlight new ways of approaching the detection of the Chikungunya virus. From nanocomposite-based biosensors [19] to Loop-Mediated Isothermal Amplification (RT-LAMP) testing [20], these approaches show promise for improving the efficiency and speed of diagnosis. The study proposing an algorithm based on early symptoms [14] indicates the crucial role of artificial intelligence in improving diagnoses. This strategy could provide earlier and more accurate detection, which is critical in the effective management of the disease. Looking at the historical production of publications it highlights the need for further research in countries such as Peru, where the burden of disease is high but document production is relatively low. In addition, international cooperation, exemplified by the partnerships between Brazil and the United States, highlights the importance of global collaboration in the fight against vector-borne diseases.

6. Conclusion

The study addressed the spread of the Chikungunya virus, a global concern due to the lack of effective measures for its prevention and the unhealthy behaviour's of the population through a study of the Chikungunya virus. Scopus and filters were used to search for information, and articles and papers were preferred. The extraction and processing of information was done using Scopus, exporting data in CSV and BibTeX formats to organize bibliographic references. The statistical analysis delimited the time interval from 2002 to 2023 and explored the temporal distribution of publications, types of documents, and sponsor participation. Cluster maps represent interrelationships between key terms. Finally, the future projection in the field of technological devices to detect the Chikungunya virus focuses on the development of innovative and accessible diagnostic methods. The continuous exploration of emerging trends in the scientific literature through platforms such as Scopus points towards the creation of advanced and efficient electronic devices. These devices will be designed to improve the prevention and control of the virus, highlighting the importance of developing effective detection methods through the use of biosensors and electrochemical methods, addressing challenges such as lack of resources and the need for effective public health interventions.

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