

# Bibliometric Analysis of Congenital Toxoplasmosis: A Ten-Year (2013-2023) Review of Research Publications

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## ABSTRACT

**Background:** *Toxoplasma gondii*, an obligate intracellular protozoan, infects more than one-third of the global population and causes toxoplasmosis, which can lead to severe fetal complications in pregnant women. The global prevalence of latent toxoplasmosis in pregnant women is 33.8%, with regional variations and risk factors, including the consumption of undercooked meat, exposure to cat feces, and consumption of contaminated water. Pregnant women lack sufficient awareness of these risk factors, necessitating enhanced education, regular screening, and counseling during antenatal care for early detection and management.

**Aim:** This study performed a comprehensive bibliometric analysis of research on congenital toxoplasmosis published between 2013 and 2023.

**Methods:** A bibliometric analysis was conducted using the Scopus database, focusing on original research publications related to congenital toxoplasmosis published between 2013 and 2023, spanning 10 years.

**Results:** A total of two thousand and one hundred (2100) publications on congenital toxoplasmosis and toxoplasmosis during pregnancy were indexed in Scopus between 2013 and 2023. Ferro E.A.V. (n=33), Villena I. (n=31), and Montoya J.G. (n=28) were the top three researchers with the most published scientific publications. A total of 134 countries contributed to congenital toxoplasmosis and pregnancy toxoplasmosis studies. The USA had the highest number of publications (n = 428) on congenital toxoplasmosis, followed by Brazil with 330 publications. Most publications were published between 2021 (n=235) and 2022 (n=245). Inserm (n=64), Fundacao Oswaldo Cruz (n=63), and Universidade de São Paulo (n=54) had the highest research output.

**Conclusion:** The number of publications on congenital toxoplasmosis has increased globally, with a slight decline during the COVID-19 period. However, the analysis revealed disparities in global research output between developed and developing countries, with underrepresentation in regions with the highest disease burden. These findings highlight the need for enhanced collaborative networks to improve research output, particularly in developing countries.

## BACKGROUND

The protozoan parasite *Toxoplasma gondii* causes toxoplasmosis, a zoonotic infection prevalent in humans and other warm-blooded animals.<sup>1</sup> Recognized more than a century ago as the most prolific parasitic organism on the planet, it can infect and multiply within all warm-blooded species, including an estimated 2.3 billion individuals.<sup>2</sup> Toxoplasmosis rarely causes symptoms in immunocompetent patients. However, severe clinical illnesses can occur in immunosuppressed individuals and developing fetuses.

Toxoplasmosis, caused by the parasite *Toxoplasma gondii*, affects up to 50% of the global population, although its prevalence varies widely by region due to differences in climate, sanitation, diet, and healthcare.<sup>3</sup> In countries such as Brazil and Ethiopia, rates exceed 60%, whereas in countries such as Canada and South Korea, they are below 5%. Most infections

are asymptomatic in healthy individuals but can cause severe complications in immunocompromised individuals and pregnant women. In North America, approximately 11% of people in the U.S. and 13–17% in Canada are infected, with higher rates among Indigenous and rural populations.<sup>4</sup> In Central America, the prevalence is higher (30–50%) due to environmental exposure, dietary habits, and limited sanitation.<sup>5,6</sup> These disparities highlight the need for targeted public health strategies to reduce the disease burden, particularly in vulnerable communities.<sup>3</sup>

Toxoplasmosis is highly prevalent across South America, with Brazil reporting some of the world's highest rates, over 70% in certain regions, due to its tropical climate, widespread cat population, and dietary habits of its people.<sup>7</sup> Argentina shows regional variation, with rural areas having over 60% prevalence, often linked to traditional farming and poor water access.<sup>8</sup> Colombia faces rates between 45% and 60%, raising concerns regarding congenital

infections in underserved areas.<sup>9</sup> In Peru, 30–50% of pregnant women are affected, particularly in the Amazon and Andes, where environmental exposure is high.<sup>10</sup> Chile has lower rates (30–40%) due to urbanization and improved food safety, although vulnerable groups remain at risk.<sup>11</sup>

The prevalence of toxoplasmosis varies widely across Europe because of differences in dietary habits, hygiene practices, and public health measures. In France, up to 50% of the population has historically been exposed to the parasite, largely due to undercooked meat consumption and pet ownership; however, recent health initiatives have reduced infection rates.<sup>12,13</sup> Germany shows a strong age-related pattern, with only 20% prevalence among young adults (18–29 years) but up to 77% among older adults (70–79 years), reflecting cumulative lifetime exposure.<sup>14</sup> Italy reports a national prevalence of between 20% and 40%, with higher rates in the south due to traditional food practices, such as consuming handcrafted cured meats.<sup>15</sup> Poland has a prevalence of approximately 40%, especially in rural areas, where exposure to contaminated soil and undercooked meat is more common.<sup>16</sup> In contrast, the United Kingdom has one of the lowest rates in Europe (10–15%) owing to better hygiene, lower raw meat consumption, and effective food safety regulations.<sup>17</sup>

In Asia, the prevalence of toxoplasmosis varies widely owing to regional differences in the environment, diet, and public health practices. Iran reports one of the highest rates, with seroprevalence reaching up to 63.9%, especially in rural and semi-urban areas, where undercooked meat and contaminated soil are common risk factors.<sup>18</sup> China has a lower national average (8–12%), although western provinces show higher rates owing to traditional farming and dietary habits.<sup>19</sup> India displays a broad range (20–40%), with the northern and northeastern regions being more affected due to environmental and cultural factors.<sup>20</sup> Japan maintains one of the lowest prevalence rates, consistently below 10%, owing to strict food safety standards and minimal raw meat consumption.<sup>21</sup> Thailand has a moderate prevalence (20–30%), particularly in rural farming communities where exposure to contaminated sources is more likely, highlighting the need for greater awareness and preventive measures.<sup>22,23</sup>

Africa has one of the highest average toxoplasmosis seroprevalence rates globally, at approximately 61.4%, which is significantly higher than North America's 17.5% and Asia's 16.4%. In Nigeria, the prevalence ranges from 40% to 60%, particularly affecting pregnant women and immunocompromised individuals due to poor sanitation and large feral cat populations.<sup>24</sup> Ethiopia reports even higher rates, often exceeding 60%, with both urban and rural populations at risk owing to limited access to clean water and health education.<sup>25</sup> South Africa shows a moderate to high prevalence with regional disparities, especially in informal settlements, where close human-animal contact and inadequate sanitation increase transmission risks. Ghana, particularly in rural areas, reports some of the highest rates in West Africa (50–70%), driven by environmental and socioeconomic challenges. These findings underscore the urgent need for targeted public health interventions across the continent of Africa.<sup>26</sup>

In Kenya, the prevalence of toxoplasmosis among pregnant women and individuals living with HIV is a growing public health concern.<sup>27</sup> Although national-level data are limited, regional studies suggest that seroprevalence rates among pregnant women can range from 30% to over 50%, particularly in areas with poor sanitation and limited access to healthcare.<sup>28</sup> This is especially critical for individuals living with HIV, whose compromised immune systems make them more susceptible to opportunistic infections such as *Toxoplasma gondii*. This situation is particularly pronounced in rural areas, where environmental exposures, such as contact with contaminated soil, consumption of undercooked meat, and inadequate access to clean water, contribute to higher infection rates. A study conducted in neighboring Rwanda, with support from the University of Nairobi, highlighted similar risk factors and emphasized the role of poor sanitation and limited health education in increasing the vulnerability of pregnant women.<sup>29–31</sup>

*Toxoplasma gondii* infection has been widely implicated as a major contributor to reproductive disorders in animals, including abortion, stillbirth, and neonatal mortality, particularly in small ruminants such as sheep and goats.<sup>32</sup> Numerous studies have demonstrated a strong association between *Toxoplasma gondii* infection and adverse reproductive outcomes, including abortion, stillbirth, and neonatal mortality. For instance, high seroprevalence rates in Egyptian sheep and goats are linked to poor reproductive performance in these animals.<sup>33</sup> Comprehensive reviews by two studies have further emphasized the ability of the parasite to cross the placenta, causing fetal death and congenital infection.<sup>34–35</sup>

Toxoplasmosis poses a significant economic and public health burden, particularly in Eastern Africa, where its transmission is influenced by a combination of environmental, cultural, and socioeconomic factors. The disease affects both humans and livestock, with an estimated seroprevalence of 30–60% in some East African populations.<sup>36</sup> In livestock, particularly sheep and goats, toxoplasmosis is a leading cause of reproductive failure, contributing to substantial economic losses in rural agricultural areas.<sup>37–39</sup>

Eastern Africa is considered a high-risk region because of the close cohabitation of humans and animals, particularly in pastoralist and agro-pastoralist societies. Cultural practices, such as the consumption of undercooked meat, poor sanitation, and limited access to veterinary and healthcare services, further exacerbate the spread of the disease. Additionally, poverty and inadequate public health infrastructure hinder effective disease surveillance and control efforts.<sup>40</sup>

Although often asymptomatic, toxoplasmosis poses a serious risk during pregnancy because the infection can be transmitted transplacentally to the fetus, potentially leading to severe congenital complications. The prevalence of *Toxoplasma gondii* infection among pregnant women varies significantly across East Africa. For instance, studies have reported seroprevalence rates of approximately 51.3% in Ethiopia<sup>41</sup>, 42.89% as a pooled average across African countries, and as high as 80.3% in the Democratic Republic of the Congo.<sup>42</sup> The likelihood of transmitting the infection from mother to child is influenced by the

stage of pregnancy in which the maternal infection occurs, with a minimal risk of approximately 5% in the first trimester and a potential risk of approximately 90% in the final trimester of pregnancy.<sup>43</sup> During pregnancy, the severity of fetal disease is often greater when an infection occurs earlier than when it occurs later.

As a preventive measure, it has been suggested that pregnant women who lack antibodies at the start of their pregnancy should undergo comprehensive serological testing to accurately identify active maternal infections.<sup>44</sup> Interventions are needed to prevent congenital infections if there is a risk of fetal infection. Upon verification of maternal infection, polymerase chain reaction (PCR) for amniotic fluid prenatal diagnosis is advised.<sup>45</sup> In such cases, it is crucial to initiate preventive treatment with spiramycin as soon as possible to minimize the likelihood of transmission and reduce infection severity.<sup>46</sup>

Polymerase chain reaction (PCR) is a widely used molecular diagnostic tool for detecting *Toxoplasma gondii* DNA, particularly in cases of congenital toxoplasmosis or in immunocompromised individuals.<sup>38</sup> Although PCR offers rapid and specific detection, its sensitivity can vary depending on the sample type and timing of infection. For instance, PCR performed on amniotic fluid during the second trimester has shown high sensitivity, but its accuracy decreases when used in maternal blood or chronic infections.<sup>47</sup> Moreover, false negatives can occur if the parasite load is low or if the sample is not properly handled, limiting its reliability as a stand-alone diagnostic tool. Therefore, PCR is often used in conjunction with serological tests to improve diagnostic accuracy.

If fetal infection is confirmed, the typical maternal treatment involves a combination of pyrimethamine, sulfonamide, and folinic acid.<sup>48</sup> Although newborns with congenital infections may not display symptoms at birth, they are at risk of developing long-term complications, including visual impairments.<sup>49</sup> In cases of congenital infection, conditions such as retinochoroiditis, cerebral calcifications, hydrocephalus, and neurocognitive impairment may develop in the offspring.<sup>49-51</sup> Congenital infections must be definitively diagnosed at birth, and appropriate management, specific therapy, and multidisciplinary counseling should be provided for follow-up care of the affected children.<sup>48,52</sup>

The treatment of toxoplasmosis, especially during pregnancy, typically involves spiramycin or a combination of pyrimethamine, sulfadiazine, and folinic acid.<sup>53</sup> Spiramycin is preferred during early pregnancy because of its ability to reduce transplacental transmission; however, it does not effectively cross the placenta, limiting its efficacy in treating fetal infections.<sup>54</sup> Combination therapy, although more effective in treating active infections, is associated with potential side effects such as bone marrow suppression, hypersensitivity reactions, and gastrointestinal disturbances.<sup>55</sup> These limitations have prompted the exploration of alternative strategies, including novel drug formulations, immunotherapy, and preventive measures such as improved food hygiene and public health education.<sup>56-58</sup> Routine screening and early intervention are critical components of effective management of toxoplasmosis in high-risk groups.

Interventions for congenital toxoplasmosis must

consider the often-asymptomatic nature of the infection at birth and its long-term consequences if left untreated. In France, where systematic prenatal screening and treatment programs have been implemented, studies have shown a significant reduction in the severity of congenital infections, justifying public health investment.<sup>59</sup> Brazil, which has one of the highest burdens of congenital toxoplasmosis globally, has demonstrated that early diagnosis and treatment can reduce ocular and neurological complications; however, challenges remain in rural areas.<sup>60</sup> In the United States, where routine screening is not universally adopted, the CDC estimates 400–4,000 congenital cases annually, with many going undetected until symptoms manifest. In Colombia, targeted screening in high-prevalence regions has shown promise; however, cost-effectiveness remains a concern owing to limited healthcare resources.<sup>61</sup> In Austria, a long-standing national screening program has led to a marked decline in severe congenital outcomes, reinforcing the benefits of early interventions.<sup>62</sup>

Congenital toxoplasmosis (CT), caused by the vertical transmission of *Toxoplasma gondii* from mother to fetus, remains a significant public health concern because of its potential to cause severe neurological and ocular complications in newborns.<sup>63</sup> Despite advancements in diagnostics and prevention, the global burden of CT remains significant, particularly in low- and middle-income countries where screening and treatment resources are limited. Over the past decade, research on CT has expanded across various domains, including epidemiology, diagnostics, treatment, and public health interventions. Bibliometric analysis offers a quantitative approach to assess scientific output, identify influential contributors, and uncover research trends and gaps. A comprehensive bibliometric review spanning 2013–2023 is essential to map the trajectory of CT research, evaluate collaboration networks, and guide future priorities. Such an analysis can highlight research disparities between high-income and resource-limited settings, where the disease burden is most significant. Few bibliometric analyses have examined the global CT research landscape over the past decade. Addressing this gap is crucial for informing researchers, policymakers, and funders to enhance CT interventions and research strategies.

Despite the considerable global impact of this issue, the distribution of research output remains uneven, with certain regions and institutions contributing disproportionately to the scholarly literature. Bibliometric analysis provides a systematic approach to evaluate the volume, trends, and impact of research in this domain. This method facilitates the identification of prolific authors, influential journals, and leading countries or institutions, thereby highlighting knowledge gaps and underrepresented regions. Such insights are essential for guiding future research priorities and promoting international collaboration.

Bibliometric analysis of congenital toxoplasmosis helps to assess research progress and guides evidence-based policies and funding. This analysis tracked shifts in research emphasis and evaluated global research dissemination. Bibliometric tools have been used to identify thematic clusters and trends that are critical for forecasting research trajectories. Given the burden of toxoplasmosis



in low- and middle-income countries, such analyses can highlight research disparities to promote equitable global health initiatives. This study aimed to investigate the publication output of congenital toxoplasmosis cases across different regions.

### Aim/Objective

This study aimed to perform a comprehensive bibliometric analysis of research on congenital toxoplasmosis and toxoplasmosis during pregnancy published between 2013 and 2023.

## METHOD

### Type of Study

This study employed bibliometric analysis to evaluate global research trends, productivity, and collaboration patterns in congenital toxoplasmosis and pregnancy-related toxoplasmosis over the past ten years (2013–2023). Bibliometric methods were used to quantitatively assess publication outputs, citation metrics, and thematic evolution within the field.

### Data Source

The primary data source for this analysis was Scopus because of its comprehensive indexing of peer-reviewed literature and robust citation-tracking capabilities. Additional databases, such as PubMed, were consulted to ensure the completeness and cross-validation of the results.

### Search Strategy.

Relevant publications were searched using the terms “*Toxoplasma gondii*,” OR “Toxoplasmosis” AND “Pregnancy” OR “Congenital toxoplasmosis” AND (2013–2023) as the search criteria. The search was limited to articles published in English between 2013 and 2023. Titles, abstracts, and keywords were examined to identify relevant publications.

### Inclusion and Exclusion Criteria

The review included publications focused on congenital toxoplasmosis and toxoplasmosis during pregnancy, including studies on the epidemiology, diagnosis, treatment, prevention, and public health implications of the disease. Articles unrelated to congenital toxoplasmosis, non-English publications, editorials, letters, and non-peer-reviewed content were excluded.

### Data Extraction and Analysis

Bibliometric data were exported in both RIS and CSV formats from the Scopus database, allowing for a comprehensive analysis of the information. Microsoft Excel was used as the primary tool for data processing, facilitating data cleaning and additional exploratory analysis. This analysis focused on investigating annual publication trends and identifying the most productive authors, leading institutions, and contributing countries in the field. To effectively summarize the publication trends and patterns of authorship, descriptive statistics were employed, providing insights into the dynamics of research output over time and highlighting the key contributors in this area of study.

### Study Quality and Risk of Bias Assessment

Bibliometric studies primarily focus on assessing trends and patterns in the scientific literature rather than evaluating the intrinsic quality of clinical research. Several steps were taken to enhance the accuracy of the analysis. Duplicate records were systematically identified and removed to ensure that each study was counted only once. Additionally, a thorough manual screening process was implemented to exclude articles deemed irrelevant to the objectives of the study. This careful vetting process helped refine the dataset and provided a more reliable foundation for concluding the bibliometric analysis.

### Ethical Approval

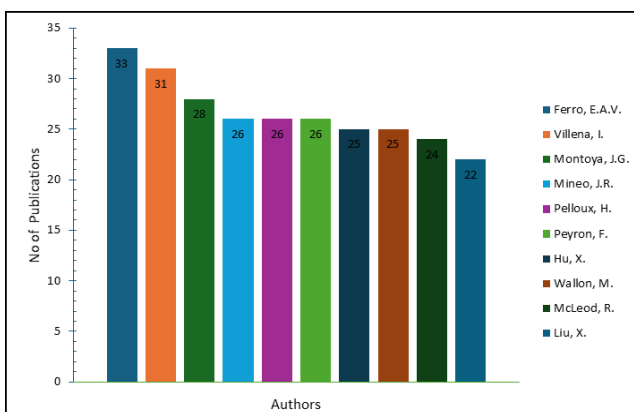
The data for this study were collected from the Scopus database, an open research database. Additionally, the study did not involve the use of live animals; therefore, it did not require approval from an institutional review board and informed consent was not necessary.

## RESULTS

### The Leading Author's Analysis

Ferro, E.A.V., has published thirty-three (33) influential papers, making him the most prolific toxoplasmosis author. This was followed closely by Villena, I., with thirty-one (31) publications, and Montoya, J. G., with twenty-eight (28) publications. Together, these authors have significantly advanced our understanding of toxoplasmosis through their research (Figure 1).

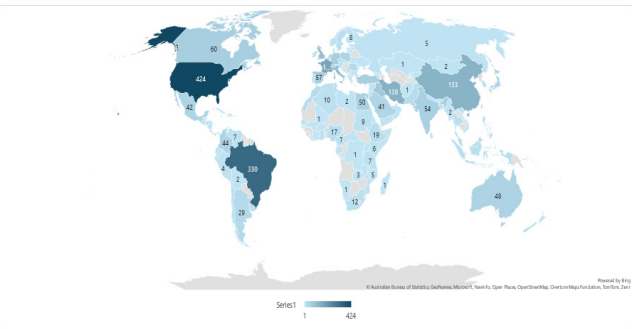
**FIGURE 1: Top Ten Authors with the Highest Number of Publications between 2013 and 2023**



### Publications by Region Analysis

The United States ranked first from 2013 to 2023, with four hundred and twenty-four (424) publications that evaluated the participating countries in the toxoplasmosis study. Brazil, which has a high prevalence of toxoplasmosis, had three hundred and thirty (330) publications on congenital toxoplasmosis. The African continent had the least number of publications, with ten (10) publications from Tunisia (Figure 2).

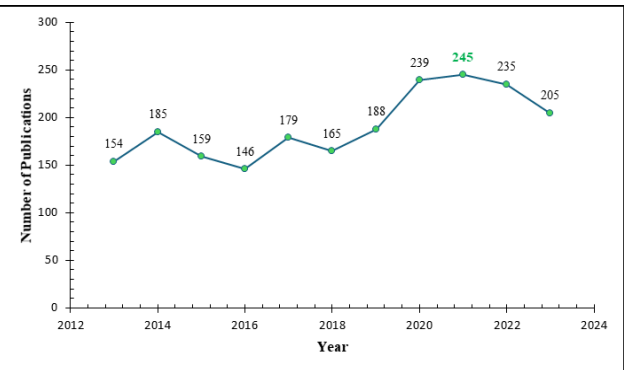
**FIGURE 2: Countries with Publications on Toxoplasmosis in Pregnancy between 2013 and 2023**



**Yearly Publication Output Analysis**

The results of this study demonstrated that two thousand and one hundred (2100) articles focusing on congenital toxoplasmosis were published between 2013 and 2023 and indexed in Scopus. This study revealed a consistent increase in global research on congenital toxoplasmosis and toxoplasmosis during pregnancy between 2016 (n=146) and 2021 (n=245); however, this number will eventually drop in 2023 (Figure 3).

**FIGURE 3: A Ten-Year Global Research Output on Toxoplasmosis in Pregnancies**

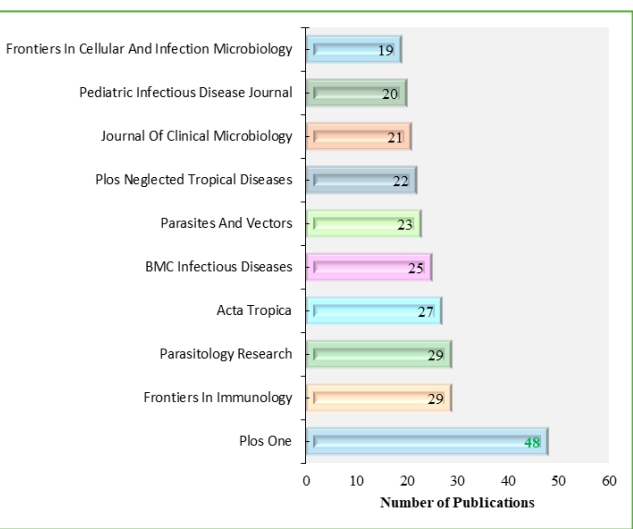


**Publication by Journals, Funding Organizations, and Institutions Analysis**

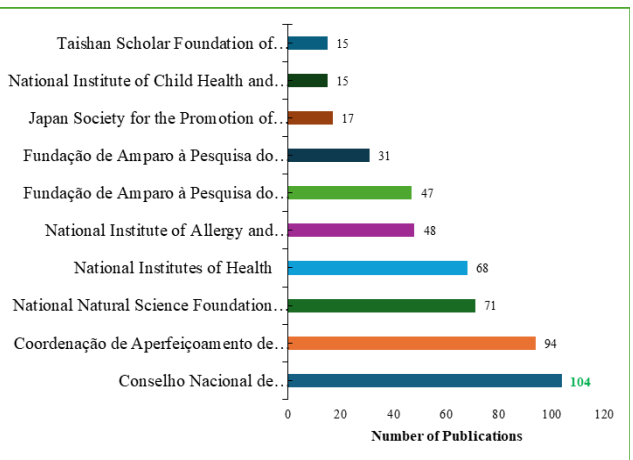
Studies on congenital toxoplasmosis and toxoplasmosis during pregnancy have been published in various journals over the last 10 years (2013-2023). PloS One had the highest number of publications (48) on congenital toxoplasmosis. Frontiers in Immunology and Parasitology Research ranked second and third, respectively, with twenty-nine (29) and twenty-six (26) publications, respectively. The top ten journals for congenital toxoplasmosis research were Acta Tropica twenty-seven (27) publications, BMC Infectious Diseases

twenty-five (25) publications ), Parasites and Vectors twenty-three (23) publications, PLOS Neglected Tropical Diseases twenty-two (22) publications, Journal of Clinical Microbiology twenty-one (21) publications, Pediatric Infectious Disease Journal twenty (20) publications, and Frontiers in Cellular and Infection Microbiology nineteen (19) publications. Additionally, two hundred and sixty-eight (268) publications were published in ten journals, representing 22% of all publications on congenital toxoplasmosis (Figure 4-6).

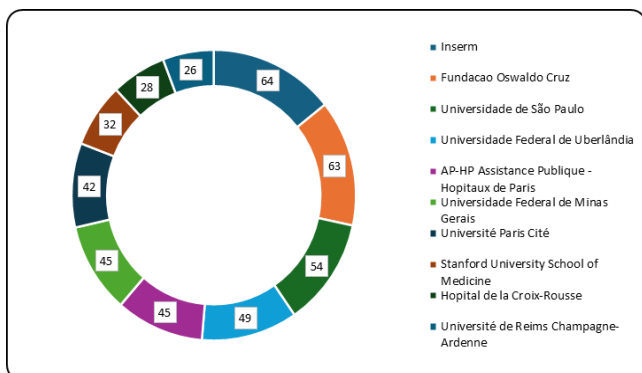
**FIGURE 4: The Top Ten Scientific Journals with the Highest Number of Research Articles Published between 2013 and 2023**



**FIGURE 5: Leading Funding Organization With the Highest Number of Publications Between 2013 and 2023**



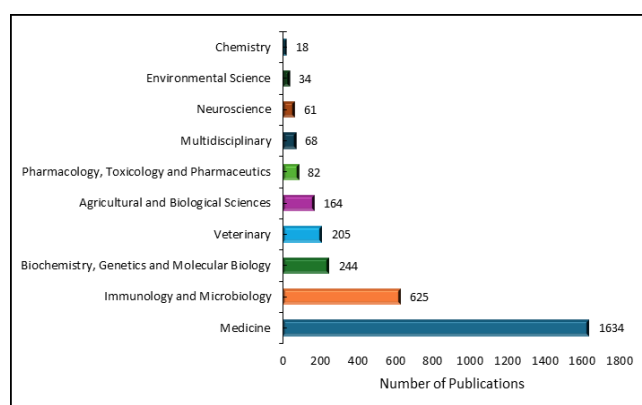
**FIGURE 6: Leading Institutions with Authors' Publishing Studies on Toxoplasmosis in Pregnancy (2013 to 2023)**



### Publication by Subject Area Analysis

Most top-ranking journals that publish research on toxoplasmosis belong to the subject categories of medicine, immunology, and microbiology, with 1634 and 625 publications published in each respective category. There were two hundred and forty-four (244) publications in the Biochemistry, Genetics, and Molecular Biology category; two hundred and five (205) in the Veterinary category; one hundred and sixty-four (164) in the Agricultural and Biological Sciences category; eighty two (82) in the Pharmacology, Toxicology, and Pharmaceutics category; sixty-eight (68) in the Multidisciplinary category; sixty-one (61) in the Neuroscience category; thirty-four (34) in the Environmental Science category; and eighteen (18) in the Chemistry category (Figure 7).

**FIGURE 7: Subject Area with the Highest Number of Research Outputs from 2013 to 2023**



## DISCUSSIONS

Our analysis revealed a significant increase in the number of publications on congenital toxoplasmosis and toxoplasmosis during pregnancy over the past decade, indicating heightened interest and research activity in this area. Previous studies have established the severe health implications of congenital toxoplasmosis, including its impact on the neurological development of affected neonates.

The global incidence and disability-adjusted life years (DALYs) of congenital toxoplasmosis are estimated to be 190,100 cases and 1.2 million, respectively, with a substantial burden in South American countries, particularly Brazil.<sup>64</sup> Moreover, seroprevalence among women of childbearing age varies from 4% to 85%.<sup>65</sup> The risk of vertical transmission is contingent on the gestational age at which maternal infection occurs; it is minimal during the first trimester and potentially reaches 90% in the final days of gestation.<sup>48</sup> Notably, only a minority of adult cases of toxoplasmosis are transmitted.<sup>66</sup>

All routes of infection are epidemiologically important and may vary among ethnic groups and geographical locations. Therefore, it is crucial to understand the probable routes of horizontal transmission of infection to humans and the sources of infection in each population to develop effective strategies. Prevention of infection in high-risk groups such as non-immune pregnant women and immunocompromised patients, particularly those with acquired immunodeficiency syndrome (AIDS).<sup>67,68</sup>

A bibliometric study of toxoplasmosis publications on the Web of Science indicated an increase in the number of publications on toxoplasmosis over 17 years (2000–2016).<sup>69</sup> As no bibliometric work has been conducted using the Scopus database, this study aimed to define the status of global *Toxoplasma* studies. However, concerns regarding the lack of well-controlled studies and the potential costs and harms of these programs outweigh their benefits in practical settings.

Moreover, according to practice guidelines, obstetricians and gynecologists in some countries have not recommended universal screening for *Toxoplasma gondii* infections in pregnant women.<sup>70,71</sup> However, some studies and systematic reviews have shown conflicting results regarding prenatal screening and treatment of congenital *Toxoplasma gondii* infection.<sup>72-74</sup> Well-controlled studies are required to determine the long-term effectiveness of these interventions.

Our study demonstrated that the number of publications on *Toxoplasma gondii* has increased over the past decade. However, compared to the number of toxoplasmosis publications between 2016 and 2021, there has been an overall decrease in the number of publications between 2022 and 2023.

Research on congenital toxoplasmosis has focused on its prevalence, diagnosis, prevention, and clinical manifestations. Seroprevalence rates in pregnant women vary by region, ranging from below 10% in China<sup>75</sup> to 4.8/1000 in Brazil, with an incidence of 0.9/1000 live births.<sup>76</sup> Recent studies have highlighted the burden of infection-induced ocular disease.<sup>77</sup> and its association with neuropsychiatric disorders in mothers and developmental



issues in newborns.<sup>78</sup>

Prevention strategies have evolved to include broader population approaches, such as freezing meat and cat vaccines.<sup>79</sup> Demographic characteristics and known risk factors are insufficient to identify all at-risk mothers, suggesting that food and water contamination by oocysts is a significant source of infection and necessitates the development of comprehensive preventive strategies.<sup>80-82</sup>

Diagnostic advances include the use of polymerase chain reaction (PCR) to detect *Toxoplasma gondii* in clinical samples,<sup>83,84</sup> and tissue culture methods for early prenatal diagnosis.<sup>85-87</sup> Future studies should focus on developing effective prevention strategies, improving diagnostics, and understanding the broader health implications of *Toxoplasma gondii* infections.

Congenital toxoplasmosis, caused by *Toxoplasma gondii* infection during pregnancy, remains a significant global public health issue but has received less attention than other parasitic diseases.<sup>88</sup> Research on this condition varies regionally; for example, limited information is available on China because of language barriers.<sup>75</sup> This indicates a gap in our understanding of the global status of maternal and congenital *Toxoplasma gondii* infections.

Despite being one of the most prevalent parasitic diseases, advancements have been made in the diagnosis and management of congenital Chagas disease.<sup>89</sup> Polymerase chain reaction (PCR) techniques have also improved the diagnostic accuracy.<sup>90</sup> Immunoglobulin G avidity testing provides better timing of maternal infection.<sup>91</sup> However, there is a need for better drugs, defined screening strategies for pregnant women, and improved diagnostic tests.<sup>91</sup> The lack of awareness, diagnostic methods, and control strategies in regions such as Mozambique and Southern Africa highlights the need for more focused research and public health initiatives to address this issue.<sup>92</sup>

Our findings contradict earlier reports, suggesting a decline in research on congenital toxoplasmosis. This indicates an ongoing research interest and activity in this field. Global research on congenital toxoplasmosis over 110 years (1900-2012) identified 13,044 publications by 26,483 authors from 125 countries, indicating sustained research efforts.<sup>93</sup> The research landscape for congenital toxoplasmosis is diverse, focusing on epidemiology, diagnosis, treatment, and prevention.<sup>90,94,95</sup> This diversity suggests continued interest and activity in this area. Thus, the context does not support claims of declining research output on congenital toxoplasmosis, but rather indicates robust and ongoing global research efforts.

Bibliometric data revealed that a significant portion of research output was generated by high-income countries, highlighting a marked disparity in global research contributions to this field.<sup>96</sup> Among these nations, the United States emerged as the leader, producing the highest number of publications. However, this contradicts the findings of a bibliometric analysis by,<sup>69</sup> who used the Web of Science database to conduct their analysis. This trend underscores the concentration of research resources and expertise in economically advanced regions, which may influence the overall landscape of scientific discovery and innovation worldwide.

This study presents a comprehensive overview of

the research landscape surrounding congenital toxoplasmosis, shedding light on significant trends in the field, identifying prominent researchers who have made important contributions, and highlighting promising areas that warrant further exploration. This bibliometric analysis can guide policymakers and funders regarding the current research status and future priorities of congenital toxoplasmosis (CT). Bibliometric studies have analyzed research trends and identified gaps, as seen in CT research over the past decade, revealing regional disparities in literature representation.<sup>97</sup> This can help allocate resources to the understudied areas. Furthermore, bibliometric analysis highlighted key research themes, influential authors, and institutions, providing an overview of the research landscape.<sup>69</sup> However, bibliometric data may not always align with the actual health priorities of a population. Thus, multiple strategies, including bibliometric analysis, are essential for setting research priorities. Bibliometric analysis is a valuable tool for assessing CT research but should be complemented with other methods to ensure a comprehensive understanding of research needs and priorities.<sup>98</sup>

Although our study presents a detailed overview of the subject, it is essential to highlight that bibliometric analyses have some limitations. Specifically, the accuracy and availability of indexed data in the Scopus database can significantly influence the results.<sup>99</sup> Inconsistent data entries, potential gaps in coverage, and variations in publication standards may have affected the comprehensiveness of our findings and the conclusions drawn. Thus, careful interpretation of the data is necessary when assessing their reliability and relevance to the research objectives.

This bibliometric analysis is pioneering in its focus on congenital toxoplasmosis over the last ten years.<sup>97</sup> By systematically examining and evaluating the published research in this area, we aimed to provide a comprehensive overview of the trends, patterns, and advancements in the field. This unique perspective not only highlights the evolution of research on congenital toxoplasmosis but also identifies key contributors, essential publications, and potential areas for future studies.

### Limitation

One notable limitation of this study was the exclusion of publications not written in English. This restriction may have inadvertently led to insufficient representation of research findings and perspectives from non-English-speaking countries and regions. Consequently, important insights and data from diverse linguistic contexts may have been overlooked, potentially affecting the overall conclusions and applicability of this study's findings.

### CONCLUSION

This study provides a comprehensive assessment of global research productivity on toxoplasmosis over the past decade. These findings offer critical insights for funding bodies and policymakers aiming to foster equitable scientific collaboration. Notably, the analysis highlights a growing body of work on congenital toxoplasmosis but also reveals significant disparities in research contributions, particularly from regions with the highest disease burden, such as sub-Saharan Africa.

To bridge these gaps, it is essential to strengthen international research networks and promote inclusive collaboration between developed and developing countries. Identifying and engaging key researchers across these regions could catalyze more balanced and impactful biomedical research efforts. This analysis serves as a foundational resource for researchers, healthcare professionals, and decision-makers, guiding future research priorities and supporting a more coordinated global response to Congenital Toxoplasmosis.

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