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RESEARCH ARTICLE

Global Bibliometric Research on a Neglected Food-Borne Parasite: *Taenia solium*

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ABSTRACT

This study analyzes publications on *Taenia solium*, the pork tapeworm, using Web of Science data from 2000-2023. It aims to characterize scientific production, distribution of contributions, and thematic research characteristics, exploring trends, prominent journals, affiliations, and global contributions to better understand this neglected tropical disease. For this bibliometric study, articles related to *Taenia solium*, published from January 1st, 2000, to September 30th, 2023, were extracted from the Web of Science Core Collection database. The analysis encompassed an exploration of the scholarly output's evolution and an examination of the diverse subject areas covered in the corpus of research. The data were systematically analyzed using the Bibliometrix 2.0 package within the RStudio application, providing a robust and comprehensive evaluation of the research landscape surrounding *Taenia solium* during the specified timeframe. An extensive analysis was conducted on a total of 4.167 articles published from 2000 to 2023. In the realm of average citations, 2018 emerged as a peak year. The journals contributing significantly to this body of work fell within the categories of tropical medicine and veterinary science. While the United States led in productivity with 896 articles, noteworthy attention is drawn to the endemic nature of *Taenia solium* in countries like India (748 articles), Brazil (615 articles). It's worth noting, however, that some endemic regions in Africa (285 articles) and Oceania (72 articles) exhibited comparatively lower participation in research efforts. This comprehensive examination aids researchers in gaining insights into its temporal evolution, providing a global audience with structured information to discern both the key areas of focus and potential research gaps. This emphasis becomes especially crucial in the context of developing endemic countries, where the encouragement of robust research practices can significantly contribute to advancing our understanding of *Taenia solium*.

INTRODUCTION

Neglected tropical diseases are a group of infectious diseases that primarily affect populations in tropical regions. They are characterised by their prevalence in poor communities where access to adequate healthcare, sanitation and education is limited (García et al., 2003). Efforts to address these diseases include preventive measures, community-based interventions, mass drug administration and research into improved diagnostics and treatments. International organisations, governments and non-governmental organisations collaborate to control and eliminate these diseases, reducing the suffering experienced by affected communities (García et al., 2000; Rajshekhar et al., 2003; Torgerson et al., 2015; Boelaert et al., 2016; WHO, 2023). Neglected tropical diseases primarily consist of parasitic infections, including foodborne trematodiases, dengue fever, Chagas disease, leprosy, draconculiasis, schistosomiasis, trypanosomiasis, leishmaniasis, onchocerciasis, lymphatic filariasis, soil-transmitted helminthiases and taeniasis/cysticercosis (Mondiale de la et al., 2016; Gripper and Welburn, 2017; WHO, 2023)

Taenia solium, commonly known as the pork tapeworm, is a parasitic flatworm that has long been a cause for concern in the fields of medicine and veterinary science. This article explores the intricacies of *Taenia solium*, examining its life cycle, its impact on human health, and the measures taken to prevent and control it.

The life cycle of *Taenia solium* is complex and involves both humans and pigs. Humans become infected by ingesting undercooked pork containing cysticerci, which are the larval stage of the tapeworm. Once ingested, these larvae develop into adult tapeworms in the small intestine, where they can grow to several metres in length. These adult tapeworms then release eggs into the host's faeces, perpetuating the cycle (Deckers et al., 2010; Rajshekhar et al., 2003; Debacq et al., 2017).

The impact of *Taenia solium* on human health is significant. Infection with the adult tapeworm can result in gastrointestinal symptoms, including abdominal pain, nausea and weight loss (Mondiale et al., 2016; Willingham & Engels, 2006). However, more severe consequences arise from the presence of cysticerci in tissues, particularly in the brain, which can lead to a condition called neurocysticercosis. This condition can manifest as seizures, headaches and more severe neurological complications, posing a substantial public health threat in endemic regions (García et al., 2000; García et al., 2020; Fonseca et al., 2020; Bustos et al., 2021; Rubio et al., 2022).

Preventing and controlling *Taenia solium* infection requires a multifaceted approach. This includes public health education campaigns emphasising the importance of proper pork cooking techniques, improved sanitation practices and regular deworming in both humans and pigs (García et al., 2003; De Coster et al., 2018; Larkins et al., 2022). Additionally, rigorous meat inspection and surveillance programmes are essential for identifying infected animals before they enter the food supply chain.

Despite the challenges posed by *Taenia solium*, significant progress has been made in recent years. Research efforts have improved our understanding of the parasite's biology, while international collaborations have contributed to the development of more effective control strategies. The use of antiparasitic drugs for deworming, alongside improved sanitation practices and meat inspection, has demonstrated potential in reducing the prevalence of *Taenia solium* in certain regions (Coral-Almeida et al., 2015; Engels & Zhou, 2020).

However, *Taenia solium* remains a formidable foe in the realm of public health. While progress has been made, ongoing research and collaborative efforts are necessary to further unravel the complexities of this parasite and implement sustainable prevention and control measures. Vigilance, education and international cooperation are essential to mitigate the impact of *Taenia solium* on global health.

Publication reviews conducted at regular intervals reveal trends and progress in a scientific field. The most frequently used method for this purpose is bibliometric analysis (Yıldız, 2020; Tokur, & Alkan, 2024).

Our study makes a significant contribution to existing knowledge as it is the first to analyse Web of Science data on *Taenia solium*. While another previous study (González-Alcaide et al., 2023) used MEDLINE data to perform a similar analysis, our strategy of focusing on Web of Science offers new insights into *Taenia solium*. Our study aims to complement and build on the results of the aforementioned study by utilising untapped databases to improve the overall understanding of this neglected tropical disease. This study aims to describe research on *Taenia solium* by examining the development of scientific output, the distribution of contributions by nationality and the distinguishing characteristics of thematic research on this subject.

MATERIALS AND METHODS

Design of the study

This study employs a descriptive bibliometric approach to analyse *Taenia solium* research, evaluating the characteristics and impact of scientific publications within this field. It defines a typology of published *Taenia solium* research, covering biomedical, epidemiological and socio-behavioural dimensions. The Web of Science (WoS) database provides a comprehensive view of the current knowledge landscape and promotes interdisciplinary collaboration. The analysis aims to identify knowledge gaps in the literature and highlight areas for further research. This will inform future research directions and provide a more comprehensive understanding of *Taenia solium* and related challenges. Acknowledging the absence of a state-of-the-art overview, the study contributes to the field by providing a typology of research and identifying key knowledge gaps. WoS is a comprehensive database covering various fields of science.

Data selections

The Web of Science database was chosen as the primary data source due to its widespread use in the health sciences and its dominance in the English language. The chosen MESH (Medical Subject Headings) keywords were applied to extract results from the Science Citation Index Expanded, providing a comprehensive and relevant dataset for the study: ([MeSH Terms] OR "*Taenia*"[Title]) AND *solium*[Title], "cysticercosis"[MeSH Terms] OR Cysticercosis[Title], and also Cysticercosis[Title] OR Cysticercoses[Title] OR “Coenuri Infection*”[Title] OR Coenurosis[Title] OR Coenuroses[Title] OR “Coenurus cerebralis Infection*”[Title] OR “Cysticercus cellulosae Infection*”[Title] OR “*Taenia solium* Cysticercosis”[Title] OR “*Taenia solium* Cysticercoses”[Title] OR Neurocysticercosis[Title] OR Neurocysticercoses[Title] OR Neurocoenurosis[Title] OR Neurocoenuroses[Title] OR “Central Nervous System Cysticercosis”[Title] OR “CNS Cysticercosis”[Title] OR “CNS Cysticercoses”[Title] OR “Brain Cysticercosis”[Title] OR “Cerebral Coenurosis”[Title] OR “Cerebral Coenuroses”[Title] OR “Cerebral Cysticercosis”[Title] OR “Cerebral Cysticercoses”[Title].

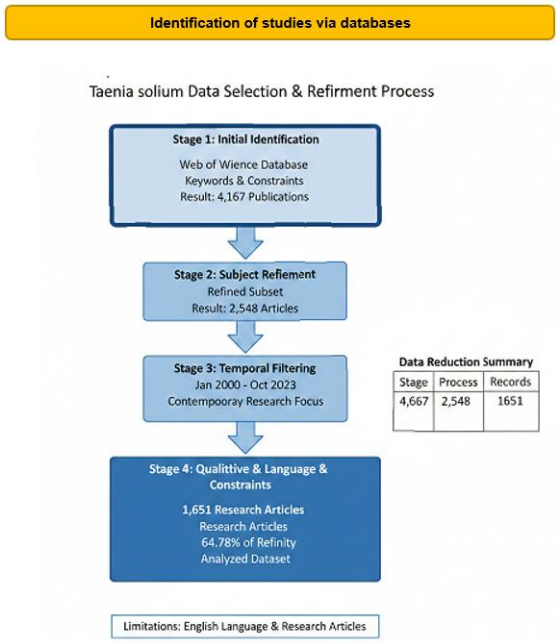
Time span

The study covers the period from January 1, 2000, to October 31, 2023, providing a comprehensive analysis of *Taenia solium* research trends and developments.

Inclusion criteria and flowchart

This study employed a multi-step process to identify and refine a dataset for a thorough analysis of *Taenia solium* publications. The initial search involved using specific keywords and constraints within the Web of Science database to identify 4,167 publications. To narrow the focus, this was refined to a subset of 2,548 articles. The study focused on contemporary and relevant research, selecting the time span from 1 January 2000 to 31 October 2023. This enabled a closer examination of recent developments and aligned with the study's objective of providing insights into the latest trends and advancements related to *Taenia solium*. The final sample consisted of 1,651 research articles, accounting for 64.78% of the initial dataset. The study's limitations, such as the use of specific search keywords and the inclusion of English-language publications only, were intentional decisions

made to ensure the relevance and quality of the selected articles (**Flowchart**).



Appendix. Flowchart

Exploring data and visualizing networks

Bibliometric maps are visual tools that illustrate the relationships, affiliations and connections between different scientific fields or research topics. Data were analysed using plain text, Excel files and 99% consensus files, with discrepancies in publications excluded. This study examined various bibliometric data, such as publication characteristics, the journals with the highest publication numbers, the leading institutions/universities in terms of publications, the temporal distribution of publications, the countries with the most cited and published works, H-indexes, frequently used keywords and keyword density. The analysis was conducted using Excel and the Bibliometrix R package (Aria et al., 2021; Çelik et al., 2023; Alkan and Tokur, 2023).

Bibliometrix is an open-source tool for quantitative scientometric and bibliometric research. It offers various routines for importing bibliographic data from different databases. Developed using the R statistical computing and graphics language, Bibliometrix is flexible and easy to automate, and can be integrated with other R statistical packages. It is used for science mapping and synthesising past research findings, which is crucial for advancing research. Bibliometrics provides a structured analysis of large bodies of information, inferring trends over time, identifying shifts in disciplinary boundaries, and highlighting prolific scholars and institutions. It also shows the 'big picture' of existing research (Aria et al., 2021).

Additionally, keyword co-occurrence analysis was visualised using Vosviewer 1.6.20 (Van Eck, & Waltman, 2011).

RESULTS

Main information

A total of 4,167 publications were identified, 2,548 of which were articles. The dataset spans from 2000 to 2023 and shows a notable increase in publications in recent years, particularly in 2006, 2016, 2019 and 2020. This indicates a diverse distribution of publications over time. Since 2000, 1,651 publications (64.78%) have been published, forming the focus of our analysis.

Examining the dataset from 2000 to 2023 reveals varying trends in scholarly article publication, highlighting the dynamic nature of scientific output (Figure 1). During this period, 443 journals published 1,651 articles, with a negative annual growth rate of 1.58%. These documents have an average age of 11.6 years and an average of 16.96 citations per document. The dataset comprises 17,295 references involving 5,850 authors, with an average of 6.29 co-authors per document. Of these, 36.04% were international collaborations.

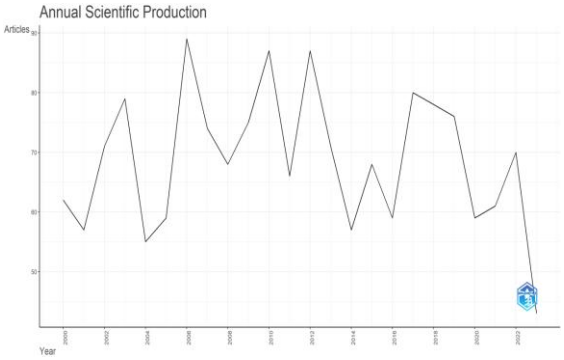


Figure 1. Annual scientific production for *Taenia solium*

A decline in the average total number of citations per article over time reflects a decrease in the average number of citations received by studies. The annual average total number of citations initially rose, reaching its peak around 2015, followed by a decline. In contrast, the cumulative total number of citable years showed a steady increase on an annual basis (Figure 2 and Table 1).

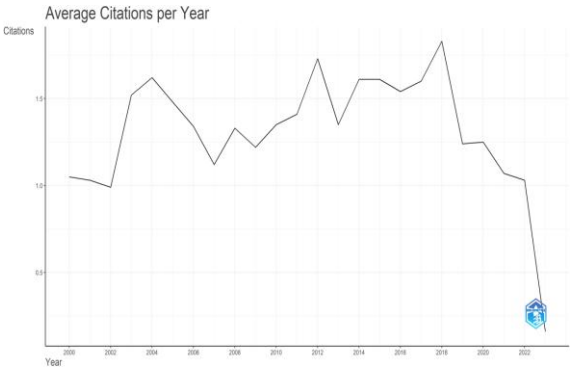


Figure 2. Average article citation per year for *Taenia solium*

Table 1. Average citations per year

Year	Mean Total Citations per article	Number of citations	Mean Total Citations per year	Citable years
2023	0.16	43.00	0.16	1
2022	2.06	70.00	1.03	2
2021	3.2	61.00	1.07	3
2020	5.02	59.00	1.25	4
2019	6.2	76.00	1.24	5
2018	11	78.00	1.83	6
2017	11.19	80.00	1.60	7
2016	12.29	59.00	1.54	8
2015	14.47	68.00	1.61	9
2014	16.14	57.00	1.61	10
2013	14.87	71.00	1.35	11
2012	20.75	87.00	1.73	12
2011	18.3	66.00	1.41	13
2010	18.91	87.00	1.35	14
2009	18.29	75.00	1.22	15
2008	21.26	68.00	1.33	16
2007	19.03	74.00	1.12	17
2006	24.09	89.00	1.34	18
2005	28.1	59.00	1.48	19
2004	32.4	55.00	1.62	20
2003	31.87	79.00	1.52	21
2002	21.76	71.00	0.99	22
2001	23.75	57.00	1.03	23
2000	25.21	62.00	1.05	24

Journals

The dataset highlights key top journals in the *Taenia solium* literature, with key publications found in PLOS Neglected Tropical Diseases, American Journal of Tropical Medicine and Hygiene, Veterinary Parasitology, Arquivos de Neuro-Psiquiatria, and Acta Tropica (Table 2).

Table 2. The prominent journals in on *T. solium* literature

Sources	Articles	Sources	Articles
Plos Neglected Tropical Diseases	81	Journal of Child Neurology	14
American Journal of Tropical Medicine and Hygiene	78	Journal of Helminthology	14
Veterinary Parasitology	56	World Neurosurgery	14
Arquivos De Neuro-Psiquiatria	54	Neurology	13
Acta Tropica	52	Pesquisa Veterinaria Brasileira	13
Transactions of The Royal Society of Tropical Medicine And Hygiene	45	Bmc Infectious Diseases	12
Parasitology Research	32	Infection And Immunity	12
Tropical Medicine & International Health	28	Journal of Clinical Microbiology	12
Parasitology International	24	Journal of The Neurological Sciences	12
Parasitology	21	Clinical Neurology and Neurosurgery	11
Revista de Neurologia	20	International Journal for Parasitology	11
Parasites & Vectors	19	Journal of Parasitology	11
Epilepsia	17	Pathogens and Global Health	11
Experimental Parasitology	17	Annals of Indian Academy of Neurology	10
Neurology India	17	Emerging Infectious Diseases	10
Preventive Veterinary Medicine	17	Journal of Travel Medicine	10
Tropical Animal Health and Production	16	Pathogens	10
Clinical Infectious Diseases	14	Semina-Ciencias Agrarias	10

In this study, the Bibliometrix software was used to analyse the number of publications, which indicates researcher productivity, and the total citation values, which reflect scientific impact. Within the scope of the analysis, the h-index (Hirsch, 2005), which establishes the balance between publications and citations, and the g-index (Nocera et al.,2024), which gives weight to highly cited studies, were calculated. The m-index, normalised according to academic age, and the first publication year (FPY) data were used to present the trajectory of scientific productivity over time from a holistic perspective. These data are summarised in Table 3.

Table 3. The prominent journals' local impact

Journal name	h_index	g_index	m_index	TC	NP	SYP
Plos Neglected Tropical Diseases	26	37	1.625	1679	81	2008
American Journal of Tropical Medicine And Hygiene	24	34	1.043	1447	78	2001
Veterinary Parasitology	24	36	1	1461	56	2000
Acta Tropica	23	40	1	1653	52	2001
Transactions of The Royal Society of Tropical Medicine and Hygiene	18	31	0.75	1009	45	2000
Parasitology International	16	23	0.889	566	24	2006
Epilepsia	14	17	0.609	764	17	2001
Tropical Medicine & International Health	14	22	0.583	539	28	2000
Arquivos de Neuro-Psiquiatria	13	19	0.542	525	54	2000
Neurology	12	13	0.5	815	13	2000
Parasitology	12	18	0.632	329	21	2005
Journal of Clinical Microbiology	11	12	0.458	513	12	2000
Parasites & Vectors	11	17	0.846	315	19	2011
Parasitology Research	11	17	0.458	343	32	2000
Clinical Infectious Diseases	10	14	0.455	357	14	2002
Experimental Parasitology	10	14	0.455	219	17	2002
Infection and Immunity	10	12	0.435	533	12	2001
International Journal for Parasitology	10	11	0.455	621	11	2002
Preventive Veterinary Medicine	9	16	0.529	280	17	2007
Vaccine	9	9	0.391	345	9	2001
American Journal of Neuroradiology	8	9	0.333	181	9	2000
Annals of Tropical Medicine and Parasitology	8	9	0.364	165	9	2002
Pathogens and Global Health	8	11	0.667	408	11	2012
Acta Neurologica Scandinavica	7	7	0.333	139	7	2003
Emerging Infectious Diseases	7	10	0.318	433	10	2002

**TC: Total Citations, NP: Number of Publications, SYP: Starting Year of Publication*

The substantial article counts, h-index, m-index and g-indexes of the top journals highlight their significant role in promoting research and advancements in these fields (Table 3). The most productive journals in our study were high-impact publications (Quarter 1, according to the Journal Citation Reports' 2022 edition's journal impact factor rankings), alongside other journals with varying levels of visibility (Quadrants 2 and 3). Notably, the number of journals nominated in the fourth quarter and listed in the Emerging Source Citation Index was relatively limited. Figure 3 shows the majority of journals' production over time.

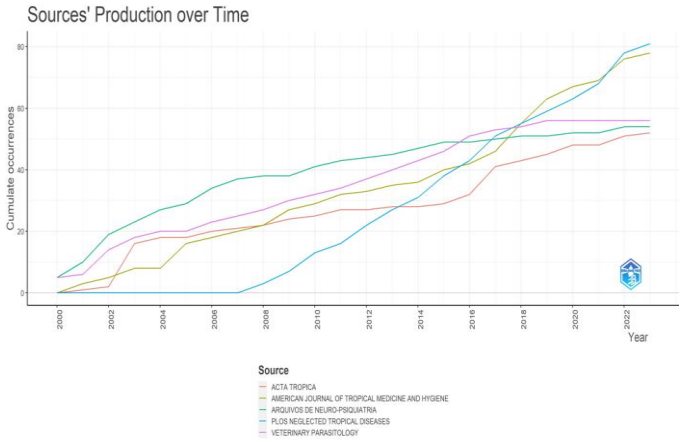


Figure 3. Mostly publishing journals's production over time for *Taenia solium*

Affiliations

The dataset reveals the distribution of articles contributed by various academic and research institutions, indicating that Peru and Mexico lead the way in terms of research output. Specifically, Universidad Peruana Cayetano Heredia in Peru and Universidad Nacional Autónoma de México in Mexico have contributed 239 and 238 articles respectively. Additionally, the Universidade de São Paulo in Brazil has made a significant contribution of 126 articles. Figure 4 shows the affiliations with the highest number of articles and Figure 5 shows the number of articles of these affiliates over the years.

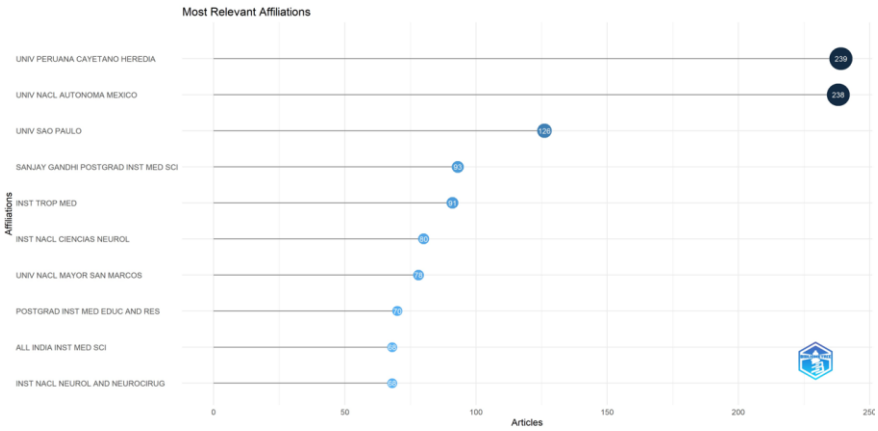


Figure 4. Most relevant affiliations for *Taenia solium*

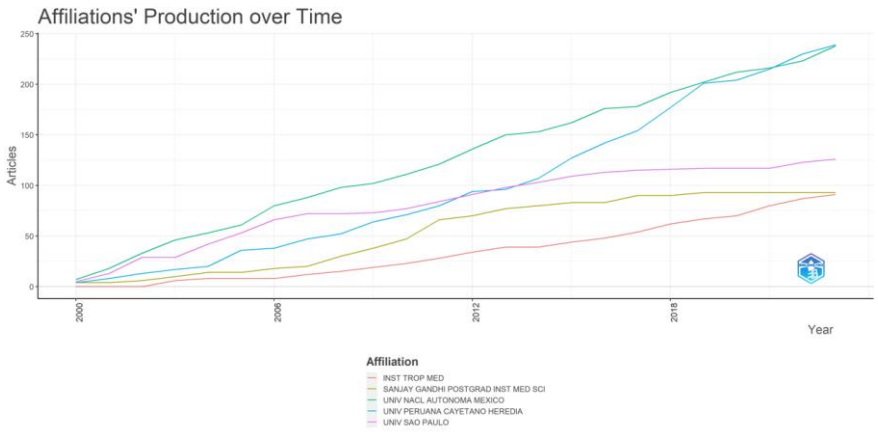


Figure 5. Affiliations' production over time for *Taenia solium*

Countries

Figure 6 displays the distribution of publication numbers on a world map**.** Figure 7 shows the countries' production over time. The dataset shows how publications are distributed across different countries. The USA is the top contributor, with 896 articles. India and Brazil followed closely behind with 748 and 615 articles, respectively. Mexico and Peru also made significant contributions with 560 and 545 articles respectively. North America, led primarily by the USA and Canada, contributed a total of 967 articles. Asia, significantly influenced by India and China, contributed a notable 902 articles. South America, led by Brazil, Peru and Ecuador, contributed 787 articles in total. Europe, including Belgium, the UK and France, contributed 844 articles. Africa contributed 285 articles and Oceania contributed 72 (Figure 7).

The USA has the highest number of citations to scientific output on *Taenia solium*, with a total of 5,773. India and Mexico also received a high number of citations, with 3,708 and 3,695, respectively. Table 4 provides an overview of the top 25 most cited countries in this context.

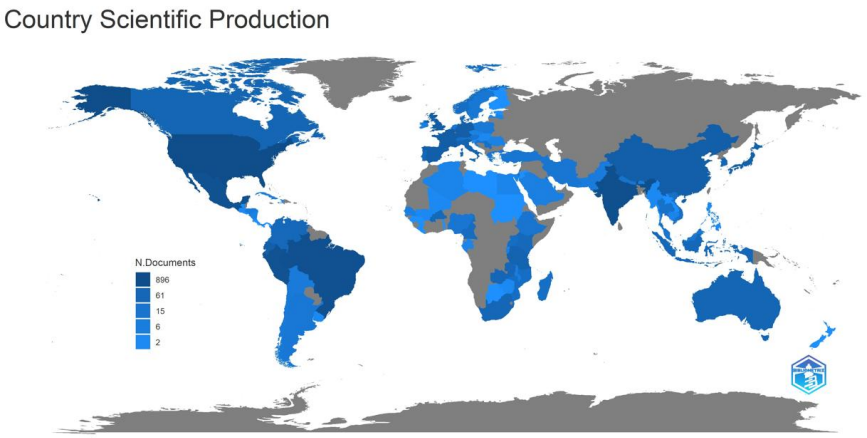


Figure 6. Countries' production over time for Taenia solium.

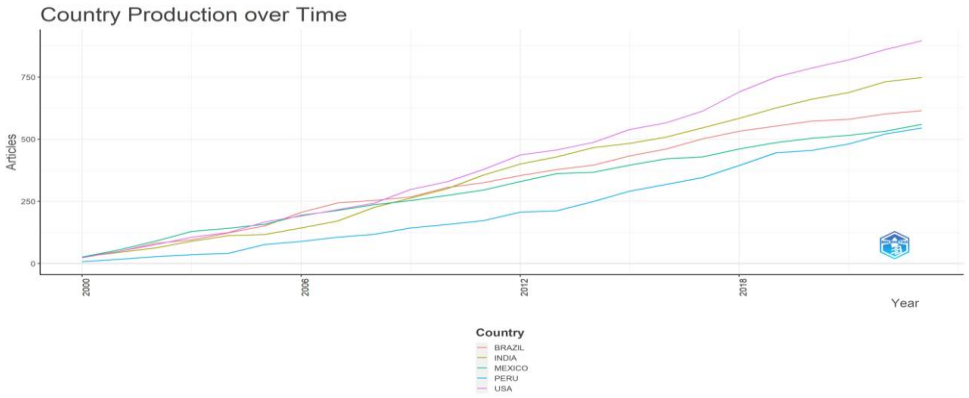


Figure 7. Countries' scientific production for Taenia solium (* Numbers represent the scientific production based on the corresponding author's country. International collaborative papers are attributed to a single country to avoid duplicate counting).

Keyword Co-occurrence Analysis

Keyword co-occurrence analysis visualised with Vosviewer 1.6.20. In total, 2069 different keywords were used in publications on *Taenia solium*. 149 of them were used at least 5 times, and 60 of them were used at least 10 times.

Upon examining the data in Figure 8 and Table 5, it is observed that the keywords with the highest frequency are neurocysticercosis (n=559, TLS=798), cysticercosis (n=414, TLS=812) and *Taenia solium* (n=363, TLS=812). These core concepts are followed by epilepsy (n=109, TLS=247), ELISA (n=71, TLS=179), Taenia saginata (n=70, TLS=171), albendazole (n=65, TLS=139), diagnosis (n=64, TLS=136), epidemiology (n=52, TLS=144) and taeniasis (n=51, TLS=132). The studies also included Taenia crassiceps (n=49, TLS=70), prevalence (n=41, TLS=131), bovine cysticercosis (n=37, TLS=66), seizures (n=37, TLS=92), magnetic resonance imaging (n=36, TLS=69), hydrocephalus (n=34, TLS=56) and porcine cysticercosis (n=28, TLS=52). In the context of animal husbandry and risk factors, pigs (n=27, TLS=77), pig (n=26, TLS=81), praziquantel (n=26, TLS=76), risk factors (n=25, TLS=84), cerebrospinal fluid (n=24, TLS=43), cattle (n=22, TLS=59), seroprevalence (n=22, TLS=57), meat inspection (n=21, TLS=52) and zoonosis (n=20, TLS=55) are recorded. In terms of geographical distribution, Peru (n=19, TLS=65), Mexico (n=16, TLS=45), Tanzania (n=14, TLS=44), Brazil (n=13, TLS=34), India (n=11, TLS=28) and Zambia (n=10, TLS=29) stand out. Other important technical and clinical terms include vaccination (n=18, TLS=49), control (n=17, TLS=43), cysticercus cellulosae (n=16, TLS=34), MRI (n=16, TLS=18), treatment (n=16, TLS=38), parasite (n=15, TLS=31), public health (n=15, TLS=38), brain (n=14, TLS=32), enzyme-linked immunosorbent assay (n=14, TLS=40), immunodiagnosis (n=13, TLS=32), serology (n=13, TLS=45) and *Taenia* (n=12, TLS=18). At the end of the list are computed tomography (n=11, TLS=31), cysticercus (n=11, TLS=11), cysticercus bovis (n=11, TLS=30), neuroendoscopy (n=11, TLS=15), parasitic infection (n=11, TLS=15), serodiagnosis (n=11, TLS=20), swine (n=11, TLS=32), taeniosis (n=11, TLS=35), vaccine (n=11, TLS=31), western blot (n=11, TLS=36), antigen (n=10, TLS=33), central nervous system (n=10, TLS=24), PCR (n=10, TLS=20), Taenia hydatigena (n=10, TLS=22) and zoonoses (n=10, TLS=31).

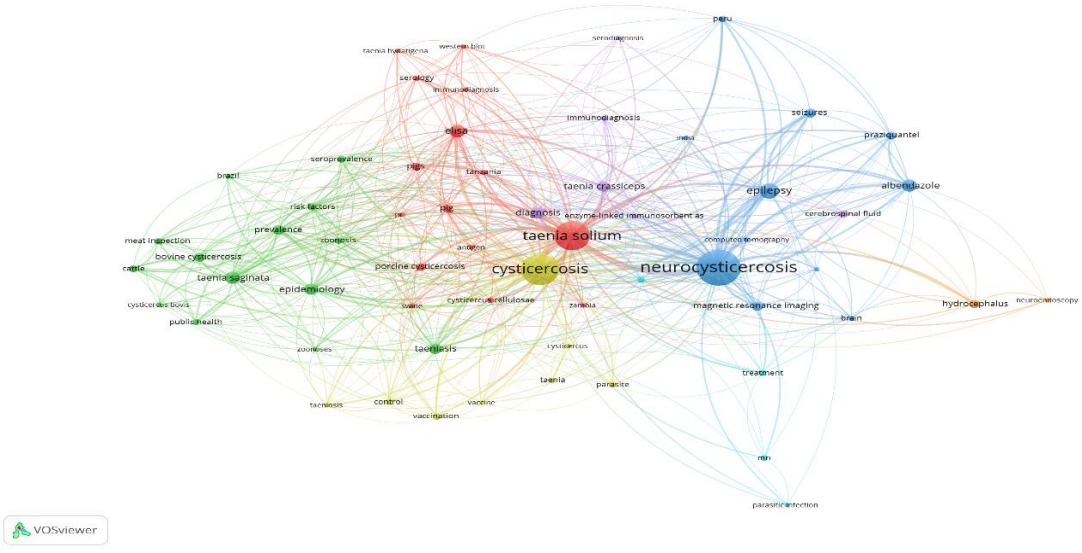


Figure 8. Keyword Co-occurrence Analysis.

Table 5. Keyword co-occurrence analysis and total link strength

Keyword	Number of occurrences	Total link strength
Neurocysticercosis	559	798
Cysticercosis	414	812
Taenia solium	363	812
Epilepsy	109	247
ELISA	71	179
Taenia saginata	70	171
Albendazole	65	139
Diagnosis	64	136
Epidemiology	52	144
Taeniasis	51	132
Taenia crassiceps	49	70
Prevalence	41	131
Bovine cysticercosis	37	66
Seizures	37	92
Magnetic resonance İmaging	36	69
Hydrocephalus	34	56
Porcine cysticercosis	28	52
Pigs	27	77
Pig	26	81
Praziquantel	26	76
Risk factors	25	84
Cerebrospinal fluid	24	43
Cattle	22	59
Seroprevalence	22	57
Meat inspection	21	52
Zoonosis	20	55
Peru	19	65
Vaccination	18	49
Control	17	43
Cysticercus cellulosae	16	34
Mexico	16	45
Mrı	16	18
Treatment	16	38
Parasite	15	31
Public health	15	38
Brain	14	32
Enzyme-linked İmmunosorbent assay	14	40
Tanzania	14	44
Brazil	13	34
İmmunodiagnosis	13	32
Serology	13	45
Taenia	12	18
Computed tomography	11	31
Cysticercus	11	11
Cysticercus bovis	11	30
Neuroendoscopy	11	15
Parasitic infection	11	15
Serodiagnosis	11	20
Swine	11	32
Taeniosis	11	35

DISCUSSION AND CONCLUSION

In recent years, scientists have become interested in bibliometric analysis, a method based on the extensive collection and evaluation of data (Fakhar et al., 2021). This analytical method utilises various bibliometric indicators to evaluate research trends in specific fields, including medicine and health sciences. In parasitology, bibliometric analysis is critical for systematically mapping the vast scientific literature, revealing which parasite species or diseases are the focus of research, identifying global research trends and highlighting gaps in academic studies objectively. This method can provide strategic guidance, particularly when visualising collaboration networks between countries and institutions within the 'One Health' framework. It can help to direct limited resources towards areas with the greatest public health impact, identify the most effective publication channels and improve understanding of the molecular-level transformation of the field's historical development process (Ekici et al., 2022).

This study focuses on global research trends related to *Taenia solium*, an often-overlooked foodborne disease. Our bibliometric analysis of *Taenia solium* research from 2000 to 2023 revealed fluctuations in the annual number of articles published, which mirrored the findings of another bibliometric analysis of *Taenia solium* (Gonzalez-Alcaide et al., 2023). The most prolific years during this

period were 2006, 2010, and 2012. The average number of citations peaked in 2004, 2012 and 2018. The observed decline in the average number of citations per article in recent years may be partly due to newer publications having had less time to accumulate citations. It may also be due to the field's natural maturation and diversification.

Journals are crucial instruments for disseminating research within the relevant scientific community. The influence of a journal is evident in its ability to convey published research to the relevant segment of society (Fakhar et al., 2021). When top journals are assessed based on the volume of published articles, it becomes evident that impact factors do not dictate the rankings. This analysis subscribes to the perspective that the impact factor of articles published in a journal may not inherently reflect the quality of those articles (Fakhar et al., 2021). In our bibliometric analysis, PLOS Neglected Tropical Diseases emerged as the leading journal for publishing articles on *Taenia solium* during this timeframe, with an h-index of 26. Notably, the journal demonstrates a commendable commitment to addressing this issue, aligning well with its stated aim and scope. In addition, journal visibility, indexing coverage, and open-access policies may substantially influence publication and citation patterns observed in bibliometric analyses.

Taeniasis and cysticercosis, which are caused by infection with the *Taenia solium* parasite, have been identified as neglected tropical diseases. They are now included in the World Health Organization's (WHO) new roadmap for intensified control measures by 2030 (WHO, 2020; WHO, 2023). Recognised as the leading causes of death among all foodborne parasitic diseases, taeniasis and cysticercosis are estimated to have caused a global burden of approximately 2.8 million disability-adjusted life years in 2015 (Garcia and Del Brutto, 2020; WHO, 2020; WHO, 2023). However, it is important to note that these estimates may be conservative due to limited data availability. The impact of taeniasis and cysticercosis extends beyond health to include social costs, as individuals with epilepsy often experience discrimination and stigmatisation. Additionally, there are economic costs incurred for treating infected individuals, and their ability to work is affected.

Our data show that the majority of *Taenia solium* publications originate from the United States. The research output on *Taenia solium* is much more extensive in the United States than in Europe and Asia. Several factors may contribute to this difference. The significant budget allocated by the USA specifically for this disease, coupled with the influx of immigrants, particularly from endemic countries (González-Alcaide et al., 2018), may indicate increased research attention to neurocysticercosis in the country rather than reflecting local transmission dynamics directly. However, this connection should be interpreted with caution, as further evidence is required. The increase in research funding in the USA and its high research output may reflect the strength of its research infrastructure and international collaborations rather than providing direct evidence of migration-related transmission.

Research funding levels in countries such as Peru, Mexico, Brazil and India appear to be associated with research productivity on this topic. However, this relationship should be interpreted with caution given the analytical limitations of bibliometric studies. However, this relationship should be interpreted with caution, given the analytical limitations of bibliometric studies. Research quality and output are not always directly linked to financing, as other factors such as institutional support, research focus and collaboration networks are also important.

The main factor guiding research efforts is the budget that countries allocate to diseases that impose a significant economic burden (WHO, 2023). The findings of this bibliometric analysis reveal that the majority of funding organisations are based in countries dealing with the challenges posed by *Taenia solium*. This highlights the need for cost-effective, comprehensive and collaborative studies spanning multiple countries, focusing specifically on preventive measures against *Taenia solium*.

A noteworthy finding of the analysis of scientific production by institutions is that the highest levels of production (more than 100 articles) are achieved by institutions in regions endemic for *Taenia solium*, as well as by some research-intensive countries. Here, 'research-intensive countries' refers to nations with well-established research infrastructures and sustained funding mechanisms rather than to endemic countries.

Notable research output was also observed at Universidad Nacional Autónoma de México (238 articles) and the University of São Paulo (126 articles), following the lead of Universidad Peruana Cayetano Heredia (239 articles). The high productivity of these institutions may be influenced by their long-standing research programmes, their role as regional reference centres and their sustained international collaborations focused on *Taenia solium*.

Beyond publication volume, *Taenia solium* research has largely focused on neurocysticercosis, epidemiology, diagnostics and control strategies. In contrast, relatively few studies have addressed the socio-economic impacts, the implementation of research and integrated One Health approaches. This highlights important gaps and potential areas for future research. Despite the epidemiological relevance of *Taenia solium* in African countries, their limited contribution to the literature may reflect structural challenges such as restricted research funding, limited infrastructure and underrepresentation in major indexing databases. Closing the gap between these regions and fostering stronger research collaborations with African institutions could significantly improve research output and coverage.

In conclusion, this bibliometric analysis offers a thorough overview of the scientific landscape of *Taenia solium* research between 1 January 2000 and 31 October 2023. The study reveals intriguing patterns in publication trends, institutional contributions and the global distribution of research efforts. Compared with previous bibliometric analyses (e.g. González-Alcaide et al., 2023), this study extends the temporal coverage and provides updated insights into institutional productivity, funding patterns and thematic research gaps. Further research should address the underrepresentation of certain regions and research themes, particularly the socio-economic impact and One Health strategies, in order to strengthen the overall body of knowledge surrounding *Taenia solium*.

LIMITATIONS

The primary limitation of this study is its reliance on the Web of Science database for bibliographic data, which could result in pertinent publications being excluded from the analysis. This is particularly pertinent for research originating in endemic countries and published in languages other than English, as this may not be adequately represented in the dataset.

This is particularly true of research conducted in endemic regions and published in languages other than English. Such research is generally underrepresented,

leading to a systematic bias in research outputs from low- and middle-income countries. Evidence generated locally is often published in unindexed regional journals or appears in grey literature, which is outside the scope of this bibliometric analysis. This includes national surveillance data, theses and technical reports from organisations such as the WHO and FAO.

Furthermore, internal biases in bibliometric metrics, such as time lag and citation window effects, may influence identified publication trends, given that it takes time for new publications to receive citations. When interpreting research impact, potential distortions arising from self-citation and institutional citation biases should also be considered. Despite our rigorous search strategy, the absence of certain keywords or differences in data reporting related to affiliated institutions may affect the comprehensiveness of the findings. Additionally, this study does not account for external factors such as policy changes, funding fluctuations or the interdisciplinary nature of *Taenia solium* research, which spans medicine, veterinary science and public health. Additionally, as this is a bibliometric analysis, content analysis has not been included.

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Ethical Declaration
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Conflict of Interest
The authors declare that they have no competing interests.

Authorship contributions
Conceptualization, Funding acquisition, Investigation, Methodology, Formal analysis, Data curation, Writing–original draft, Writing–review & editing: S.A., Visualization, Writing – review & editing: S. K. A, Formal analysis, Writing–review & editing: M. E. A.

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