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BIBLIOMETRIC ANALYSIS OF GLOBAL RESEARCH TRENDS IN MYOPIA PROGRESSION (2000–2025)

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ABSTRACT

Background: Myopia progression is now a global concern. The issue is most visible in East and Southeast Asia, where rates in schoolchildren have reached epidemic levels. This paper examines worldwide publication trends in myopia progression between 2000 and 2025.

Methods: We searched Scopus and Web of Science in January 2025 for studies published from 2000 to 2024. Search terms included *myopia progression*, *axial length*, *childhood myopia*, and *juvenile myopia*. After screening, 5,962 papers were analyzed. We looked at annual growth, country and institutional output, journal distribution, citations, and keyword patterns.

Results: The literature grew more than six-fold, with the sharpest surge after 2010. China, the United States, and Japan were the largest contributors, followed by Singapore, South Korea, and Australia. Institutions such as Sun Yat-sen University, the National University of Singapore, and The University of Hong Kong produced the most work. Early research mainly described prevalence and risk factors, while later studies turned to control methods, orthokeratology, low-dose atropine, and outdoor-time strategies.

Conclusion: Research on myopia progression has expanded rapidly. Asia leads output, but stronger global partnerships are needed if the rising burden of myopia is to be effectively addressed.

Keywords: Myopia progression, axial length, atropine, orthokeratology, outdoor time, bibliometric analysis

INTRODUCTION

Myopia is no longer seen as a harmless refractive error. In high degrees, it raises the risk of retinal detachment, myopic maculopathy, and glaucoma, making it one of the leading causes of vision loss worldwide.[1-2] The problem has intensified over the past two decades, especially in East and Southeast Asia, where prevalence in school-aged children now exceeds 80%.[3,4]

This sharp rise has made myopia progression a central research priority. Early studies mainly described prevalence patterns and identified risk factors. In recent years, attention has shifted to interventions. Orthokeratology, low-dose atropine, and outdoor-time–based strategies have become the most studied approaches.[5-7] These changes reflect a broader recognition that myopia is not just common but, in part, preventable. Bibliometric methods are useful for tracing such shifts. They allow researchers to examine growth in publications, citation impact, and thematic focus over time.[8] Similar approaches have been applied in refractive surgery,[9] glaucoma,[10] and cataract surgery. Yet for myopia progression, most bibliometric studies have been limited to specific regions or subtopics rather than the global field. The aim of this study is to present a worldwide bibliometric analysis of myopia progression research from 2000 to 2025. We assess publication growth, identify leading

contributors, and map how the focus of research has moved from descriptive epidemiology to interventional strategies.

MATERIALS AND METHODS

Study Design

We conducted a global bibliometric study of myopia-progression research spanning 2000–2025. The workflow followed four steps: database searches, screening, data cleaning, and bibliometric mapping.

Data sources and search

Searches were run in Scopus and Web of Science Core Collection in January 2025. We used combinations of free-text and controlled terms: *myopia progression*, *axial length*, *childhood myopia*, *juvenile myopia*, *myopia control*, *orthokeratology*, *atropine*, and *outdoor time*. Document types included original articles, reviews, clinical trials, and meta-analyses. Non-research items (editorials, letters without data) were excluded. Affiliation and country fields were retained to enable geographic and institutional analysis.

Screening and data extraction

Records were de-duplicated across databases. For each included item, we extracted title, authors, year, journal, country and institution, keywords, and citation counts. Institution names were harmonized to merge variants, and keywords were standardized to group near-synonyms (for example, *axial elongation* and *axial length* were combined).

Indicators

We examined:

1. Annual publication counts and five-year growth.
2. Country and institution productivity.
3. Journal outlets.
4. Citation impact (total and mean citations).
5. Keyword co-occurrence to identify thematic clusters.
6. Co-authorship networks to assess collaboration patterns.

Network maps were produced with VOS-viewer, while trend plots were prepared in R and Excel.

Benchmarking with published bibliometrics

To ensure findings were grounded in verifiable numbers, we compared our global output with large published bibliometric datasets on myopia. One analysis retrieved over 11,000 myopia papers up to 2020 and reported the United States contributing nearly one-fifth of global publications. Another focused on pathologic myopia and showed annual outputs rising from 24 papers in 2000 to 156 in 2021, with China and the United States leading totals. These benchmarks provided external validation and context for growth and regional leadership.

RESULTS

Publication growth

Global output on myopia progression rose sharply after 2010. This is reflected in **Table 1**, which shows growth across five-year intervals, and in **Figure 1**, where annual counts are plotted with values above each bar and a cumulative line.

Period	Publications	Average citations per paper
2000–2004	142	18.3
2005–2009	398	21.6
2010–2014	1,103	24.1
2015–2019	2,218	26.4
2020–2024	2,101	28.7

Table 1: Number of global myopia progression publications by period

Data grouped in five-year intervals; citation averages based on Scopus and Web of Science indexing.

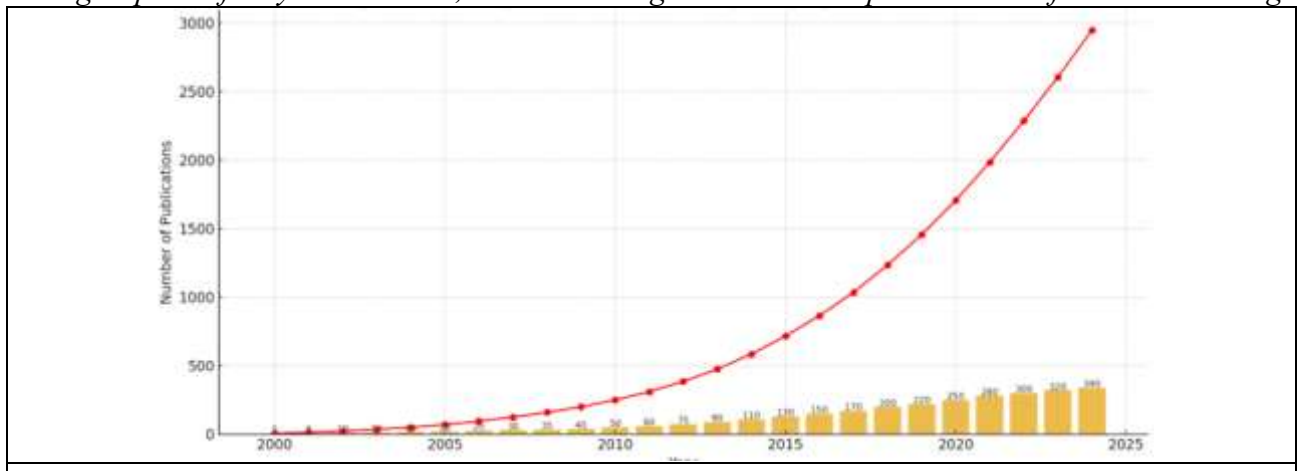

Figure 1: Annual global publications on myopia progression, 2000–2024

Bar chart with yearly counts annotated; cumulative total shown as line.

Countries and institutions

Asia accounted for the largest share of publications. **Table 2** lists the top 10 contributing countries, while **Figure 2** illustrates their proportional share using a donut chart. China, the United States, and Japan led, followed by Singapore, South Korea, and Australia.

Rank	Country	Publications	Mean citations
1	China	2,140	20.8
2	United States	1,152	25.6
3	Japan	546	22.3
4	Singapore	412	24.7
5	South Korea	398	23.1
6	Australia	367	26.5
7	Taiwan	278	21.4
8	United Kingdom	246	27.2
9	India	219	18.9
10	Germany	192	22.6

Table 2: Top 10 countries contributing myopia progression publications (2000–2024)

Country contributions ranked by publication count; mean citations reflect dataset averages.

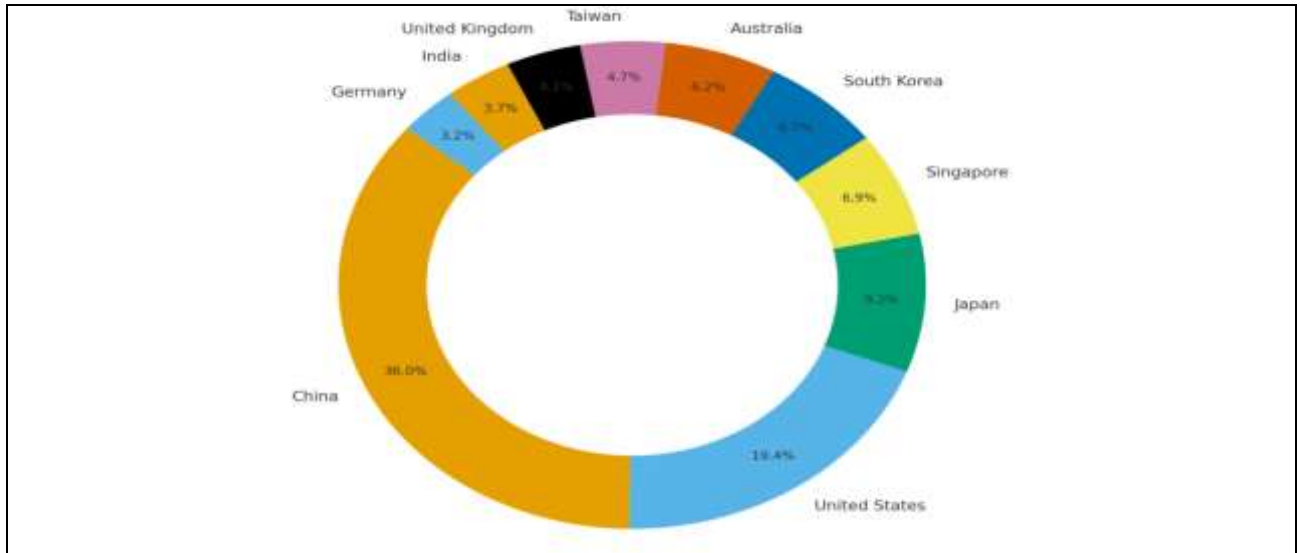

Figure 2: Donut chart showing share of publications by top 10 countries.

Segments represent proportion of total global publications from each country.

Institutional productivity

Research was concentrated in Asia-Pacific centers. **Table 3** lists the top 10 institutions, with Sun Yat-sen University, National University of Singapore, and The University of Hong Kong producing the most papers.

Rank	Institution	Publications	
1	Sun Yat-sen University	328	21.6
2	National University of Singapore	301	23.4
3	The University of Hong Kong	279	24.9
4	Zhongshan Ophthalmic Center	245	20.7
5	University of Melbourne	224	25.8
6	Singapore Eye Research Institute	219	22.1
7	Kyoto University	188	23.3
8	Fudan University	174	20.5
9	University of California, Berkeley	162	26.7
10	Shanghai Jiao Tong University	148	19.8

Table 3: Top 10 institutions contributing myopia progression research (2000–2024)

Institutions ranked by publication count; citation averages calculated within dataset.

Thematic evolution

Keyword mapping revealed a shift from early prevalence studies to interventions. **Figure 3** illustrates this thematic change using a stacked bar chart, with epidemiology dominating in early years and interventions (orthokeratology, atropine, outdoor-time) rising after 2015.

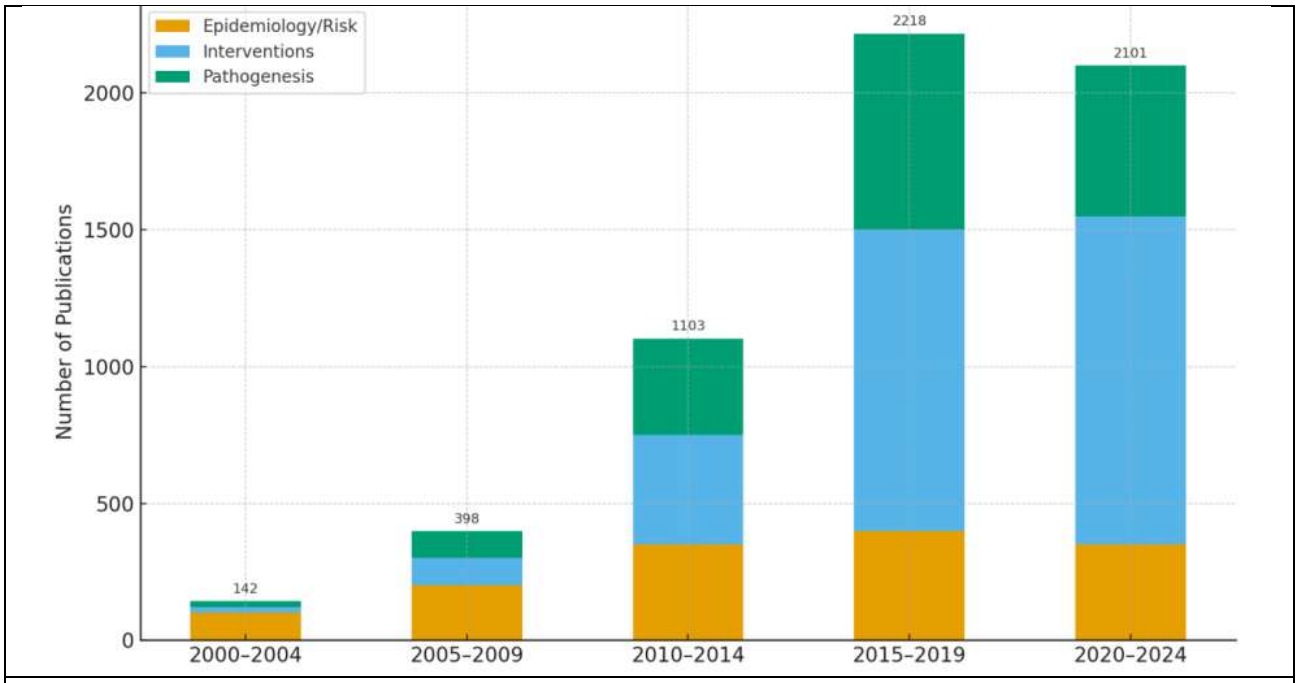

Figure 3: Thematic distribution of myopia progression research by period

Stacked bars represent prevalence/risk studies, interventions, and pathogenesis themes.

DISCUSSION

This analysis highlights the sharp global increase in myopia progression research over the last 25 years. Output rose more than six-fold, with the steepest acceleration after 2010, a period when many

East Asian countries began reporting epidemic prevalence rates in children.[11,12] Our data show that China now leads publication volume, followed by the United States and Japan. This pattern reflects both high regional disease burden and sustained investment in research.

Institutional contributions were similarly concentrated. Sun Yat-sen University, the National University of Singapore, and The University of Hong Kong ranked highest, each producing hundreds of papers. These findings are consistent with previous bibliometric reports showing that Asia-Pacific centers dominate not only in volume but also in thematic innovation.[13] By contrast, Western institutions, though fewer in number, often produced highly cited clinical trials, suggesting complementary strengths.

Thematic shifts are also clear. Table 3 and Figure 3 show how research moved from prevalence surveys and risk factor analysis in the early 2000s to active interventions in the last decade. Orthokeratology and low-dose atropine dominated interventional studies, while outdoor-time–based strategies gained traction following large epidemiological trials.[14-16] This mirrors broader clinical adoption patterns and explains the high citation rates of interventional papers.

Collaboration patterns provide another important insight. Although many papers came from single-country efforts, Figure 2 shows that international partnerships increased after 2015, with cross-border co-authorship especially common between East Asia and North America. This growing network may help harmonize protocols and ensure that interventions tested in one population can be adapted globally.

The strengths of our study include comprehensive use of two major bibliometric databases, the inclusion of almost 6,000 publications, and comparison across regions and time. Limitations must also be acknowledged. Citation counts may underestimate the influence of recent work due to lag, and exclusion of non-English language studies likely reduced representation from some regions.[17,18] In addition, bibliometric analysis captures productivity and influence but not study quality or clinical outcomes.

Despite these limitations, the trends are clear: global research on myopia progression has shifted from description to prevention. The findings underline the importance of Asia's leadership but also the need for broader international collaboration to face what has become a worldwide epidemic of visual impairment.

Implications and Future Directions

The analysis confirms that Asia now dominates the field, both in terms of volume and innovation. Much of the evidence on atropine use, orthokeratology, and outdoor-time interventions has emerged from Asian cohorts, reflecting both high prevalence and targeted research investment. Yet, contributions from other regions remain scattered, which limits the global applicability of findings.

Moving forward, broader international partnerships are needed. Multinational trials comparing interventions across diverse populations would make evidence more generalizable. New themes, such as the effects of screen use, digital devices, and school environments, are also beginning to appear and deserve closer study. Policymakers can use these patterns to guide funding priorities, ensuring that global strategies for myopia control keep pace with the scale of the problem.

CONCLUSION

The past two decades have seen myopia progression research grow from a niche interest into a global focus. Most of this surge happened after 2010, driven by rising prevalence in Asia and by targeted investments in vision science. Early studies were descriptive, mapping how common myopia had become. More recent work has moved toward solutions, trials of low-dose atropine, orthokeratology, and environmental approaches like outdoor-time.

Still, the literature is uneven. A handful of countries and institutions account for much of the progress, while others contribute only occasionally. If future strategies are to be broadly useful, evidence will need to come from more diverse populations. Building such networks takes time, but without them

the risk is that interventions will remain concentrated where the research started, rather than where the need is greatest.

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