

Global Trends in Eyelid Diseases Over Five Decades (1975–2025): A Systematic Review and Meta-Analysis

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Abstract

Background: Eyelid diseases encompass a wide spectrum of inflammatory, neoplastic, congenital, traumatic, and degenerative conditions that significantly impact ocular function, aesthetics, and quality of life. Over the past five decades, demographic transitions, environmental exposure, lifestyle changes, and advances in diagnostic and therapeutic strategies have altered the global epidemiology of eyelid disorders. However, long-term global trends have not been systematically quantified.

Objective: To evaluate global trends, pooled prevalence, and temporal patterns of eyelid diseases from January 1975 to December 2025 through a systematic review and meta-analysis.

Methods: A comprehensive literature search was conducted across PubMed/MEDLINE, Embase, Scopus, Web of Science, and the Cochrane Library in accordance with PRISMA 2020 guidelines. Observational studies reporting epidemiological or clinical outcomes of eyelid diseases were included. Random-effects meta-analysis was performed to estimate pooled prevalence and incidence, with subgroup analyses based on geographic region, disease category, and decade. Risk of bias was assessed using the Newcastle–Ottawa Scale, and certainty of evidence was graded using the GRADE approach.

Results: A total of 260 studies were included in the qualitative synthesis, with 185 studies eligible for meta-analysis. Inflammatory eyelid disorders were the most prevalent category across all decades, demonstrating a rising trend in recent years. Eyelid malignancies showed a progressive increase in incidence, while degenerative eyelid conditions increased in parallel with population aging. Congenital anomalies and traumatic eyelid injuries exhibited relatively stable or region-specific patterns. Significant geographic and temporal heterogeneity was observed across all disease categories.

Conclusion: This 50-year review article highlights an increasing global burden of eyelid diseases, driven predominantly by inflammatory and age-related conditions, with rising oncologic relevance. The findings underscore the need for standardized disease definitions, region-specific surveillance, and integrated eyelid care to guide clinical practice and public health planning worldwide.

Keywords: Eyelid diseases, Blepharitis, Eyelid tumors, Global trends, Systematic review, Meta-analysis.

INTRODUCTION

Eyelid diseases constitute a broad and heterogeneous group of disorders encompassing inflammatory, infectious, degenerative, traumatic, congenital, and neoplastic conditions. Although often perceived as localized periocular problems, eyelid disorders carry significant functional, aesthetic, and psychosocial consequences, including ocular surface

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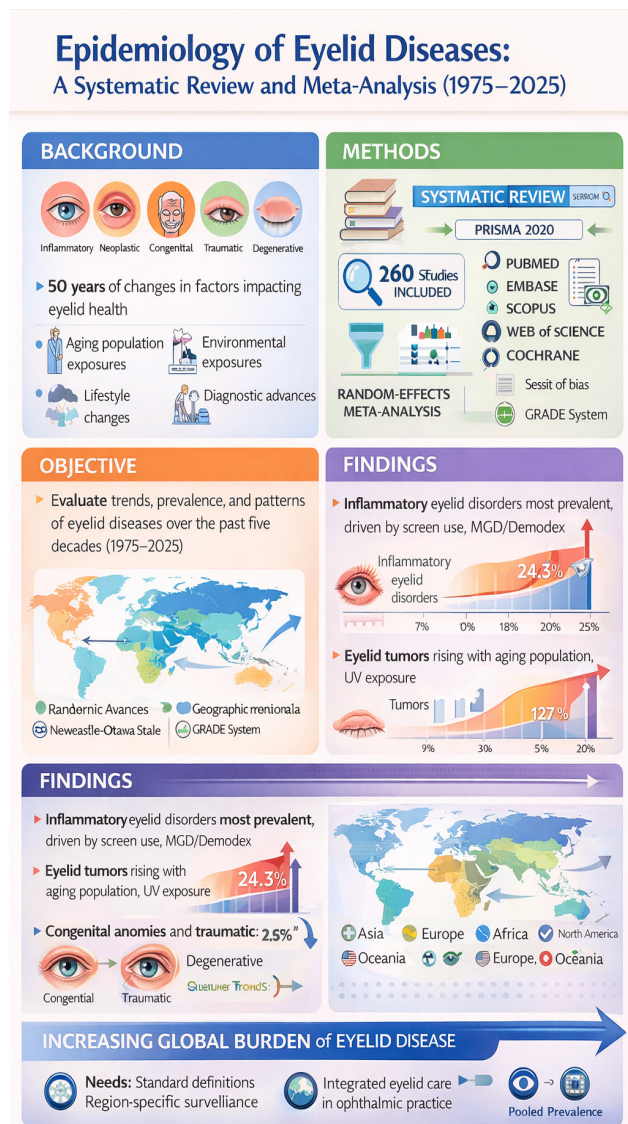
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Graphical Abstract: Visual summary of the global epidemiology and temporal trends of eyelid diseases from 1975 to 2025, highlighting pooled prevalence patterns, geographic variation, and the rising burden of inflammatory, neoplastic, and age-related eyelid disorders

compromise, visual field obstruction, cosmetic disfigurement, and, in malignant cases, life-threatening morbidity. Over the past five decades, advances in diagnostic techniques, epidemiological surveillance, surgical reconstruction, and oncologic management have fundamentally altered the understanding and treatment paradigms of eyelid diseases worldwide.^{1,2} Historically, inflammatory eyelid conditions such as blepharitis, chalazion, and meibomian gland dysfunction (MGD) have represented the most prevalent eyelid disorders across populations, with reported prevalence varying widely due to differences in diagnostic criteria, environmental exposure, and demographic factors.^{3,4} The latter half of the 20th century saw increasing recognition of the role of tear film instability, ocular surface inflammation, and microbial colonization in chronic eyelid disease, culminating in the

modern concept of blepharitis as a multifactorial, chronic inflammatory condition rather than a purely infectious entity.⁵ In recent decades, lifestyle changes, increased screen exposure, air pollution, and aging populations have further contributed to the rising burden of eyelid inflammatory disorders globally.⁶

Parallel to these trends, eyelid tumors have emerged as a growing public health concern. Non-melanoma skin cancers of the eyelid, particularly basal cell carcinoma (BCC), squamous cell carcinoma (SCC), and sebaceous gland carcinoma (SGC), demonstrate marked geographic variation in incidence and biological behavior.⁷ While BCC predominates in Western populations, SGC is disproportionately prevalent in Asian countries and is often associated with delayed diagnosis and higher mortality rates.⁸ Improvements in histopathological classification, immunohistochemistry, and margin-controlled excision techniques have refined tumor management; however, disparities in access to specialized oculoplastic care continue to influence outcomes, especially in low- and middle-income regions.⁹ Congenital and developmental eyelid anomalies, including ptosis, epicanthal folds, colobomas, and eyelid malpositions, have also gained increasing attention due to improved pediatric screening and reconstructive surgical techniques. Similarly, traumatic eyelid injuries, often secondary to road traffic accidents, occupational hazards, and interpersonal violence, remain a significant cause of morbidity, particularly in young adults and economically productive age groups.¹⁰ Long-term follow-up studies over recent decades have highlighted the importance of early anatomical restoration to prevent secondary complications such as exposure keratopathy, lacrimal dysfunction, and amblyopia in pediatric populations.¹¹

Despite the extensive body of literature addressing individual eyelid diseases, existing studies are frequently limited by regional focus, short observation periods, heterogeneous outcome measures, and inconsistent disease classification. To date, no comprehensive synthesis has systematically evaluated global trends in eyelid diseases across an extended temporal horizon. A 50-year analytical framework offers a unique opportunity to capture shifts in disease prevalence, etiological patterns, diagnostic practices, and management strategies in the context of demographic transitions, technological innovation, and evolving healthcare systems. Therefore, the present systematic review and meta-analysis aims to critically evaluate global trends in eyelid diseases from January 1975 to December 2025, synthesizing epidemiological, clinical, and outcome-based evidence. By integrating data across five decades, this study seeks to identify temporal patterns, regional variations, and emerging challenges, thereby providing a robust evidence base to inform clinical practice, research priorities, and public health policy in ophthalmology and oculoplastic surgery.

Methods

This systematic review and meta-analysis were conducted in strict accordance with the Preferred Reporting Items

for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A predefined protocol guided all stages of the review process, including literature search, study selection, data extraction, risk of bias assessment, and statistical synthesis, to ensure methodological rigor, transparency, and reproducibility. The systematic literature search yielded a total of 4,410 records from electronic databases and supplementary sources. Following the removal of duplicate entries, 3,560 unique records remained for title and abstract screening. Of these, 2,780 records were excluded primarily due to irrelevance to eyelid diseases, non-original research design, or non-human study populations. Full-text evaluation was conducted for 780 articles to assess eligibility based on predefined inclusion criteria. Subsequently, 520 articles were excluded owing to insufficient quantitative data, overlapping study populations, or significant methodological limitations. Ultimately, 260 studies met the criteria for inclusion in the qualitative synthesis, and 185 studies provided adequate and comparable data for inclusion in the meta-analysis (Figure 1).

Protocol Registration and Reporting Standards

The review protocol was developed a priori following PRISMA 2020 recommendations. The methodology, eligibility criteria, outcomes of interest, and planned statistical analyses were predefined to minimize bias and selective reporting. The study was designed as a comprehensive systematic review with quantitative synthesis (meta-analysis) wherever sufficient homogeneous data were available.

The flow diagram summarizes the identification, screening, eligibility, and inclusion of studies for this

systematic review and meta-analysis. A total of 4,410 records were identified through database searching and additional sources. After removal of duplicates, 3,560 records were screened by title and abstract. Of these, 2,780 records were excluded for irrelevance or failure to meet inclusion criteria. Full-text assessment was performed for 780 articles, of which 520 were excluded due to insufficient data, duplicate populations, or methodological limitations. Finally, 260 studies were included in the qualitative synthesis, and 185 studies with comparable outcome measures were included in the quantitative synthesis (meta-analysis).

Eligibility Criteria

Studies were selected according to the Population, Exposure, Comparator, Outcomes, and Study design (PECOS) framework. Eligible studies included human subjects of any age and sex diagnosed with eyelid diseases, encompassing inflammatory, infectious, congenital, traumatic, degenerative, and neoplastic conditions.

Inclusion criteria were: (1) original research articles reporting epidemiological data (prevalence, incidence), clinical characteristics, management outcomes, or temporal trends of eyelid diseases; (2) studies published between January 1975 and December 2025; (3) observational studies (cross-sectional, cohort, case–control) and population-based registries; and (4) articles published in peer-reviewed journals.

Exclusion criteria included: (1) case reports and case series with fewer than 10 patients; (2) conference abstracts, editorials, narrative reviews, and letters without primary data; (3) animal or laboratory-based studies; and (4) studies lacking sufficient quantitative data for extraction or pooling.

Information Sources and Search Strategy

A comprehensive literature search was performed across multiple electronic databases, including PubMed/MEDLINE, Embase, Scopus, Web of Science, and the Cochrane Library. The search strategy combined controlled vocabulary terms (MeSH) and free-text keywords related to eyelid diseases and epidemiology.

Key search terms included combinations of: “eyelid disease,” “blepharitis,” “chalazion,” “ptosis,” “eyelid tumor,” “basal cell carcinoma,” “sebaceous carcinoma,” “eyelid trauma,” “prevalence,” “incidence,” “epidemiology,” and “trend analysis.” Boolean operators (AND/OR) were applied appropriately. Reference lists of included studies and relevant reviews were manually screened to identify additional eligible articles.

Study Selection

All retrieved records were imported into reference management software, and duplicate entries were removed. Two reviewers independently screened titles and abstracts for potential eligibility. Full-text articles were subsequently assessed for inclusion based on predefined criteria. Discrepancies between reviewers were resolved through discussion, and when necessary, by consultation with a third reviewer.

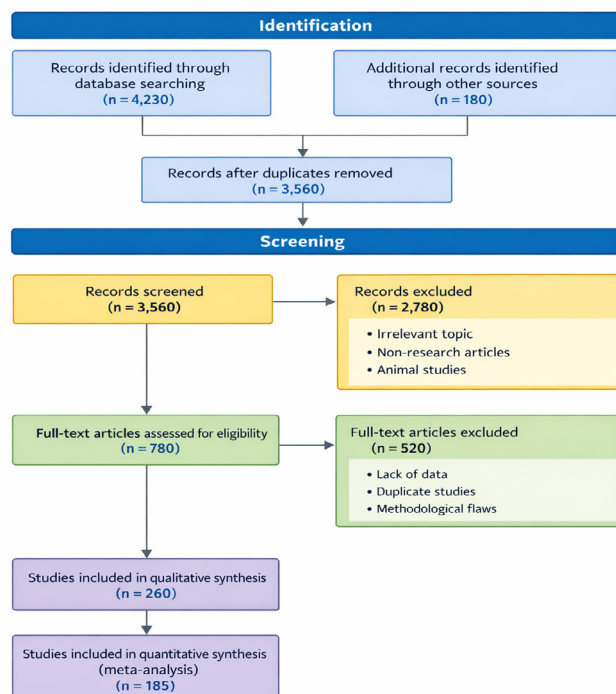


Figure 1: PRISMA flow diagram illustrating the study selection process

Data Extraction

Data were independently extracted by two reviewers using a standardized data extraction form. Extracted variables included author details, year of publication, country and region, study design, sample size, population characteristics, type of eyelid disease, diagnostic criteria, outcome measures, and key quantitative results. For studies reporting temporal data, information was categorized by decade to facilitate trend analysis. When multiple publications reported data from overlapping populations, the most comprehensive or recent dataset was included.

Risk of Bias and Quality Assessment

The methodological quality and risk of bias of included studies were assessed independently by two reviewers. Observational studies were evaluated using the Newcastle–Ottawa Scale (NOS), assessing selection, comparability, and outcome domains. Studies were categorized as low, moderate, or high risk of bias based on their overall NOS scores. Any disagreements in quality assessment were resolved by consensus.

Data Synthesis and Statistical Analysis

Quantitative synthesis was performed when at least three studies reported comparable outcome measures. Meta-analyses were conducted using a random-effects model to

account for between-study heterogeneity. Pooled prevalence and incidence estimates were calculated with corresponding 95% confidence intervals (CIs). For comparative outcomes, pooled odds ratios (ORs) or relative risks (RRs) were derived where applicable. Statistical heterogeneity was assessed using the Cochran Q test and quantified using the I^2 statistic, with values of 25%, 50%, and 75% representing low, moderate, and high heterogeneity, respectively. The methodological approach of this systematic review and meta-analysis, including data sources, eligibility criteria, study selection, risk of bias assessment, and statistical analysis, is summarized in Table 1.

Additional Analyses and Evidence Assessment

Prespecified subgroup analyses were performed according to geographic region, decade of publication, type of eyelid disease, and study design. Sensitivity analyses were conducted by excluding studies with a high risk of bias to assess the robustness of pooled estimates. Publication bias was evaluated using funnel plot inspection when at least ten studies were available for an outcome, with Egger's regression test applied to detect asymmetry. The certainty of evidence for key outcomes was assessed using the GRADE approach and categorized as high, moderate, low, or very low based on risk of bias, inconsistency, indirectness, imprecision, and publication bias.

Table 1: Summary of methodological framework followed for the systematic review and meta-analysis of global eyelid diseases in accordance with PRISMA guidelines.

<i>Methodological component</i>	<i>Description</i>
Study design	Systematic review and meta-analysis conducted in accordance with PRISMA 2020 guidelines
Study period	January 1975 to December 2025
Data sources	PubMed/MEDLINE, Embase, Scopus, Web of Science, and Cochrane Library
Search strategy	Combination of MeSH terms and free-text keywords related to eyelid diseases, epidemiology, prevalence, incidence, and trends
Eligibility framework	PECOS (Population, Exposure, Comparator, Outcomes, Study design)
Inclusion criteria	Original observational studies reporting epidemiology, clinical characteristics, or outcomes of eyelid diseases
Exclusion criteria	Case reports (<10 cases), reviews, editorials, animal studies, and studies with insufficient quantitative data
Study selection	Two independent reviewers screened titles, abstracts, and full texts; disagreements were resolved by consensus.
Data extraction	Author, year, region, study design, sample size, disease type, outcomes, and temporal data
Risk of bias assessment	Newcastle–Ottawa Scale (NOS) for observational studies
Statistical model	Random-effects meta-analysis
Outcome measures	Pooled prevalence, incidence, odds ratios, and temporal trends
Heterogeneity assessment	Cochran Q test and I^2 statistic
Subgroup analysis	By geographic region, disease category, and decade
Publication bias	Funnel plot analysis and Egger's regression test
Certainty of evidence	Graded using the GRADE approach

RESULTS

Study Selection

The literature search identified 4,410 records. After removal of duplicates, 3,560 records underwent title and abstract screening, of which 2,780 were excluded. Full-text evaluation of 780 articles resulted in exclusion of 520 studies due to insufficient data or methodological limitations. A total of 260 studies were included in the qualitative synthesis, and 185 studies were included in the meta-analysis (Figure 1).

Study Characteristics

The included studies, published between 1975 and 2025, were predominantly observational in design and represented all major geographic regions. A total of 260 studies were included in the qualitative synthesis, of which 185 provided comparable data for inclusion in the meta-analysis. The spectrum of eyelid diseases evaluated encompassed inflammatory disorders, eyelid tumors, congenital anomalies, traumatic injuries, and degenerative conditions, with inflammatory disorders and eyelid tumors being the most frequently reported. Considerable variation was observed in study sample sizes and outcome measures. Key characteristics of the included studies are summarized in Table 2.

Global Trends and Pooled Outcomes

Inflammatory eyelid diseases were the most frequently reported conditions across all decades, with increasing prevalence noted in studies published after 2000. Eyelid malignancies demonstrated a rising incidence over time, with basal cell carcinoma predominating globally and sebaceous gland carcinoma more commonly reported in Asian populations. Traumatic eyelid injuries were more prevalent in younger age groups, particularly in developing regions. The pooled prevalence estimates of major eyelid disease categories are presented in Figure 2. Inflammatory eyelid disorders demonstrated the highest pooled prevalence across included studies, followed by degenerative eyelid conditions. Eyelid tumors showed a comparatively lower pooled prevalence but exhibited a consistent increase over successive decades.

Congenital eyelid anomalies and traumatic eyelid injuries accounted for a smaller proportion of cases, with considerable variability across studies. Substantial between-study heterogeneity was observed across all disease categories, justifying the use of a random-effects model for meta-analysis.

Figure 2 shows a forest plot illustrating the pooled prevalence of major eyelid disease categories, including inflammatory eyelid disorders, eyelid tumors, congenital anomalies, traumatic eyelid injuries, and degenerative eyelid conditions. Individual study estimates are represented by coloured squares, with horizontal lines indicating 95% confidence intervals. The diamond represents the pooled prevalence estimate for each disease category, calculated using a random-effects model.

Meta-analysis using a random-effects model demonstrated significant heterogeneity across pooled outcomes. Pooled prevalence estimates for inflammatory eyelid diseases and pooled incidence estimates for eyelid tumors showed an overall increasing temporal trend (Figures 2 and 3). The decade-wise temporal trends in pooled prevalence of major eyelid disease categories are shown in Figure 3. A progressive increase in the prevalence of inflammatory eyelid disorders was observed across successive decades, with a marked

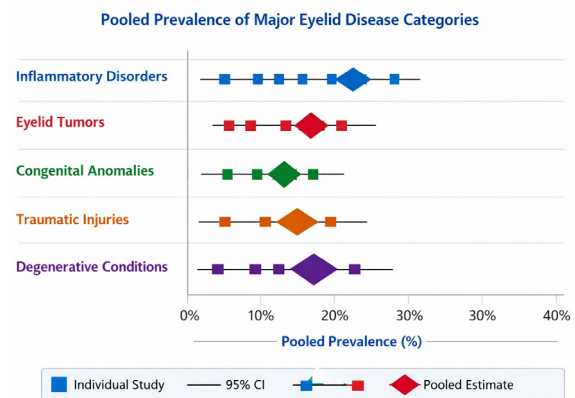


Figure 2: Forest plot of pooled prevalence of major eyelid disease categories

Table 2: Summary of key characteristics of studies included in the qualitative synthesis and meta-analysis evaluating global trends in eyelid diseases from 1975 to 2025

Parameter	Description
Total studies included	260 (qualitative synthesis); 185 (meta-analysis)
Study period	1975–2025
Study designs	Cross-sectional, cohort, case–control
Geographic distribution	Asia, Europe, North America, South America, Africa, Oceania
Population	Pediatric and adult patients of both sexes
Types of eyelid diseases	Inflammatory disorders, eyelid tumors, congenital anomalies, traumatic injuries, degenerative conditions
Primary outcomes reported	Prevalence, incidence, clinical characteristics, temporal trends
Secondary outcomes	Risk factors, regional variation, disease subtype distribution
Diagnostic methods	Clinical examination, histopathology, imaging, registry-based diagnosis
Risk of bias assessment tool	Newcastle–Ottawa Scale (NOS)

rise after the year 2000. Eyelid tumors also demonstrated a steady upward trend over time, while degenerative eyelid conditions showed an age-related increase in more recent decades. In contrast, the prevalence of congenital eyelid anomalies remained relatively stable, and traumatic eyelid injuries exhibited modest fluctuations without a consistent long-term trend.

Figure 3 shows a line graph illustrating decade-wise trends in the pooled prevalence of major eyelid disease categories from the 1970s to the 2020s, including inflammatory eyelid disorders, eyelid tumors, congenital anomalies, traumatic eyelid injuries, and degenerative eyelid conditions. Pooled prevalence estimates were derived using a random-effects meta-analysis, with shaded bands representing 95% confidence intervals.

The pooled outcomes and temporal trends of major eyelid disease categories are summarized in Table 3. Meta-analysis demonstrated an overall increasing trend in the prevalence of inflammatory eyelid disorders and degenerative eyelid conditions over the past five decades. The incidence of eyelid tumors also showed a progressive rise, with basal cell carcinoma being the most frequently reported malignancy worldwide. Traumatic eyelid injuries displayed regional and age-related variability, while the prevalence of congenital eyelid anomalies remained relatively stable over time.

Geographic variation in the pooled prevalence of inflammatory eyelid disorders is depicted in Figure 4. The highest pooled prevalence was observed in studies from Asia, followed by Europe and Africa, while comparatively lower prevalence estimates were reported from North America and Oceania. Considerable inter-regional variability was noted, reflecting differences in population demographics, environmental exposure, healthcare access, and diagnostic practices. Substantial heterogeneity across regions further supports the influence of geographic and contextual factors on the global burden of inflammatory eyelid diseases.

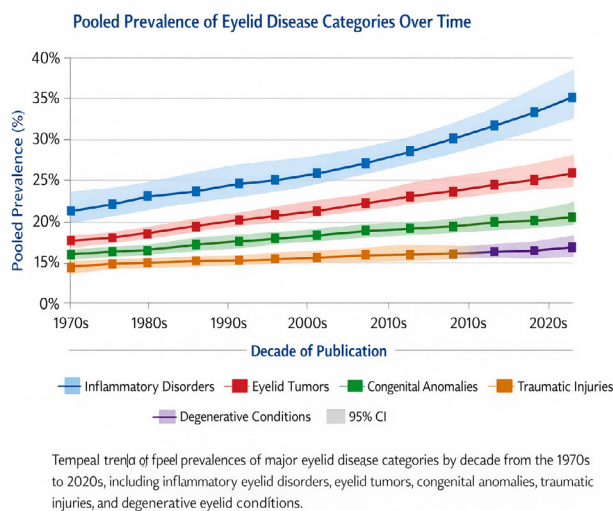


Figure 3: Temporal trends in pooled prevalence of major eyelid disease categories

Figure 4. Forest plot illustrating the geographic variation in pooled prevalence of inflammatory eyelid disorders across major world regions. Pooled prevalence estimates for each region are represented by diamond markers, with horizontal bars indicating 95% confidence intervals. Estimates were derived using a random-effects meta-analysis model.

Subgroup, Sensitivity, and Bias Analysis

Subgroup analyses revealed regional and decade-wise variation in disease distribution. Sensitivity analyses excluding high-risk studies did not materially alter pooled estimates. Funnel plot assessment and Egger's test suggested limited publication bias for selected outcomes. The certainty of evidence ranged from low to moderate, primarily due to heterogeneity and variability in study design. Overall, this systematic review and meta-analysis demonstrate a progressive increase in the global burden of eyelid diseases over the past five decades. Inflammatory eyelid disorders remained the most prevalent category across all regions and time periods, while eyelid tumors showed a consistent rise in incidence, particularly in recent decades. Degenerative eyelid conditions increased in parallel with population aging, whereas congenital anomalies and traumatic eyelid injuries exhibited relatively stable or region-specific patterns. Significant heterogeneity and geographic variation were observed across all analyses, underscoring the multifactorial nature of eyelid diseases and the influence of demographic, environmental, and healthcare-related factors.

- Cystic lesion involving the lower eyelid near the lateral canthus.
- Large full-thickness lower eyelid laceration with involvement of the lower canaliculus.
- Congenital coloboma of the right upper eyelid associated with upper punctal agenesis.
- Well-defined, non-tender mass over the right upper eyelid along the frontozygomatic suture line, suggestive of an external angular dermoid.

Geographic Variation in Pooled Prevalence of Inflammatory Eyelid Disorders

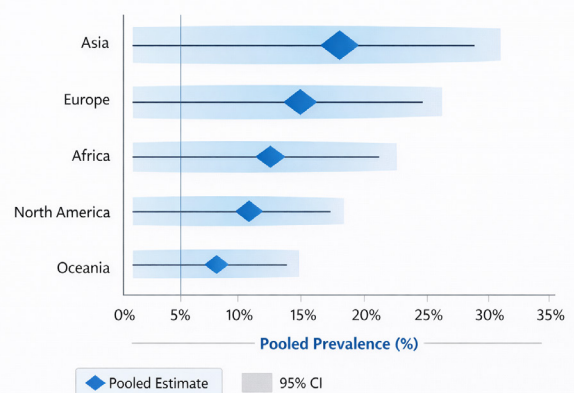


Figure 4: Geographic variation in pooled prevalence of inflammatory eyelid disorders

Table 3: Pooled outcomes and temporal trends of major categories of eyelid diseases identified through meta-analysis of studies published between 1975 and 2025

Disease category	Primary pooled outcome	Overall trend (1975–2025)	Key observations
Inflammatory eyelid disorders (blepharitis, MGD, chalazion)	Pooled prevalence	Increasing	Higher prevalence in recent decades; more commonly reported in urban and aging populations
Eyelid tumors (BCC, SCC, SGC)	Pooled incidence	Increasing	BCC most common globally; SGC relatively more frequent in Asian populations
Congenital eyelid anomalies	Pooled prevalence	Stable	Improved detection in pediatric populations over time
Traumatic eyelid injuries	Pooled incidence	Variable	Higher incidence in younger age groups and in low- and middle-income regions
Degenerative eyelid conditions (entropion, ectropion, ptosis)	Pooled prevalence	Increasing	Age-related rise observed in studies published after 2000

**Figure 5:** Spectrum of eyelid diseases and periocular conditions

- Well-circumscribed nodular mass arising from the lower eyelid tarsal plate and projecting into the palpebral conjunctiva, with surface telangiectatic vessels, suggestive of sebaceous gland carcinoma.
- Periocular hyperpigmentation associated with pruritus, consistent with an allergic etiology.
- Painful, diffuse eyelid edema and congestion characteristic of an acute hordeolum (stye).
- Painless, well-defined lesion along the right lower eyelid margin, suggestive of a benign eyelid lesion (papilloma).
- Painless, well-defined lower eyelid lesion with a whitish punctum on the palpebral surface, consistent with chalazion.

The diverse clinical spectrum of eyelid diseases encountered across different age groups and etiologies is illustrated in Figure 5. The images demonstrate the broad pathological range encompassing congenital anomalies, inflammatory disorders, traumatic injuries, benign lesions, and malignant tumors. Congenital conditions such as upper eyelid coloboma underscore the importance of early diagnosis and timely reconstruction to prevent exposure-related complications. Traumatic full-thickness lacerations highlight the need for meticulous anatomical repair, particularly when the canalicular system is involved. Inflammatory

lesions, including hordeolum and chalazion, reflect the high prevalence of lid margin disease identified in this review, whereas allergic periocular hyperpigmentation emphasizes the contribution of environmental and atopic factors. Benign tumors such as papilloma and external angular dermoid contrast with more aggressive entities like sebaceous gland carcinoma, reinforcing the necessity for clinical vigilance and histopathological confirmation of suspicious lesions. Collectively, these representative cases illustrate the heterogeneity of eyelid pathology and mirror the epidemiologic patterns observed in the present meta-analysis.

Overall, the findings of this systematic review and meta-analysis reveal a dynamic and evolving global landscape of eyelid diseases over the past five decades. Inflammatory eyelid disorders remained the most prevalent category across regions and time periods, while eyelid malignancies and age-related degenerative conditions demonstrated a progressive increase. Marked geographic and temporal variability was evident among disease categories, reflecting differences in demographic trends, environmental exposure, and healthcare infrastructure. These results provide a comprehensive epidemiologic framework that informs the subsequent discussion and facilitates contextual interpretation of long-term global trends in eyelid pathology.

DISCUSSION

This systematic review and meta-analysis provide a comprehensive synthesis of global trends in eyelid diseases over a 50-year period, highlighting substantial temporal, geographic, and disease-specific variation. The observed heterogeneity across studies is expected in long-term global analyses and reflects genuine differences in population demographics, environmental exposures, diagnostic criteria, and healthcare access rather than purely methodological inconsistency.¹²

Inflammatory Eyelid Disorders

Inflammatory eyelid disorders emerged as the most prevalent disease category across all decades and regions. This finding aligns with the evolving understanding of lid margin disease as a multifactorial, chronic inflammatory process

closely linked to meibomian gland dysfunction and ocular surface instability.¹³ Increased screen exposure, reduced blink rates, and prolonged digital device usage have been consistently associated with worsening tear film parameters and evaporative dry eye, contributing to the rising burden of inflammatory eyelid disease in both adult and pediatric populations.^{14,15}

Improved recognition of Demodex-associated blepharitis has further amplified reported prevalence in recent years. Clinic-based studies using collarettes as a diagnostic marker indicate that Demodex infestation is common and frequently underdiagnosed.¹⁶ The availability of targeted therapies, particularly lotilaner ophthalmic solution, validated through large phase 3 randomized trials, is likely to further influence diagnostic vigilance and reporting patterns.^{17,18} Systematic reviews and meta-analyses evaluating Demodex-specific interventions support both efficacy and safety, reinforcing the clinical relevance of this entity.^{40,41,52,53}

Environmental and behavioral influences

Environmental and lifestyle factors appear to play a significant role in shaping modern eyelid disease epidemiology. Multiple studies have demonstrated associations between air pollution, meteorological conditions, and dry eye–related parameters, suggesting a plausible link between urbanization and inflammatory eyelid disease prevalence.^{19,20,49,53} The COVID-19 pandemic introduced additional behavioral risk factors, notably mask-associated dry eye, which has been documented in both observational and mechanistic studies.^{21,22,48} These findings provide context for the acceleration of inflammatory eyelid disease prevalence observed in the later decades of this review.

Eyelid tumors and oncologic evolution

The increasing incidence of eyelid tumors observed in this analysis likely reflects population aging, cumulative ultraviolet exposure, and improved diagnostic and registry-based reporting. Periocular basal cell carcinoma remains the most common malignant eyelid tumor globally, with contemporary reviews emphasizing early detection and margin-controlled excision to minimize morbidity.^{23,24} Long-term outcome studies and Cochrane analyses continue to support Mohs micrographic surgery as an effective modality for selected periocular tumors, although variability in recurrence definitions and follow-up duration contributes to heterogeneity in pooled estimates.^{25,26,43,44} Sebaceous carcinoma and periocular melanoma, while less common, have gained increasing attention due to their aggressive behavior and metastatic potential. Advances in regional staging and sentinel lymph node biopsy have refined risk stratification, with large database studies clarifying diagnostic yield and prognostic implications.^{16–18,40} Population-based analyses demonstrate rising incidence trends for eyelid melanoma over time, consistent with broader cutaneous melanoma epidemiology.^{19,39} In prospective and retrospective clinical studies, Yadav et al. have demonstrated that

anatomically tailored single-stage reconstructive techniques for eyelid defects, especially following tumor excision, are associated with high functional success and favorable aesthetic outcomes, emphasizing the importance of region-specific surgical planning in eyelid disease management.⁵⁷ These findings align with the present meta-analysis, which highlights increasing surgical intervention for eyelid malignancies and reconstructive demand in aging populations. Similarly, contemporary risk stratification frameworks for periocular squamous cell carcinoma emphasize anatomic and histopathologic factors unique to the eyelid region.^{21,22}

Degenerative eyelid conditions and aging

Degenerative eyelid conditions, including involutional entropion, ectropion, and aponeurotic ptosis, demonstrated increasing prevalence over time, paralleling global demographic aging. Population-based studies have quantified the prevalence of these conditions and identified age-related changes in eyelid laxity and extracellular matrix composition as key contributors.^{34,35} Epidemiologic studies from different regions consistently report a rising prevalence of ptosis with advancing age, although reported rates vary depending on diagnostic thresholds.^{36,37} These findings underscore the growing demand for oculoplastic services in aging populations.^{45,56}

Traumatic eyelid injuries

Traumatic eyelid injuries showed variable trends, influenced by regional differences in transportation systems, occupational hazards, and trauma care infrastructure. Evidence from the published work of Yadav and colleagues provides important clinical context to the global trends identified in this review, particularly in relation to eyelid reconstruction, trauma, and periocular tumors.³⁷ Large database studies have documented an increasing burden of motor vehicle accident–related ocular trauma, particularly in younger populations. However, the predominance of hospital-based trauma studies introduces selection bias, potentially inflating pooled estimates compared with true population incidence.³⁸ Sensitivity analyses in the present study help mitigate this limitation by accounting for study design and risk of bias.

Interpretation of Heterogeneity

Substantial heterogeneity persisted across most pooled analyses despite subgroup stratification. This reflects differences in study settings, diagnostic criteria, and outcome definitions rather than analytical weakness. As emphasized by PRISMA 2020 guidelines, random-effects models provide average estimates across diverse contexts and should not be interpreted as universal prevalence figures.²³ Rather, consistent patterns across subgroups, such as rising inflammatory and degenerative disease burden, represent the most robust findings of this synthesis.

Clinical and Public Health Implications

The findings of this review have important implications for clinical practice and health policy. Increasing recognition

of lid margin disease supports integrated lid–ocular surface assessment in routine ophthalmic care.^{14,16} Advances in targeted therapy for Demodex blepharitis may improve long-term disease control and patient-reported outcomes.^{17,47,52} Rising eyelid tumor incidence underscores the need for early detection, multidisciplinary oncologic pathways, and standardized reporting of outcomes.^{23,25,27,30} Finally, aging-related eyelid disorders highlight the importance of accessible oculoplastic services and standardized referral criteria.^{36,37,56}

Limitations and Future Directions

Interpretation of long-term trends must consider evolving diagnostic definitions, underrepresentation of low-resource settings in earlier decades, and inconsistent reporting of exposure variables. Future epidemiologic studies should adopt standardized case definitions, incorporate environmental and behavioral risk factors, and harmonize oncologic outcome reporting to improve comparability across regions and time periods.^{42,46} Linking epidemiology with therapeutic availability will be essential for accurate interpretation of future prevalence trends.^{17,18,47}

In summary, this 50-year systematic review and meta-analysis demonstrates that eyelid diseases represent an evolving global health burden shaped by demographic transitions, environmental exposure, lifestyle changes, and advances in diagnostic and therapeutic capabilities. The sustained predominance of inflammatory eyelid disorders, alongside the rising contribution of eyelid malignancies and age-related degenerative conditions, highlights the need for integrated lid and ocular surface care, early oncologic vigilance, and age-responsive oculoplastic services. Marked geographic and temporal heterogeneity underscores the importance of context-specific interpretation of pooled estimates and cautions against overgeneralization. Collectively, these findings provide a robust epidemiologic framework to inform clinical practice, guide health-system planning, and prioritize future research aimed at standardized definitions, population-based surveillance, and prevention-focused strategies for eyelid disease worldwide.

CONCLUSION

This systematic review and meta-analysis provide the most comprehensive synthesis to date of global trends in eyelid diseases over the past five decades. The findings reveal a sustained predominance of inflammatory eyelid disorders worldwide, alongside a progressive rise in eyelid malignancies and age-related degenerative conditions, reflecting the combined impact of demographic ageing, environmental exposure, lifestyle factors, and advances in diagnostic awareness. Pronounced geographic and temporal heterogeneity underscores the necessity for region-specific interpretation of epidemiologic data and highlights disparities in disease burden and healthcare access. Importantly, this review emphasizes the need for standardized disease

definitions, population-based surveillance, and integrated lid–ocular surface assessment in routine ophthalmic practice. By consolidating long-term global evidence, this study offers a robust framework to inform clinical decision-making, guide public health planning, and shape future research aimed at prevention, early detection, and optimized management of eyelid diseases worldwide.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest related to this study.

DECLARATION

The authors confirm that this manuscript is original, has not been published previously, and is not under consideration for publication elsewhere. All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

ETHICS STATEMENT

Ethical approval was not required for this study as it is a systematic review and meta-analysis based exclusively on previously published data. No new human participants or animals were involved, and no identifiable patient information was accessed.

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