Clinical Ophthalmology

Dovepress
Taylor & Francis Group

Open Access Full Text Article

ORIGINAL RESEARCH

Spectrum of Pediatric Visual Disorders in Outpatient and Inpatient Settings at a Tertiary Hospital: A 10-Year Retrospective Study

Worapot Srimanan, Phawasutthi Keokajee

Ophthalmology Division, Phramongkutklao Hospital, Bangkok, Thailand

Correspondence: Worapot Srimanan, Ophthalmology Division, Phramongkutklao Hospital, 315 Ratchawithi Road, Thung Phayathai Subdistrict, Ratchathewi, Bangkok, Thailand, Tel +662-763-9300, Fax +662-354-9309, Email drworapotsmn@gmail.com

Purpose: Visual problems are a common reason for ophthalmic evaluation in children and encompass a wide spectrum of functional visual disturbances and visual impairment. Understanding the patterns of pediatric visual disorders across different clinical care settings is important for service planning and resource allocation, particularly in tertiary referral hospitals.

Patients and Methods: This retrospective descriptive study included pediatric patients aged <18 years who presented to a tertiary hospital with clinically assessed visual problems from January 1, 2015, to December 31, 2024. Patients were identified from outpatient (OPD) and inpatient (IPD) services using International Classification of Diseases, Tenth Revision (ICD-10) codes for visual disturbances (H53) and visual impairment or blindness (H54). Demographic data, laterality, clinical diagnoses, refractive status, and management indicators were collected. The distribution of visual disorders was compared between OPD and IPD settings. An exploratory multivariable logistic regression analysis was performed to identify clinical factors associated with inpatient admission.

Results: A total of 321 pediatric patients were included, comprising 196 OPD and 125 IPD cases. Amblyopia and refractive-related conditions were the most common diagnoses in OPD, whereas cataract predominated in IPD. Surgical intervention was required significantly more frequently among IPD patients than OPD patients. Refractive error was common in both settings, but occurred more frequently in IPD. ICD-10–based analysis showed that visual disturbance codes (H53) were more prevalent in OPD, while visual impairment codes (H54) were more common in IPD. In multivariable analysis, cataract and bilateral involvement were independently associated with inpatient admission.

Conclusion: Pediatric visual disorders presenting to a tertiary hospital demonstrate distinct patterns between outpatient and inpatient settings. Outpatient encounters are dominated by amblyopia and refractive-related conditions, whereas inpatient admissions are largely driven by cataract and conditions requiring surgical management. These findings highlight the importance of differentiated service strategies to optimize the delivery of pediatric eye care and resource utilization.

Plain Language Summary: Children are often brought to eye clinics because of concerns about their vision. These problems can range from mild conditions, such as needing glasses, to more serious diseases that require hospital admission or surgery. Understanding the types of visual problems children present with, and how they differ between outpatient and inpatient care, can help improve planning and delivery of pediatric eye services.

In this study, we reviewed medical records of children under 18 years of age who were evaluated for visual problems at a tertiary hospital between 2015 and 2024. We compared children seen in outpatient clinics with those who required hospital admission. Standardized diagnostic codes were used to classify clinically assessed visual conditions, and information on diagnoses, vision, and treatment was collected.

We found clear differences between outpatient and inpatient cases. Children seen in outpatient clinics most commonly had amblyopia (reduced vision in one or both eyes) or refractive errors such as short-sightedness or astigmatism. In contrast, children admitted to hospital were more likely to have cataracts and other conditions requiring surgery. Surgery was needed much more frequently in hospitalized patients, and visual problems affecting both eyes were also more common.

Overall, outpatient and inpatient services manage different types of pediatric visual disorders. Outpatient care mainly focuses on common and treatable conditions, while inpatient care is required for more severe diseases needing surgical management. Recognizing

https://doi.org/10.2147/OPTH.S596742
Received: 16 January 2026
Accepted: 8 April 2026
Published: 16 April 2026

these differences can help improve resource allocation and optimize pediatric eye care in tertiary hospitals.

Keywords: pediatric visual disorders, amblyopia, cataract, ICD-10, tertiary eye care

Introduction

Visual problems in children constitute a common reason for ophthalmic evaluation and encompass a broad spectrum of underlying conditions, ranging from benign refractive or binocular vision disorders to sight-threatening diseases requiring timely intervention.[1–3] Early recognition and appropriate evaluation are essential, as childhood visual impairment can adversely affect visual development, academic performance, psychosocial well-being, and long-term quality of life.[1,3,4]

Unlike adults, children often have a limited ability to articulate subjective visual symptoms, particularly at younger ages.[2,5] Consequently, pediatric visual problems are frequently identified indirectly through caregiver observations, screening programs, or clinical examination rather than through explicit symptom reporting.[2] In clinical practice, therefore, pediatric visual presentations often reflect functionally assessed visual disturbances or measurable visual impairment, rather than purely subjective complaints.

Previous studies have demonstrated that amblyopia, refractive error, and binocular vision disorders are among the most common causes of pediatric visual problems, while retinal and optic nerve diseases contribute to more severe visual impairment.[6,7] In tertiary care settings, the clinical spectrum is broader, reflecting referral of children with more complex or advanced disease, including bilateral involvement and conditions requiring surgical or inpatient management.[8,9] However, much of the existing literature focuses on specific diagnoses or subspecialty populations, whereas relatively few studies have examined pediatric visual problems from functional and service-based perspectives across diverse clinical care settings.[10,11]

The International Classification of Diseases, Tenth Revision (ICD-10), provides a standardized framework for categorizing visual disturbances (H53) and visual impairment or blindness (H54), enabling consistent characterization of functional visual problems across healthcare systems.[12] These classifications are particularly useful in pediatric populations, where objective clinical assessment often substitutes for subjective symptom reporting. ICD-10–based approaches have been widely used in epidemiologic and service-oriented ophthalmic research to describe patterns of visual impairment and healthcare utilization.[13,14]

In Thailand and similar healthcare systems, tertiary hospitals serve as referral centers for children with a wide range of visual conditions requiring specialized evaluation or management. Characterizing the patterns of pediatric visual presentations in such settings can provide important insights into disease burden, referral pathways, and healthcare utilization. Nevertheless, data describing pediatric visual problems using standardized functional classifications across both outpatient and inpatient settings remain limited.

Therefore, this study aimed to describe the patterns of pediatric visual presentations and associated clinical diagnoses in a tertiary hospital, using ICD-10–based functional classification of visual disturbances and visual impairment. By comparing outpatient and inpatient populations, this study seeks to provide a comprehensive overview of disease distribution and care patterns to support service planning and future research in pediatric ophthalmology.

Materials and Methods

Study Design and Setting

This retrospective descriptive study was conducted at a tertiary care hospital that serves as a regional referral center for pediatric ophthalmology from January 1, 2015, to December 31, 2024. The institution provides comprehensive ophthalmic services, including outpatient clinics, emergency consultations, and inpatient care, and routinely manages a broad spectrum of pediatric visual conditions, ranging from common refractive disorders to complex neuro-ophthalmic and surgical cases. The study was designed to characterize patterns of pediatric visual complaints across clinical care settings and to compare outpatient and inpatient presentations over an extended observation period.

Study Population

The study population consisted of pediatric patients aged <18 years who underwent ophthalmic evaluation during the study period. Eligible patients were identified through the hospital's electronic medical record system and included both outpatient and inpatient encounters. Patients were included if the treating ophthalmologist recorded an ICD-10 diagnosis code for visual complaints at the initial clinical encounter.

To avoid duplication and potential overlap between outpatient and inpatient cohorts, patients who were initially evaluated in the outpatient setting but subsequently required hospital admission were classified only once under the inpatient (IPD) cohort. These cases were excluded from the outpatient (OPD) group to ensure that each patient contributed a single index encounter to the analysis. This approach was implemented to prevent inflation of denominators and to maintain clear separation between OPD and IPD populations for accurate comparison.

To avoid duplication arising from repeated visits over the study period, only the initial (index) presentation of each patient was included in the analysis. Subsequent follow-up visits or repeat encounters were not counted as separate cases. This ensured that each patient contributed a single observation to the dataset and minimized the risk of double-counting.

Patients were excluded if (1) best-corrected visual acuity data were unavailable, (2) clinical documentation was incomplete with respect to visual assessment or laterality, or (3) key variables required for classification and analysis were missing. These exclusion criteria were applied to ensure data completeness and internal consistency, in accordance with the predefined study protocol.

The flow diagram of patient selection is illustrated in Figure 1.

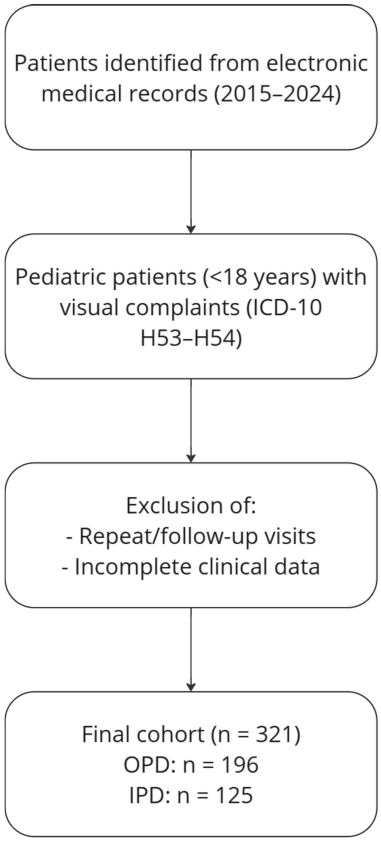

Figure 1 Flow diagram of patient selection. Pediatric patients were identified from electronic medical records over a 10-year period. Only the initial presentation for each patient was included, and repeat visits were excluded to avoid duplication. Patients were then categorized into outpatient (OPD) and inpatient (IPD) groups.

https://doi.org/10.2147/OPTH.S596742

Definition and Classification of Visual Complaints

Visual complaints were identified using the International Classification of Diseases, Tenth Revision (ICD-10) codes documented at the initial presentation. ICD-10 codes were used as standardized proxies for vision-related problems prompting ophthalmic evaluation, rather than as definitive etiologic diagnoses. This approach reflects real-world clinical documentation and enables standardized comparison across care settings.

For the purpose of this study, the "visual spectrum" was defined as the range of clinically assessed visual conditions, including refractive-related problems, binocular vision disorders, visual field defects, color vision abnormalities, and visual impairment. The "pattern" refers to the distribution of these conditions across diagnostic categories and clinical care settings (outpatient versus inpatient).

Visual complaints were classified into two principal categories based on ICD-10 coding:

1. Visual disturbances (ICD-10 H53), including amblyopia (H53.0), diplopia (H53.2), disorders of binocular vision (H53.3), visual field defects (H53.4), color vision deficiencies (H53.5), and other or unspecified visual disturbances (H53.8–H53.9).
2. Visual impairment or blindness (ICD-10 H54), representing functional visual impairment according to World Health Organization visual acuity classifications, including unilateral or bilateral low vision and blindness.

Each patient was assigned a single primary ICD-10 code corresponding to the most clinically relevant visual complaint at presentation, as recorded by the attending ophthalmologist. Board-certified ophthalmologists performed the coding. In addition, ICD-10 codes H53–H54 were reviewed to describe patterns of functional visual disturbance and visual impairment across outpatient and inpatient settings, serving as a secondary descriptive indicator of visual severity. Codes reflect final clinical assessment, not preliminary triage.

Data Collection

Demographic variables, including age and sex, were extracted from electronic medical records. Clinical variables collected included laterality of visual involvement (unilateral or bilateral), clinical setting of presentation (outpatient clinic, emergency department, or inpatient admission), and best-corrected visual acuity (BCVA).

Visual acuity was measured using age-appropriate visual acuity charts and recorded in logarithms of the minimum angle of resolution (logMAR) units, in accordance with routine clinical practice at the institution. When applicable, refractive data were obtained following cycloplegic or non-cycloplegic refraction based on clinical indication and patient age.

Outcomes

The primary outcome of the study was the distribution of pediatric visual complaints categorized according to ICD-10 codes H53 and H54. Secondary outcomes included the distribution of visual complaints by laterality and by clinical care setting (outpatient versus inpatient).

Statistical Analysis

All data were entered into a standardized database and analyzed using Stata 14 (StataCorp LLC, the USA).

Descriptive statistics were used to summarize demographic characteristics, clinical features, and distributions of visual complaint categories. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using appropriate measures of central tendency and dispersion.

Comparative analyses between outpatient and inpatient groups were performed using chi-square or Fisher's exact tests for categorical variables and appropriate parametric or non-parametric tests for continuous variables. Logistic regression results were interpreted as associations rather than causal relationships, given the study's retrospective, observational design. Statistical significance was defined using a two-sided p-value threshold of <0.05.

An exploratory multivariable logistic regression analysis was performed to identify clinical factors associated with inpatient admission. Variables were selected a priori based on clinical relevance and existing literature, rather than data-driven or automated selection procedures. Age younger than five years was included as a surrogate marker for early-onset and congenital ocular conditions. Cataract was incorporated due to its strong association with surgical management and hospitalization in pediatric ophthalmology. Neuro-ophthalmic disorders were included, given their potential association with systemic or intracranial pathology requiring inpatient evaluation. Bilateral involvement was selected as a marker of functional visual severity, and ocular trauma was included because traumatic eye injuries frequently necessitate admission for monitoring or surgical intervention. These variables were chosen to reflect clinically meaningful factors influencing admission decisions in routine pediatric ophthalmic practice. Adjusted odds ratios with 95% confidence intervals were reported.

Ethics

The Institutional Review Board of the Royal Thai Army Medical Department (approval number S021h68_Exp) reviewed and approved the study protocol. Written informed consent for publication was waived because of the retrospective study design. Participant data were kept anonymous and confidential.

Results

Study Population and Demographic Characteristics

A total of 321 pediatric patients presenting with visual complaints were included in the analysis, comprising 196 outpatient (OPD) and 125 inpatient (IPD) encounters. The mean age was 10.6 ± 5.5 years in the OPD group and 9.3 ± 5.3 years in the IPD group. Children younger than five years accounted for 17.3% of OPD cases and 22.4% of IPD cases. Male patients predominated in both settings, comprising 60.7% of OPD and 52.8% of IPD patients. Detailed demographic characteristics are summarized in Table 1.

Diagnostic Spectrum of Visual Complaints

The distribution of diagnoses differed significantly between outpatient and inpatient settings (Table 2). Among OPD patients, amblyopia (25.5%) and refractive-related complaints (8.2%) were the most frequent diagnoses. In contrast, cataract was the predominant diagnosis among IPD patients, accounting for 22.4%, a proportion significantly higher than that observed in OPD (2.0%, $p < 0.001$).

Table 1 Demographic Characteristics of Pediatric Patients with Visual Complaints by Care Setting

Characteristic	OPD (n = 196)	IPD (n = 125)
Age (years)		
Mean ± SD	10.6 ± 5.5	9.3 ± 5.3
Median (IQR)	11 (6–15)	10 (5–14)
Age group, n (%)		
< 5 years	34 (17.3%)	28 (22.4%)
5–10 years	57 (29.1%)	42 (33.6%)
> 10 years	105 (53.6%)	55 (44.0%)
Sex, n (%)		
Male	119 (60.7%)	66 (52.8%)
Female	77 (39.3%)	59 (44.2%)

Abbreviations: OPD, outpatient department; IPD, inpatient department; IQR, interquartile range.

https://doi.org/10.2147/OPTH.S596742

Table 2 Diagnostic Spectrum of Pediatric Visual Complaints in Outpatient and Inpatient Settings

Diagnosis Category	OPD (n = 196)	IPD (n = 125)	p-value
Amblyopia	50 (25.5%)	14 (11.2%)	0.003
Refractive error/eye strain	16 (8.2%)	2 (1.6%)	0.025
Strabismus	10 (5.1%)	10 (8.0%)	0.418
Cataract	4 (2.0%)	28 (22.4%)	<0.001
Ocular trauma	12 (6.1%)	5 (4.0%)	0.567
Retinal disease (ROP, RD, CMVR)	14 (7.1%)	7 (5.6%)	0.754
Neuro-ophthalmic disorders	15 (7.7%)	4 (3.2%)	0.160
Ocular tumor (RB)	9 (4.6%)	3 (2.4%)	0.479
Congenital ocular anomalies	10 (5.1%)	1 (0.8%)	0.080
Others / mixed diagnoses	56 (28.6%)	51 (40.8%)	0.032

Notes: Data are presented as number (%). Statistical test: Chi-square test.
Abbreviations: ROP, retinopathy of prematurity; RD, retinal detachment; CMVR, cytomegalovirus retinitis; RB, retinoblastoma.

Amblyopia and refractive-related complaints were significantly more common in the outpatient setting ($p = 0.003$ and $p = 0.025$, respectively). No statistically significant differences were observed between OPD and IPD for ocular trauma ($p = 0.567$), retinal disease ($p = 0.754$), or strabismus ($p = 0.418$). Collectively, these findings demonstrate a clear divergence in diagnostic profiles between outpatient and inpatient pediatric visual complaints.

A complete list of ophthalmic diagnoses and their distribution by care setting is provided in Supplementary Table S1.

Disease Severity and Management Indicators

Markers of disease severity and management requirements are presented in Table 3. Surgical intervention was required in 65.6% of IPD patients compared with 24.0% of OPD patients ($p < 0.001$), reflecting a substantially greater treatment burden among hospitalized children. Rates of bilateral involvement and neuroimaging utilization did not differ significantly between the two groups.

Refractive Characteristics

Refractive error was common in both care settings and was significantly more frequent among IPD patients (75.2%) than among OPD patients (58.2%; $p = 0.003$). However, no statistically significant differences were observed between OPD and IPD in the prevalence of myopia, hyperopia, astigmatism, or anisometropia. The mean spherical equivalent of the worse eye was also comparable between groups (4.63 vs 3.91 diopters, $p = 0.308$). Detailed refractive characteristics are shown in Table 4.

Table 3 Disease Severity and Management Indicators by Care Setting

Variable	OPD (n = 196)	IPD (n = 125)	p-value
Bilateral involvement, n (%)	100 (51.0%)	72 (57.6%)	0.299
Surgical intervention required, n (%)	47 (24.0%)	82 (65.6%)	<0.001
Neuroimaging performed, n (%)	156 (79.6%)	91 (72.8%)	0.203

Notes: Data are presented as percentages. Statistical test: Chi-square test.

Table 4 Refractive Characteristics of Pediatric Patients with Visual Complaints

Refractive Variable	OPD (n = 196)	IPD (n = 125)	p-value
Any refractive error (%)	114 (58.2%)	94 (75.2%)	0.003
Myopia (≤ −0.50 D) (%)	60 (30.6%)	50 (40.0%)	0.108
Hyperopia (≥ +2.00 D) (%)	26 (13.3%)	13 (10.4%)	0.554
Astigmatism ≥ 1.50 D (%)	55 (28.1%)	48 (38.4%)	0.070
Anisometropia ≥ 1.00 D (%)	47 (24.0%)	31 (24.8%)	0.973
Mean spherical equivalent (worse eye), D	4.63	3.91	0.308

Notes: Data are presented as numbers (percentages) unless otherwise specified; Unit of analysis: patient-level; Refractive status determined based on the worse eye. Definitions: Myopia: spherical equivalent ≤ −0.50 diopters (D); Hyperopia: ≥ +2.00 D; Astigmatism: cylinder ≥ 1.50 D; Anisometropia: interocular difference ≥ 1.00 D; Any refractive error: presence of at least one of the above. Statistical tests: categorical variables: Chi-square test; continuous variable: Welch's *t*-test.

Functional Visual Classification Based on ICD-10 Codes

Visual disturbance codes (H53) were more frequent in OPD (32.1%) compared with IPD (24.8%), while visual impairment codes (H54) were more common in IPD (72.8%) than OPD (65.3%) (p = 0.199). A detailed distribution of coding is shown in Table 5.

Factors Associated with Inpatient Admission

In an exploratory multivariable logistic regression analysis (Table 6), cataract was strongly associated with inpatient admission (adjusted OR 18.73, 95% CI 6.21–56.47, p < 0.001). Bilateral involvement was also independently associated

Table 5 Distribution of ICD-10 Visual Disturbance (H53) and Visual Impairment (H54) Codes by Care Setting

ICD-10 category	OPD (n = 196)	IPD (n = 125)	p-value
H53 – Visual disturbances	63 (32.1%)	31 (24.8%)	0.199
H54 – Visual impairment/blindness	128 (65.3%)	91 (72.8%)	0.199
Other ICD-10 codes	5 (2.6%)	3 (2.4%)	NA

Notes: Data are presented as a number (%). Statistical test: Chi-square test.

Table 6 Multivariable Logistic Regression Analysis of Factors Associated with Inpatient Admission

Variable	Adjusted OR	95% CI	p-value
Age < 5 years	1.36	0.74–2.50	0.321
Cataract	18.73	6.21–56.47	<0.001
Neuro-ophthalmic disorder	0.66	0.24–1.79	0.413
Bilateral involvement	1.90	1.11–3.23	0.019
Ocular trauma	1.56	0.53–4.58	0.418

Notes: Model: Multivariable logistic regression. Reporting: Adjusted odds ratios (OR) with 95% confidence intervals.

with hospitalization (adjusted OR 1.90, 95% CI 1.11–3.23, p = 0.019). Age younger than five years, neuro-ophthalmic disorders, and ocular trauma were not independently associated with inpatient admission after adjustment.

Discussion

This 10-year retrospective study provides a comprehensive overview of pediatric visual presentations in a tertiary care setting and demonstrates clear and clinically meaningful differences between outpatient and inpatient populations. By analyzing OPD and IPD cohorts separately, our findings show that pediatric visual problems are not a homogeneous entity but instead reflect distinct patterns of disease severity, diagnostic composition, and management requirements. These findings underscore that outpatient and inpatient pediatric ophthalmic services address fundamentally different clinical needs and highlight important implications for clinical triage, resource allocation, and service planning. In this study, "visual complaints" were operationalized using ICD-10–based functional and diagnostic classifications, reflecting clinically assessed visual presentations rather than patient-reported symptoms.

The demographic profile of our cohort, characterized by a predominance of school-aged children and a relatively higher proportion of younger children in the inpatient group, is broadly consistent with previous hospital-based studies.[10,11] School-aged children are more likely to present due to increasing visual demands and detection through academic activities, whereas younger children requiring inpatient care often have congenital or early-onset conditions necessitating surgical or specialized management.[3,15] Variability across studies may reflect differences in healthcare access, referral systems, and the role of tertiary centers in managing more complex disease. These demographic patterns further suggest that pediatric visual presentations in tertiary care are influenced not only by age-related visual demands but also by referral bias, whereby more complex or early-onset conditions are preferentially managed in inpatient settings.

In the outpatient setting, amblyopia and refractive-related conditions constituted the most common diagnostic categories. This pattern is consistent with prior literature demonstrating that amblyopia and uncorrected refractive error are leading causes of visual impairment in children worldwide.[3,6,7] Amblyopia affects approximately 1–5% of children and remains a major cause of preventable visual impairment when not detected early.[3,6] Importantly, these findings indicate that a substantial proportion of pediatric visual presentations in the outpatient setting are identified through routine examination or screening rather than arising from clearly articulated symptoms, reflecting the well-recognized discrepancy between subjective complaints and clinically detected visual disorders in children.[2,5] The predominance of these conditions in OPD highlights the importance of early identification and management, as emphasized in pediatric vision screening guidelines.[2] Moreover, the impact of amblyopia extends beyond visual acuity, affecting reading performance, fine motor skills, and psychosocial development.[4] The prevalence of refractive error observed in our cohort is broadly comparable to previous clinic-based studies, although variations may be attributable to differences in definitions, handling of bilateral involvement, and inclusion of asymptomatic cases detected through screening.[3,7]

In contrast, the inpatient cohort demonstrated a distinctly different diagnostic profile, with cataract emerging as the most frequent diagnosis. Pediatric cataract is a well-recognized cause of severe visual impairment and childhood blindness, particularly in tertiary referral settings.[3,13] The higher prevalence of cataract and other surgically managed conditions among IPD patients reflects both disease severity and the need for operative intervention. These findings are consistent with global epidemiologic data identifying cataract, retinal disease, and congenital anomalies as major contributors to childhood blindness.[3,13,15] Importantly, these inpatient presentations represent clinically significant visual disorders that are less likely to be detected through subjective complaints alone and more often require structured clinical evaluation and timely intervention.

The marked difference in surgical intervention rates between OPD and IPD patients provides objective evidence that hospitalization in pediatric ophthalmology is closely associated with disease severity and treatment complexity. Similar patterns have been reported in tertiary centers, where inpatient care is largely driven by conditions requiring surgical or multidisciplinary management.[3,13] Although ocular trauma remains an important cause of pediatric visual morbidity, its similar frequency between OPD and IPD groups in our study may reflect effective triage systems, whereby only more severe cases require admission.[1] Collectively, these findings reinforce that pediatric visual presentations differ

substantially across care settings, with outpatient encounters reflecting functional or screening-detected conditions and inpatient admissions representing structurally or surgically significant disease.

Bilateral involvement, which was common in both groups and more frequent among inpatients, represents an important marker of functional visual severity. Bilateral visual impairment has been consistently associated with greater impact on visual development and quality of life and is a major contributor to childhood blindness globally.[3,16] These findings underscore the importance of early detection and timely management, particularly in children with bilateral or progressive disease. Furthermore, bilateral involvement may be underrecognized at the level of subjective complaint, especially in younger children, further emphasizing the need for objective clinical assessment in pediatric populations.[2,5]

The diagnosis of pediatric visual problems remains inherently challenging due to children's limited ability to articulate symptoms, particularly at younger ages.[2,5] Visual disorders are often identified indirectly by caregivers or during clinical examination, which may delay recognition of more severe pathology. This diagnostic challenge helps explain the observed discrepancy between patient-reported complaints and clinically confirmed diagnoses, reinforcing the importance of systematic examination and structured screening approaches in pediatric ophthalmology.[1,2]

Neuro-ophthalmic disorders accounted for a smaller but clinically significant proportion of cases in both outpatient and inpatient settings. These conditions frequently present with non-specific or poorly localized visual symptoms, further highlighting the limitations of relying solely on complaint-based assessment in pediatric patients.[8,9] The relatively high utilization of neuroimaging in both groups reflects the role of tertiary hospitals as referral centers for complex or unexplained visual presentations. Although less common, these conditions contribute disproportionately to diagnostic complexity and healthcare utilization.

From a public health and educational perspective, the predominance of amblyopia and refractive error in the outpatient setting highlights the critical importance of early detection strategies, particularly school-based vision screening programs. Early screening has been shown to improve visual outcomes and reduce long-term visual disability.[2,7] Furthermore, visual impairment during childhood can adversely affect academic performance, reading ability, and psychosocial development.[4] Strengthening school-based screening and referral pathways is therefore essential for improving pediatric visual health. These findings further support the role of screening programs in identifying visual disorders that may not be recognized through subjective complaints alone, thereby enhancing early detection and treatment outcomes.[2,7]

The clear distinction between outpatient and inpatient case-mix has important implications for healthcare policy and resource allocation. Outpatient services should prioritize screening, refraction, and amblyopia management, whereas inpatient services should focus on surgical capacity, perioperative care, and multidisciplinary collaboration. These findings support the development of integrated care pathways linking community-based screening programs with tertiary referral services. In line with global initiatives such as VISION 2020, prioritizing avoidable causes of childhood blindness, particularly cataract and uncorrected refractive error, remains essential.[15] The observed differences in diagnostic spectrum and clinical presentation between OPD and IPD further highlight the need for differentiated service models tailored to the nature of pediatric visual presentations across care settings.

Strengths and Limitations

The strengths of this study include its extended study period, clear delineation between outpatient and inpatient populations, and comprehensive representation of real-world clinical practice in a tertiary care setting. These features provide a robust overview of pediatric visual conditions across different levels of care.

However, several limitations should be acknowledged. First, the retrospective design is inherently subject to incomplete documentation and potential information bias. Although ICD-10 coding provides a standardized framework for classifying visual conditions, variability in clinical coding practices may have led to misclassification and affected diagnostic categorization.[12] Second, as a single-center study conducted in a tertiary referral hospital, the findings may not be fully generalizable to primary or secondary care settings, where case-mix and referral patterns differ.

In addition, the lack of standardized documentation of presenting complaints limited our ability to directly analyze the relationship between initial patient-reported symptoms and final clinical diagnoses. This limitation reflects the challenges of retrospective data capture in pediatric populations, where presenting symptoms are often inconsistently recorded.

Future prospective studies incorporating structured documentation of presenting complaints would be valuable for better characterizing diagnostic pathways and improving understanding of clinical yield in pediatric ophthalmology.

Conclusions

In summary, pediatric visual problems presenting to a tertiary hospital, as captured through ICD-10–based functional classification, demonstrate distinct patterns between outpatient and inpatient settings. These presentations encompass a broad spectrum of clinically assessed visual disturbances and visual impairment, reflecting differences in disease severity and management needs. Outpatient encounters are predominantly characterized by amblyopia and refractive-related conditions, whereas inpatient admissions are largely driven by cataract and other conditions requiring surgical intervention.

These findings highlight that pediatric visual presentations in routine clinical practice are closely aligned with underlying diagnostic categories and care settings. Recognizing these differences is essential for optimizing pediatric eye care delivery, improving resource allocation, and guiding future research aimed at early detection and reduction of childhood visual impairment and blindness.

Data Sharing Statement

This article and its supplementary material files include all data generated or analyzed during this study. Further inquiries should be directed to the corresponding authors.

Ethics Approval and Informed Consent

The Royal Thai Army Medical Department Institutional Review Board reviewed and approved the study protocol (approval number S021h68_Exp). This study has been conducted in accordance with the principles stated in the Declaration of Helsinki. Written informed consent for publication was waived due to the study's retrospective nature. Participant data were kept anonymous and confidential.

Acknowledgments

The authors sincerely thank Dr. Thitiporn Ratanapojnart, Chief Director of the Ophthalmology Department at Phramongkutklao Hospital, for her invaluable support and guidance throughout this study. Her expertise and leadership were instrumental in the successful completion of this research.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

There is no funding to report.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Wright JD, Boger WP. Visual complaints from healthy children. *Surv Ophthalmol*. 1999;44(2):113–121. PMID: 10541150. doi:10.1016/s0039-6257(99)00078-8
2. Donahue SP, Baker CN, Simon GR, et al; Committee On Practice And Ambulatory Medicine, Section On Ophthalmology, American Association Of Certified Orthoptists, American Association For Pediatric Ophthalmology And Strabismus. Procedures for the evaluation of the visual system by pediatricians. *Pediatrics*. 2016;137(1):e20153597. doi:10.1542/peds.2015-3597
3. Solebo AL, Teoh L, Rahi J. Epidemiology of blindness in children. *Arch Dis Child*. 2017;102(9):853–857. doi:10.1136/archdischild-2016-310532

4. Birch EE, Castañeda YS, Cheng-Patel CS, et al. Self-perception of school-aged children with amblyopia and its association with reading speed and motor skills. *JAMA Ophthalmol*. 2019;137(2):167. doi:10.1001/jamaophthalmol.2018.5527
5. Jenkins L, Ekberg S, Wang NC. Communication in pediatric healthcare: a state-of-the-art literature review of conversation-analytic research. *Res Lang Soc Interact*. 2024;57(1):91–108. doi:10.1080/08351813.2024.2305046
6. Holmes JM, Clarke MP. Amblyopia. *Lancet*. 2006;367(9519):1343–1351. doi:10.1016/S0140-6736(06)68581-4
7. Williams C, Northstone K, Harrad RA, Sparrow JM, Harvey I. Amblyopia treatment outcomes after screening before or at age 3 years: follow up from randomised trial. *BMJ*. 2002;324(7353):1549. doi:10.1136/bmj.324.7353.1549
8. Martyn LJ. Pediatric neuro-ophthalmology. *Pediatr Clin North Am*. 1983;30(6):1103–1121. doi:10.1016/S0031-3955(16)34505-9
9. Lim SA, Siatkowski RM. Pediatric neuro-ophthalmology. *Curr Opin Ophthalmol*. 2004;15(5):437–443. doi:10.1097/01.icu.0000135504.89223.bf
10. Demissie BS, Demissie ES. Patterns of eye diseases in children visiting a tertiary teaching hospital: south-western Ethiopia. *Ethiop J Health Sci*. 2014;24(1):69–74. PMID: 24591801; PubMed Central PMCID: PMC3929930. doi:10.4314/ejhs.v24i1.9
11. Kelkar J, Kelkar A, Thakur P, Jain HH, Kelkar S. The epidemiology and disease pattern of pediatric ocular morbidities in Western India: the National Institute of OphthalMology AmBlyopia StUdy in Indian Paediatric EyeS (NIMBUS) study report 1. *Indian J Ophthalmol*. 2023;71(3):941–945. doi:10.4103/IJO.IJO_2759_22
12. ICD-10 version:2016 [Internet]. 2026. Available from: https://icd.who.int/browse10/2016/en. Accessed April 10, 2026.
13. Flaxman SR, Bourne RRA, Resnikoff S, et al. Global causes of blindness and distance vision impairment 1990–2020: a systematic review and meta-analysis. *Lancet Glob Health*. 2017;5(12):e1221–34. doi:10.1016/S2214-109X(17)30393-5
14. Varma R, Vajaranant TS, Burkemper B, et al. Visual impairment and blindness in adults in the United States: demographic and geographic variations from 2015 to 2050. *JAMA Ophthalmol*. 2016;134(7):802. doi:10.1001/jamaophthalmol.2016.1284
15. Gilbert C, Foster A. Childhood blindness in the context of VISION 2020--the right to sight. *Bull World Health Organ*. 2001;79(3):227–232. PMID: 11285667; PubMed Central PMCID: PMC2566382.
16. Rahi JS, Cable N. Severe visual impairment and blindness in children in the UK. *Lancet*. 2003;362(9393):1359–1365. doi:10.1016/S0140-6736(03)14631-4