Original Article

Descriptive Analysis of Common Ophthalmic Disorders and Their Management Approaches among Patients Visiting Tertiary Care Hospitals in South Punjab, Pakistan

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ABSTRACT

Background: Ophthalmic disorders are a major cause of avoidable visual impairment in low- and middle-income countries, where delayed presentation and limited screening capacity often shift the burden to tertiary hospitals. Objective: To describe the prevalence, clinical patterns, and management strategies of common ophthalmic disorders among patients attending tertiary care hospitals in South Punjab, Pakistan. Methods: This descriptive cross-sectional study was conducted over eight months in ophthalmology outpatient departments of selected tertiary hospitals in South Punjab. A total of 384 patients aged ≥10 years were enrolled through consecutive sampling. Standard ophthalmic assessment was performed using visual acuity testing, slit-lamp biomicroscopy, ophthalmoscopy, and intraocular pressure measurement. Diagnoses and primary management modality were recorded using a structured proforma. Descriptive statistics were reported with 95% confidence intervals (CIs), and age-patterning of major disorders was tested using chi-square analysis. Results: The mean age was 46.2 ± 16.4 years, and 51.0% were female. Refractive errors were most prevalent (34.9%; 95% CI: 30.3–39.8), followed by cataract (24.0%; 95% CI: 20.0–28.5), conjunctivitis (12.5%), and glaucoma (9.4%). Pharmacological therapy (41.1%) and surgical intervention (27.1%) were the dominant management approaches. Age distribution differed significantly across refractive error, cataract, and glaucoma ($\chi^2(6)=153.61$; $p<0.001$). Conclusion: Tertiary care workload in South Punjab is dominated by treatable disorders, supporting targeted refraction services for younger patients and strengthened cataract, glaucoma, and diabetic retinopathy screening pathways for older adults. Keywords: Cataract, Conjunctivitis, Glaucoma, Ophthalmic diseases, Refractive errors, South Punjab, Tertiary care.

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INTRODUCTION

Ophthalmic disorders remain a major contributor to avoidable visual impairment and disability globally, with the burden disproportionately concentrated in low- and middle-income settings where delayed presentation, limited screening coverage, and uneven access to specialist services persist (1). In Pakistan, tertiary eye care centers frequently function as both referral hubs and primary points of contact for large segments of the population, particularly those from rural and underserved areas, resulting in a broad clinical spectrum that includes preventable and treatable conditions alongside progressive sight-threatening diseases (2). The consequences extend beyond clinical morbidity, with measurable impacts on productivity, dependency, and household-level socioeconomic stability, especially among older adults and individuals with chronic comorbidities (3). Hospital-based ophthalmology data therefore remain valuable for service planning because tertiary outpatient departments

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often capture the cumulative effect of community screening gaps, health-seeking behaviors, and health system inequities (3,4).

The leading causes of visual impairment in South Asia include uncorrected refractive errors and cataract, while glaucoma and diabetic retinopathy contribute substantially to irreversible vision loss when not detected early (4). Within Pakistan, evidence also indicates that access barriers—such as limited awareness, cost constraints, travel distance, and availability of trained personnel—delay care utilization and amplify disease severity at presentation (3). Furthermore, the increasing prevalence of non-communicable diseases, particularly diabetes mellitus, has created an expanding pool of patients vulnerable to diabetic retinopathy, reinforcing the need for integrated chronic disease and eye health strategies (4). Despite these concerns, the available literature from Pakistan remains fragmented, commonly focusing on single conditions, narrow subpopulations, or specific service interventions rather than providing consolidated hospital-based profiling of ocular morbidity and routine management pathways (5,6). International and regional work suggests that service utilization patterns and disease profiles differ across countries based on environmental exposures, demographics, and healthcare organization, which limits the generalizability of non-Pakistani tertiary care evidence to local planning (5,7).

In addition to disease frequency, understanding management approaches in real-world tertiary settings is essential because clinical practice may diverge from guideline ideals due to drug availability, affordability, institutional protocols, and surgical capacity, particularly for chronic diseases such as glaucoma where polypharmacy is common and comorbidities influence prescribing patterns (8). Local evidence also suggests that patient knowledge and practice patterns—especially among caregivers for pediatric eye problems—remain suboptimal in rural communities, contributing to delayed or inappropriate care seeking and reinforcing the need for data-driven screening and counseling strategies (9). Hospital-based descriptive studies can therefore identify the dominant clinical workload (e.g., refractive errors, cataract, conjunctivitis), quantify the surgical and medical demand, and highlight the relative contribution of progressive posterior segment disease, thereby informing targeted resource allocation, training priorities, and screening models in underserved regions (10,11).

South Punjab, characterized by heterogeneous urban–rural distribution and variable access to specialized care, lacks consolidated tertiary hospital evidence that simultaneously profiles the prevalence of common ophthalmic disorders and documents routine management modalities used in practice. Addressing this gap is particularly important for planning refractive screening programs, cataract surgical throughput, glaucoma monitoring services, and diabetic retinopathy screening integration. Therefore, this study aimed to describe the prevalence, clinical patterns, and management strategies of common ophthalmic disorders among patients presenting to tertiary care hospitals in South Punjab, Pakistan, and to evaluate how these patterns vary across demographic strata. The research question was: What is the hospital-based frequency distribution of common ophthalmic disorders and their management approaches among patients attending tertiary ophthalmology outpatient departments in South Punjab, and how do these patterns differ by age and other demographic characteristics?

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted over eight months in ophthalmology outpatient departments of selected tertiary care hospitals in South Punjab, Pakistan. The study was designed to quantify the spectrum of ophthalmic morbidity presenting to tertiary services and to document management modalities employed in routine clinical practice,

thereby supporting service planning in a resource-constrained setting. Patients were recruited using consecutive sampling, whereby all eligible individuals presenting during clinic hours and consenting to participation were enrolled until the required sample size was achieved.

The sample size was calculated using the Cochran formula for single-proportion estimation, assuming a prevalence of 50% to maximize variability, a 95% confidence level, and a 5% margin of error, yielding a minimum of 384 participants. Eligible participants included male and female patients aged ≥10 years presenting with ocular complaints and receiving at least one ophthalmic diagnosis following clinical evaluation. Patients with incomplete records that prevented confirmation of diagnosis or management approach and those who declined participation were excluded. Written informed consent was obtained from adult participants, and assent with guardian consent was obtained for participants aged <18 years. Confidentiality was maintained by assigning unique study identifiers and restricting dataset access to the research team.

Data were collected using a structured, pretested proforma designed to capture demographic characteristics (age, sex, residence, education), presenting complaint, ocular and systemic history, final clinical diagnosis, and management strategy. Standard ophthalmic examination protocols were applied for all participants. Visual acuity was assessed using a Snellen chart, anterior segment examination was performed with slit-lamp biomicroscopy, and posterior segment evaluation was performed using direct and indirect ophthalmoscopy. Intraocular pressure was measured using Goldmann applanation tonometry. Additional diagnostic tests were performed when clinically indicated, including fluorescein staining for ocular surface disease and further posterior segment assessment when diabetic retinopathy was suspected.

Operational definitions were applied to standardize classification. Refractive error was defined as reduced visual acuity improved with pinhole testing and confirmed by refraction requiring corrective lenses. Cataract was defined as lens opacity on slit-lamp examination associated with visual impairment and clinician-documented cataract diagnosis. Conjunctivitis was defined as conjunctival hyperemia with discharge and/or irritation consistent with infectious or allergic conjunctivitis documented by the examining clinician. Glaucoma was defined as elevated intraocular pressure and/or glaucomatous optic neuropathy requiring initiation or continuation of anti-glaucoma therapy or referral for surgical management, consistent with clinical diagnosis and practice patterns common in tertiary care settings (12). Diabetic retinopathy was defined as retinal microvascular changes consistent with diabetic retinopathy on fundoscopy in patients with diabetes mellitus. Pterygium was defined as fibrovascular conjunctival growth extending onto the cornea on slit-lamp examination. Age-related macular degeneration was defined as macular changes consistent with ARMD documented on fundoscopy in older adults.

Management strategy was recorded as the primary management modality initiated or advised at the index visit and categorized into: pharmacological therapy (e.g., topical antibiotics, anti-inflammatory medications, anti-glaucoma drops), surgical intervention (e.g., cataract extraction with intraocular lens implantation or glaucoma procedures), refractive correction (spectacles/contact lenses), observation/conservative management, and patient education/counseling. Where multiple modalities were used (e.g., perioperative medication plus surgery), the primary modality was defined as the principal disease-modifying intervention (e.g., cataract surgery categorized as surgical).

Data were coded and entered into IBM SPSS Statistics version 25. Descriptive statistics were reported as mean ± standard deviation for continuous variables and frequency (%) for categorical variables. Prevalence estimates were presented with 95% confidence intervals

using binomial proportion methods. Inferential analyses were prespecified to explore differences in age distribution across major disorders and to test associations between categorical variables using chi-square tests, with effect size estimation where appropriate. Statistical significance was set at $p<0.05$. Data integrity was ensured through double-checking of entries, internal validation rules for range and consistency, and secure storage of de-identified datasets.

RESULTS

A total of 384 patients were enrolled. The mean age was 46.2 ± 16.4 years, with 196 females (51.0%) and 188 males (49.0%). Rural residents comprised 227 (59.1%), while 157 (40.9%) were urban. Regarding education, 134 (34.9%) had primary education or less, 156 (40.6%) had secondary education, and 94 (24.5%) had tertiary education (Table 1). These findings indicate that tertiary ophthalmology services in South Punjab are utilized predominantly by rural and low-to-middle education populations, supporting the interpretation that tertiary hospitals are absorbing both referral demand and unmet primary care needs.

Table 1. Demographic Characteristics of Study Participants (N = 384)

Variable	Category	n (%)	95% CI for %
Age (years)	Mean ± SD	46.2 ± 16.4	—
Gender	Male	188 (49.0)	44.1–54.0
	Female	196 (51.0)	46.0–55.9
Residence	Urban	157 (40.9)	36.1–45.9
	Rural	227 (59.1)	54.1–63.9
Education	Primary or less	134 (34.9)	30.3–39.8
	Secondary	156 (40.6)	35.8–45.6
	Tertiary	94 (24.5)	20.5–29.1

The most prevalent ophthalmic disorder was refractive error (n=134), representing 34.9% of the sample (95% CI: 30.3–39.8), followed by cataract (n=92), 24.0% (95% CI: 20.0–28.5). Conjunctivitis accounted for 12.5% (n=48; 95% CI: 9.6–16.2), while glaucoma was observed in 9.4% (n=36; 95% CI: 6.8–12.7). Posterior segment involvement was reflected by diabetic retinopathy in 7.3% (n=28; 95% CI: 5.1–10.3) and ARMD in 5.2% (n=20; 95% CI: 3.4–7.9). Pterygium constituted 6.8% (n=26; 95% CI: 4.7–9.7) (Table 2). Overall, the disease spectrum was dominated by treatable conditions, particularly refractive errors and cataract, together comprising 58.9% of all diagnoses.

Table 2. Prevalence of Common Ophthalmic Disorders (N = 384)

Ophthalmic Disorder	n	%	95% CI (%)
Refractive Errors	134	34.9	30.3–39.8
Cataract	92	24.0	20.0–28.5
Conjunctivitis	48	12.5	9.6–16.2
Glaucoma	36	9.4	6.8–12.7
Diabetic Retinopathy	28	7.3	5.1–10.3
Pterygium	26	6.8	4.7–9.7
Age-related Macular Degeneration (ARMD)	20	5.2	3.4–7.9

Regarding management, pharmacological therapy was the most frequently documented primary modality (n=158), accounting for 41.1% of all cases (Table 3).

Table 3. Primary Management Strategies Adopted (N = 384)

Management Approach	n	%	95% CI (%)
Pharmacological Treatment	158	41.1	36.3–46.1
Surgical Intervention	104	27.1	22.9–31.8
Refractive Correction	92	24.0	20.0–28.5
Observation/Conservative	16	4.2	2.6–6.7
Patient Education/Counseling	14	3.6	2.2–6.0

Surgical intervention was the second most common approach (n=104; 27.1%), reflecting the high cataract burden and operative case-load in tertiary settings. Refractive correction constituted 24.0% (n=92), consistent with refractive error as the leading diagnosis.

Observation/conservative approaches (n=16; 4.2%) and structured counseling/education (n=14; 3.6%) were less frequently recorded as primary modalities, suggesting that most tertiary visits resulted in active therapeutic intervention rather than watchful waiting. Age-specific patterns demonstrated clear clinical clustering. Refractive errors were concentrated in younger patients, with 70/134 (52.2%) occurring in the 10–29 year group and 53/134 (39.6%) in the 30–49 group, while no refractive error cases were observed in those aged ≥70 within this dataset (Table 4). In contrast, cataract was predominantly observed in older adults, with 47/92 (51.1%) occurring in the 50–69 group and 21/92 (22.8%) in those aged ≥70. Similarly, glaucoma showed a strong shift toward older age, with 19/36 (52.8%) in 50–69 and 14/36 (38.9%) in ≥70.

A chi-square test comparing the age distribution across refractive error, cataract, and glaucoma demonstrated a highly significant difference ($\chi^2(6)=153.61$, $p<0.001$), with a large effect size (Cramer's V=0.54), confirming that these conditions have markedly different age-patterning in tertiary care presentations (Table 4). Clinically, this pattern supports age-targeted screening priorities: refractive screening and correction strategies for younger adults, and intensified cataract and glaucoma surveillance for populations aged ≥50 years.

Table 4. Age Group Distribution for Major Ophthalmic Disorders and Association Test

Age Group (years)	Refractive Errors n (%)	Cataract n (%)	Glaucoma n (%)
10–29	**70 (52.2)**	**3 (3.3)**	**0 (0.0)**
30–49	**53 (39.6)**	**21 (22.8)**	**3 (8.3)**
50–69	**11 (8.2)**	**47 (51.1)**	**19 (52.8)**
≥70	**0 (0.0)**	**21 (22.8)**	**14 (38.9)**
Total	**134 (100)**	**92 (100)**	**36 (100)**
Chi-square			**$\chi^2(6)=153.61$; p<0.001; Cramer's V=0.54**

The bubble heatmap demonstrates a strong age-gradient across major ophthalmic disorders. Refractive errors were overwhelmingly concentrated in younger patients, with 52.2% of refractive error diagnoses occurring in 10–29 years and 39.6% in 30–49 years, while 0.0% occurred in individuals aged ≥70.

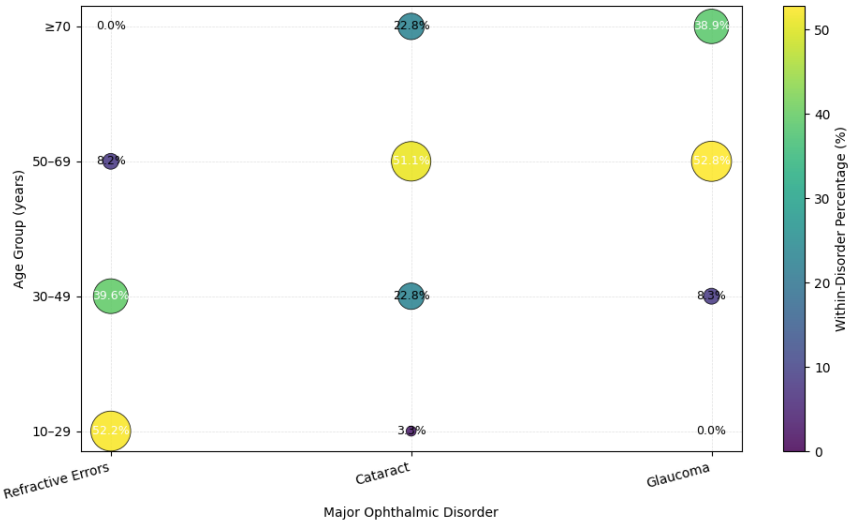

Figure 1 Age-Stratified Case Concentration by Disorder

In contrast, cataract showed a pronounced shift toward older age groups, with the highest concentration in 50–69 years (51.1%), followed by ≥70 years (22.8%), and minimal contribution from 10–29 years (3.3%). Glaucoma demonstrated the most elderly-skewed pattern, peaking at 50–69 years (52.8%) and remaining high at ≥70 years (38.9%), with negligible representation in younger age strata (0.0% in 10–29 years; 8.3% in 30–49 years). Collectively, this figure highlights clinically meaningful nonlinearity in disease burden

across age groups, supporting age-targeted service planning with refractive services prioritized for younger populations and intensified cataract–glaucoma surveillance pathways for adults aged ≥50 years.

DISCUSSION

The present study provides a hospital-based profile of common ophthalmic disorders and their management strategies among patients attending tertiary care ophthalmology outpatient departments in South Punjab, Pakistan. The findings demonstrate that the clinical workload in this setting is dominated by treatable and preventable conditions, particularly refractive errors (34.9%) and cataract (24.0%), together accounting for 58.9% of all recorded diagnoses. This distribution aligns with the broader regional epidemiological understanding that uncorrected refractive errors and cataract remain leading contributors to avoidable visual impairment in low- and middle-income settings and continue to place substantial demand on tertiary eye care services despite being amenable to cost-effective interventions (13,14). Importantly, the predominance of rural residents in this cohort (59.1%) supports the interpretation that tertiary hospitals in South Punjab serve not only as referral centers but also as access points for patients who may have limited community-level screening and primary eye care availability, a pattern consistent with reported access barriers in comparable contexts where distance, awareness, affordability, and service availability shape health-seeking behavior and late presentation (3,21).

Age-stratified analyses revealed a clinically coherent pattern: refractive errors clustered strongly among younger patients, with 52.2% of refractive errors occurring in 10–29 years, while cataract and glaucoma were concentrated in older adults, with 51.1% of cataract and 52.8% of glaucoma in 50–69 years, and an additional 22.8% of cataract and 38.9% of glaucoma in ≥70 years. The association between age group and disorder distribution was highly significant ($\chi^2(6)=153.61$; $p<0.001$; Cramer's $V=0.54$), indicating a large effect and reinforcing the need for age-targeted screening models. These findings have direct service-planning implications. The burden of refractive errors in younger groups suggests an unmet need for systematic school- and community-based refraction services with efficient referral pathways for complicated refractive or amblyopia-risk cases, while the older-age concentration of cataract and glaucoma emphasizes the importance of strengthening cataract surgical throughput, perioperative pathways, and long-term glaucoma monitoring systems at tertiary and secondary levels (14). Within this framework, the value of optometry-aligned service strengthening becomes particularly relevant in resource-limited settings, where expanding trained refraction capacity can reduce avoidable tertiary visits and improve timely correction coverage (14).

The management distribution further contextualizes this clinical spectrum. Pharmacological therapy was the most frequent primary modality (41.1%), reflecting the high proportion of ocular surface and inflammatory disorders and the widespread reliance on medical therapy as a first-line approach in outpatient practice. Surgical intervention (27.1%) was the second most common strategy, consistent with cataract being the second most frequent diagnosis and representing a substantial surgical case-load. This finding is concordant with the reality that tertiary eye hospitals often function as procedural hubs for cataract and other surgical services, and it underscores the need for operational capacity planning related to theater availability, intraocular lens supply chains, and postoperative follow-up mechanisms to maintain quality and outcomes (13). Meanwhile, refractive correction (24.0%) remained a major therapeutic pathway, mirroring refractive error prevalence and reinforcing that a significant proportion of tertiary utilization could

potentially be managed through strengthened primary eye care and community optometry coverage, thereby reducing service congestion and improving pathway efficiency.

Although posterior segment disorders were less frequent in this dataset, their clinical significance is substantial. Diabetic retinopathy (7.3%) and age-related macular degeneration (5.2%) represent progressive diseases with potential for irreversible vision loss, often requiring longitudinal monitoring, imaging access, and multidisciplinary systemic disease coordination. The presence of diabetic retinopathy at a tertiary outpatient level is consistent with wider South Asian concerns regarding the health transition toward non-communicable diseases and the expanding pool of individuals requiring diabetic eye screening (4). Evidence from regional settings indicates that barriers to diabetic retinopathy screening frequently include system-level constraints, limited awareness, and provider and patient workflow challenges, particularly in public-sector facilities, which can delay detection and treatment escalation (22). Moreover, patient knowledge and practice patterns related to diabetes and retinopathy have been shown to differ by access and service availability, further emphasizing the need to integrate structured diabetic eye screening into chronic disease management programs (23). Outreach and screening camps have been highlighted as a practical approach to improving screening uptake among rural populations and may be particularly appropriate given the rural predominance observed in this cohort (24). Similarly, the observed ARMD frequency, while lower than anterior segment disease, aligns with global evidence indicating increasing ARMD burden with population aging and changing dietary and cardiovascular risk profiles, supporting the need for long-term planning for retinal services and patient counseling pathways in older adults (15,17).

The findings should be interpreted in the context of the study's limitations. As a hospital-based descriptive study using consecutive sampling, results reflect the clinical spectrum of patients who sought care at tertiary centers and therefore cannot be interpreted as population prevalence estimates. Referral bias is likely, particularly for surgical and sight-threatening disorders, and the distribution of cases may be influenced by facility-specific service offerings, clinician practice patterns, and local health-seeking behaviors. Additionally, management strategies were categorized according to the primary modality at the index visit, which may underrepresent multimodal care pathways (e.g., perioperative medications accompanying surgery or combined counseling and treatment). Finally, the cross-sectional design does not permit evaluation of outcomes, adherence, or longitudinal progression. Despite these limitations, the study provides a clinically meaningful snapshot of tertiary ophthalmic workload in South Punjab and supports actionable planning priorities: expansion of refraction and optical dispensing capacity, enhancement of cataract surgical throughput, systematic glaucoma detection and follow-up systems, and integration of diabetic retinopathy screening into chronic disease services, complemented by community-level outreach strategies to reduce late presentation and prevent avoidable vision loss (21–24).

CONCLUSION

This hospital-based study in tertiary care settings of South Punjab, Pakistan, demonstrates that the ophthalmology outpatient burden is predominantly driven by treatable conditions, particularly refractive errors and cataract, while glaucoma and diabetic retinopathy constitute clinically significant progressive disease requiring longitudinal monitoring; the marked age-patterning of disorders supports targeted screening models with refractive services for younger populations and strengthened cataract, glaucoma, and diabetic retinopathy pathways for adults aged ≥50 years, alongside primary eye care strengthening and rural outreach strategies to reduce preventable visual impairment and optimize tertiary service capacity.

DECLARATIONS

Ethical Approval

Ethical approval was approved by research ethical committee of Khyber Teaching Hospital, Peshawar, Pakistan.

Informed Consent

Informed consent was given by participants.

Conflict of Interest

The authors declare no conflict of interest.

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Authors' Contributions

Concept: MI; Design: MI, RFA; Data Collection: MI, RFA, SG, JR; Analysis: MI, MZI; Drafting: MI, MW, MZI.

Data Availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Acknowledgments

Not applicable.

Study Registration

Not applicable.

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