ORIGINAL ARTICLE

Spectrum of Ocular Diseases in a Tertiary Eye Care Center: A Cross-Sectional Analysis

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ABSTRACT

Background: Ocular diseases remain one of the major public health problems worldwide and continue to contribute significantly to visual impairment and avoidable blindness. Although many of these conditions are preventable or treatable, late presentation and lack of awareness still leads to considerable morbidity. Understanding the local pattern of ocular diseases is therefore essential for planning appropriate preventive and therapeutic strategies.

Objective: To determine the frequency, pattern, and demographic distribution of ocular morbidities among patients attending a tertiary care specialist eye hospital.

Methodology: This hospital-based cross-sectional study was conducted over one year in the ophthalmology outpatient department. Sample size was calculated using the single population proportion formula, yielding a minimum of 384; however, all eligible patients were included to improve precision. A total of 1,749 participants of all ages and both genders were enrolled by consecutive sampling. Detailed history and comprehensive ophthalmic examination including visual acuity testing, refraction, slit-lamp biomicroscopy, tonometry, and fundus evaluation were performed. Ocular conditions were categorized clinically. Data were analyzed using SPSS, and associations between categorical variables were assessed using Chi-square or Fisher's exact test, with $p<0.05$ considered statistically significant.

Results: Among 1,749 participants, females (59%) outnumbered males (41%). Majority belonged to the 16–40 years (41.6%) and ≥41 years (41.2%) age groups. Occupational status showed significant association with gender ($p<0.001$). Diabetes and hypertension were distributed almost equally between genders. Conjunctivitis constituted the most common ocular morbidity, followed by cataract, refractive errors, and glaucoma. Advanced cataract, glaucoma, corneal ulcer, and ocular trauma were significantly more frequent in males ($p<0.05$). Several other anterior segment disorders showed near equal gender distribution. Increasing age demonstrated higher prevalence of cataract and glaucoma.

Conclusion: The study shows that most ocular morbidities presenting at tertiary care level are preventable or treatable conditions, yet they continue to cause significant burden due to delayed presentation. Elderly population and males were more affected with severe pathologies like glaucoma, trauma, and advanced cataract. Early screening, public awareness, and strengthening of primary eye care services are necessary to reduce avoidable blindness and improve visual outcomes in the community.

Keywords: Ocular morbidity; Cataract; Glaucoma; Refractive errors; Conjunctivitis; Visual impairment; Cross-sectional study; Tertiary eye care

INTRODUCTION

Human body is equipped with several special senses which work together in coordination to allow an individual to interact with the environment, including the sensations of sight, hearing, smell, taste and touch. Among these, vision is considered the most dominant and functionally important sense, because almost all daily activities depend directly or indirectly upon proper eyesight. The eye, therefore, is not merely another organ but a very delicate and highly specialized structure, without which normal life becomes difficult and sometimes even dependent on others. From a clinical point of view, loss of vision is one of the most disabling conditions a person can suffer, and in routine ophthalmic practice we repeatedly observe how even minor ocular disturbances can greatly affect the quality of life of patients.

The human eye is a complex optical and neuro-sensory organ, designed to capture light, convert it into electrical impulses, and transmit these signals to the brain where they are interpreted as vision. Over the years of evolution, this organ has developed into an intricate system consisting of cornea, lens, retina, optic nerve and several accessory structures working in precise harmony. The anatomy as well as physiology of the eye is extensive and somewhat remarkable, and because of this complexity it is also more prone to wide variety of pathological changes. Even small structural alterations may lead to disproportionate functional impairment. For this reason, ocular disorders are not simple localized problems only, but they often become causes of long-term morbidity and sometimes irreversible blindness[1].

Despite the tremendous advances in medical and surgical ophthalmology, ocular diseases continue to pose a major public health concern worldwide. Conditions affecting the eye may ranges from mild inflammatory disorders such as conjunctivitis to serious and vision-threatening pathologies like cataract, glaucoma, corneal opacity, retinal diseases, and refractive errors. These diseases, if not detected and treated at appropriate time, may gradually progresses to permanent visual disability which sometimes become irreversible. Globally, the burden of visual impairment is quite alarming and continues to increase in many regions. It has been estimated that approximately 595 million people were living with some form of vision impairment in the year 2020, out of which nearly 43 million were blind, and projections suggest that this number may exceed 60 million by the year 2050 if effective preventive strategies are not strengthened[2]. Such figures clearly indicates that ocular morbidity is not a small issue but a significant challenge for health systems across the world, especially in low and middle income settings.

Importantly, it should be emphasized that majority of the causes leading to blindness is either preventable or treatable with timely intervention. Cataract surgery, correction of refractive errors, early glaucoma detection, and proper management of infections can significantly reduces avoidable blindness when implemented appropriately. It is somewhat unfortunate that even today many patients presents to tertiary hospitals only at advanced stages of

disease, mainly due to lack of awareness, financial constraints, and poor accessibility of eye care services which remains inadequately distributed. Therefore, blindness from many of these conditions are not always due to medical limitations but rather due to gaps in public health delivery and community education[3], and this gap continues to widen in underserved populations.

Ocular diseases also exerts substantial socio-economic burden not only on the individual but also on families and the nation as a whole. Loss of vision reduce productivity, increases dependency, and add to healthcare expenditure, thereby affecting the overall development of society in multiple dimensions. In developing countries particularly, where resources is already limited, preventable blindness further aggravates poverty and decreases work capacity among economically active age groups. Hence, studying the epidemiology and distribution of ocular diseases become essential for proper allocation of healthcare resources and planning of targeted interventions which should be context specific[4].

The pattern of ocular morbidities are known to vary between developed and developing nations and even among different communities within the same region. Factors such as age, gender, occupation, environmental exposure, and socioeconomic status all influences the occurrence of these diseases in complex manner. Globally, cataract, glaucoma, conjunctivitis, and refractive errors remains among the most commonly encountered ocular conditions, but their relative frequencies may differ from place to place depending upon demographic transition and healthcare accessibility[5]. From practical experience also, we see that each region have its own characteristic disease profile which needs localized evaluation.

Keeping these considerations in mind, the present cross-sectional study was undertaken to determine the pattern and distribution of ocular diseases among patients attending a specialist eye hospital. By identifying the common conditions and their demographic associations, we hope that more effective preventive measures, early detection strategies, and management protocols can be planned in systematic way, which ultimately may helps in reducing the burden of avoidable visual impairment in our population.

METHODOLOGY

This study was designed as a hospital-based cross-sectional descriptive study and was conducted in the Department of Ophthalmology of a tertiary care specialist eye hospital. The aim was to evaluate the pattern and frequency of different ocular diseases among patients attending the outpatient department, because in day-to-day clinical work we encounter large number of cases with variable spectrum of eye disorders, and proper documentation of these conditions is necessary for planning preventive and curative services. The study was carried out over a period of one year, during which all eligible patients presenting to the department were examined and recorded consecutively.

The required sample size was calculated using the single population proportion formula for cross-sectional studies:

$$n = \frac{Z^{2} \times p \times (1-p)}{d^{2}}$$

where n is the required sample size, Z is the standard normal deviation at 95% confidence interval (1.96), p is the anticipated prevalence of ocular morbidity, and d is the margin of error. Since the exact local prevalence was not known, the prevalence was assumed as 50% to obtain maximum sample size. With precision of 5% and confidence level of 95%, the calculated minimum sample size came approximately 384. However, to increase the reliability of results and considering the high patient inflow in our tertiary setup, we included all patients during the study duration. Therefore, a total of 1,749 participants were finally enrolled, which is much higher than minimum required, thereby improving the statistical strength of the study.

All patients of either gender and of all age groups who attended the ophthalmology outpatient department during the study period were included by consecutive sampling. Patients presenting with any ocular complaint or those coming for routine evaluation was assessed in the outpatient setting. Individuals who refused consent, had incomplete information, or were unable to cooperate for examination was excluded from the study analysis. This method, although hospital-based in nature, gives a fairly practical picture of the disease burden which we surgeons routinely manages in real clinical settings, even if it does not represent the absolute community prevalence.

After obtaining informed consent, detailed demographic and clinical history were recorded using a structured proforma specially designed for this purpose. Information regarding age, gender, occupation, and relevant systemic illnesses such as diabetes mellitus and hypertension was documented carefully, because these conditions frequently influences ocular health in various ways. History of trauma, prior surgery, and duration of symptoms were also noted and sometimes re-confirmed to avoid recall bias, although minor variations in patient reporting cannot be fully eliminated.

All participants underwent comprehensive ophthalmic evaluation as per standard departmental protocol. Visual acuity were assessed using Snellen's chart for distance vision and near charts where required depending upon literacy level. Objective and subjective refraction were performed for suspected refractive errors to confirm diagnosis. Slit-lamp biomicroscopy was used to examine anterior segment structures including lids, conjunctiva, cornea, anterior chamber, iris and lens in systematic manner. Intraocular pressure were measured by tonometry for glaucoma screening in all cases wherever feasible. Posterior segment examination were carried out by direct or indirect ophthalmoscopy after pharmacological dilatation. Additional investigations such as visual field testing, fundus photography, or ultrasonography was advised when clinically indicated and depending on patient affordability.

Based on clinical findings, ocular diseases was categorized into cataract, glaucoma, refractive errors, conjunctivitis, corneal diseases, eyelid disorders, trauma, and other miscellaneous conditions for uniformity of data. For each patient, a primary diagnosis were assigned according to the most significant pathology, although in few cases multiple coexisting conditions was present.

All collected data were entered and coded in statistical software (SPSS version 25 or equivalent) for analysis in systematic way. Descriptive statistics was calculated for demographic and clinical variables. Categorical variables such as gender, occupation, systemic diseases, and types of ocular morbidities were expressed as frequencies and percentages. Continuous variables like age were summarized as mean and standard deviation where appropriate, though median was considered in skewed distributions.

To determine associations between categorical variables, the Chi-square test were applied. In situations where expected cell counts was small, Fisher's exact test were used accordingly. A p-value of less than 0.05 were considered statistically significant for interpretation purpose. The purpose of this analysis was mainly to assess relationship and distribution rather than to establish causation, because being cross-sectional in nature the temporal sequence cannot be confirmed clearly.

Ethical approval were obtained from the institutional ethical review committee before commencement of the study. All procedures was conducted in accordance with ethical standards of medical research and institutional guidelines. Written informed consent were obtained from each participant, and confidentiality of personal data were strictly maintained throughout the study period. Participation was voluntary and patients was allowed to withdraw at any stage without affecting their treatment in any manner.

RESULTS

The total number of patients included in this study was 1,749, comprising a wide spectrum of age groups and both genders.

Majority of the subjects were belonging to the productive age group of 16–40 years (41.6%), closely followed by those above 41 years (41.2%), while only small proportion was from pediatric age group 0–15 years (17.1%). Females were more in number (59%) as compared to males (41%), which we commonly observe in our routine ophthalmic OPD where female patients attend more frequently for chronic and non-traumatic complaints. When we see the occupation status, there was a clear difference between genders, males mostly being self-employed or employees, whereas females were largely unemployed, and this association was found statistically highly significant (p<0.001), showing that socioeconomic pattern strongly influence health-seeking behaviour. Regarding systemic illnesses, diabetes and hypertension were present in both genders almost similarly, with only slight female predominance in hypertension, but these differences were not statistically significant, hence systemic comorbidities were distributed more or less equal among males and females.

Table 1 : Gender and Age group distribution among participants

		N (%)
Age group	0-15 Years	299 (17.1%)
	16-40 Years	729 (41.6%)
	41+ Years	721 (41.2%)
Gender	Male	717 (41.0%)
	Female	1032 (59.0%)

Table 2 : Association of gender with the employment status

OCCUPATION	FEMALE	MALE	P value
EMPLOYEE	57	181	0.000
SELF-EMPLOYEE	66	524	0.000
UN-EMPLOYEE	594	327	0.000

Chi Square test was applied, level of significance was <0.05

Table 3: Association of diabetes and Hypertension with gender

Diseases	Female N (%)	Male N (%)	P value
Diabetes	24 (3.3%)	32 (3.1%)	1.846
Hypertension	105 (14.6%)	99 (9.5%)	2.697

Chi Square test was applied, level of significance was <0.05

Table 4 : Association of eye disease with gender

DIAGNOSE	FEMALE	MALE	P value
CATARACT	119	135	0.891
EARLY CATARACT	14	8	0.153
MODRATE CATARACT	16	16	0.958
ADVANCED CATARACT	89	111	0.041
GLAUCOMA	51	97	0.002
CHALAZION	8	4	0.002
ENTEROPIAN	2	0	0.037
STYE	2	0	0.037
CORNEAL ULCER	9	27	0.001
CORNEAL OPACITY	15	33	0.315
OCULAR TRAUMA	11	56	0.000
REFRACTIVE ERROR	99	89	0.794
NLD BLOCK	1	4	0.032
CONJUNCTIVITIS	244	252	0.913
UVEITIS	15	13	0.321
PTERYGIUM	17	41	0.529
BLEPHRITIS	2	3	0.550
R.P	0	1	0.794
DIABETIC RETINOPATHY	1	0	0.201
SQUINT	2	5	0.757
RD	1	2	0.907
ARMD	2	0	0.198

Coming to ocular morbidities, cataract was the most frequent diagnosis overall, seen almost equally in both genders, which is expected in elderly population, however advanced cataract cases were comparatively more in males and this difference reached significance. Glaucoma, corneal ulcer, and ocular trauma were distinctly higher among males, probably due to more outdoor activities, occupational hazards, and negligence in early consultation, which we surgeons see very commonly in daily practice. Minor lid and adnexal conditions like chalazion, entropion and stye also showed male predominance. On the other side, conditions such as refractive errors, conjunctivitis, corneal opacity, uveitis, pterygium and blepharitis were distributed nearly equal with no significant gender difference. Overall, the findings suggest that though many eye diseases affect both genders similarly, severe and preventable pathologies like trauma, ulcer and advanced cataract are more seen in males, indicating late presentation and poor protective measures, which remains a practical challenge for ophthalmic surgeons managing such patients in tertiary care setup.

DISCUSSION

Understanding the pattern of ocular diseases in any given population is always important, because without knowing the burden and distribution, proper planning and preventive strategies cannot be implemented effectively. In routine ophthalmic practice we repeatedly observe that many of these conditions are avoidable or treatable, yet they continue to present late due to lack of awareness and services. Therefore, the present study was conducted to identify the common ocular morbidities and their demographic associations, so that suitable policies and region-specific interventions can be formulated. Such epidemiological mapping is not only academic exercise but is directly helpful for surgeons and clinicians working at tertiary centers where heavy patient load is routinely encountered.

When we analyze the gender distribution, males were more commonly affected with ocular disorders as compared to females, which is something frequently noticed in hospital settings, possibly because males are more exposed to outdoor activities, occupational hazards and trauma. However, literature shows somewhat variable findings. Xu et al. reported that there was no significant difference between genders for refractive errors, intraocular pressure, glaucoma, and cataract, although females were associated with narrow anterior chamber angles, predisposing them to angle closure disease[6]. Hence, gender influence on ocular pathology appears complex and not always uniform across populations.

With regard to systemic comorbidities, diabetes and hypertension were slightly more frequent in females in our cohort. Even though the statistical significance was not strong, the trend is clinically important because these metabolic disorders are well known risk factors for cataract formation, retinopathy, and other microvascular ocular changes. Previous studies have also demonstrated that cataract prevalence increases with the number of metabolic syndromes in both sexes[7]. In our patients, the majority of diabetes and hypertensive cases were seen in the older age groups, particularly above 40 years, which is consistent with other epidemiological reports[8–11]. As the eye ages, it undergoes many degenerative and physiological alterations, and because of this the susceptibility to cataract, glaucoma, and refractive changes becomes more higher, so naturally the disease burden shifts toward elderly population.

Age-wise distribution in our study clearly demonstrated that ocular morbidities increased with advancing age, with the highest frequency in older groups. Cataract, advanced cataract, glaucoma and refractive errors were predominantly concentrated in the oldest age category. This finding correlates with earlier research which showed that glaucoma prevalence rises progressively from 0.7% in the 40–49 years group to nearly 7–8% in individuals above 80 years[12]. From clinical experience also, we surgeons see that most complicated and advanced cases belong to this elderly category, often presenting late with already compromised vision.

Among the spectrum of diseases observed, conjunctivitis constituted the largest proportion, followed by cataract, refractive errors and glaucoma. Conjunctivitis being highly prevalent is not surprising, particularly in developing regions where hygiene, overcrowding and environmental irritants are common. Similar findings were described by Ajaiyeoba et al., who reported an 8% prevalence of conjunctival diseases and 5.8% refractive error among school children[13]. Another study demonstrated allergic

conjunctivitis prevalence as high as 32%, especially among younger age groups, gradually declining with increasing age[14]. These observations emphasize that many anterior segment disorders are preventable with basic public health measures and health education, rather than requiring advanced surgical interventions.

Gender-specific trends were also observed in certain conditions. Cataract and refractive errors were relatively more frequent in females, whereas glaucoma showed higher occurrence among males. Comparable results were reported elsewhere, where cataract prevalence was 44% and majority of affected individuals were females, and socio-demographic factors such as age, marital status, and occupation were significantly associated[15]. Glaucoma in particular remains a silent disease, and its prevalence varies widely depending on demographic and genetic factors[16]. Previous studies documented that glaucoma frequency increases steeply with age, reaching above 9% in very elderly populations, and has been associated with female gender and lower education levels as well[17,18]. Hence, both biological as well as social determinants probably contribute to this variation.

Most importantly, the majority of ocular morbidities detected in our study are either preventable or treatable, and therefore blindness from these causes should not be occurring in such numbers. In real practice, many patients present only when disease has already advanced, mainly due to poor access, financial constraints, and lack of awareness. Social determinants of health significantly limit utilization of eye care services, which further aggravates visual impairment[19]. It is well recognized that vision loss negatively affects daily functioning, independence, and overall quality of life[20].

From a surgeon's point of view, early detection and timely management remains the cornerstone. If proper screening programs, patient education, and affordable eye care facilities are made available at community level, the burden of avoidable blindness can be considerably reduced. So, strengthening primary eye care and preventive strategies is not optional but rather necessary, otherwise we will continue to see these same preventable diseases filling our outpatient clinics and operation theaters year after year.

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