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ORIGINAL ARTICLE

Demographic Patterns and Clinical Distribution of Refractive Errors in Patients Attending a Tertiary Eye Care Center

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ABSTRACT

Background: Refractive errors are a leading cause of avoidable visual impairment worldwide. Despite being easily correctable, uncorrected refractive errors remain prevalent, particularly in low-resource settings, affecting quality of life and productivity.

Objective: To determine the pattern of refractive errors among patients attending a tertiary eye hospital and assess associations with age, gender, and occupational status.

Methods: A hospital-based cross-sectional study was conducted involving 1,749 patients aged ≥5 years. Visual acuity was assessed using the Snellen chart, followed by objective and subjective refraction; cycloplegic refraction was performed when indicated. Refractive errors were classified into myopia, hypermetropia, astigmatism (and subtypes), presbyopia, and amblyopia. Demographic data including age, gender, and occupation were recorded. Data were analyzed using descriptive statistics and chi-square tests, with $p<0.05$ considered significant.

Results: Females exhibited higher frequencies of hypermetropia, astigmatism, and simple variants of myopic and hyperopic astigmatism. Myopia was most common in individuals aged 16–40 years, while hypermetropia and presbyopia increased with age. Occupational analysis revealed a higher burden of myopia, hypermetropia, and astigmatic subtypes among unemployed participants, whereas presbyopia was more frequent in employed individuals. These trends suggest that refractive errors are influenced by physiological aging, lifestyle, occupational visual demands, and healthcare-seeking behaviors.

Conclusion: Refractive errors are prevalent across all age groups, with distinct patterns linked to gender, age, and occupation. Early detection, regular screening, and accessible refractive services are essential to reduce avoidable visual impairment and improve quality of life, particularly in underserved populations.

Keywords: Refractive Errors, Myopia, Hypermetropia, Astigmatism, Tertiary Eye Care

INTRODUCTION

Human body consist of many complex organs working together to keep normal life, among them eye is one of the most delicate and specialized sensory organs responsible for vision which often taken for granted. Eye always capture light and convert it into visual perception, letting humans see and interact with environment. Despite its precision, eye is not free from disease or problems. Like other organs, it can affect by genetic, developmental, metabolic or environmental factors which may disturb function and cause vision problems. One of the most common but underestimated problems in eye clinics is refractive error. Even it is easy to diagnose and correct, refractive error still cause major avoidable visual impairment worldwide, especially in low-resource areas where eye care not regular[1,2].

Refractive errors happen when eye cannot focus light properly on retina, usually because of mismatch between eyeball axial length and cornea–lens power. This make images formed in front or behind retina and vision become blurred or distorted. Clinically they divided into myopia, hyperopia, and astigmatism, each having different optical characteristics. Presbyopia also develop with age due to loss of accommodation, affecting near vision. These conditions seen in almost all age groups, but distribution vary with genetics, environment, and lifestyle[2]. Uncorrected refractive errors not only reduce clarity of vision but also affect quality of life in daily activities.

From public health view, burden of uncorrected refractive errors is big and often underestimated. Globally more than 157 million people have moderate to severe visual impairment because of uncorrected refractive errors and[3–4] million become blind from conditions which could be corrected by spectacles or simple interventions[1,3]. This show that refractive errors not minor problem but serious public health concern, mostly in developing countries where eye exams are limited.

Pattern of refractive errors vary across population. Myopia is rising fast in children and young adults, mostly because of more near-work, screen time, less outdoor activity. Many studies show prevalence of myopia in school children increasing every year and trend will continue if preventive strategies not used[4]. Hyperopia and astigmatism also common but often not diagnosed until symptoms appear. So, pattern of refractive errors is not same in all groups, differ by age, population, and occupation.

Even refractive errors correctable by spectacles, contact lenses, or surgery, many people remain untreated. This gap not always because treatment not available, often due to poor awareness, money problems, or skipping regular checkups. Untreated refractive errors in children can cause poor school performance, reading difficulties, sometimes amblyopia. Adults can have less work productivity and efficiency. Elderly may lose independence and mobility. Also, many people complain of headache, eye strain, less concentration, discomfort in daily life[2,5]. These effects not life-threatening but affect quality of life a lot.

Even with many studies worldwide, prevalence reports still inconsistent, because different sampling methods, diagnostic criteria, age groups, or using cycloplegia or not. This make comparisons difficult and sometimes misleading. So local hospital-based data important to know real burden in community[2,6]. In our experience many patients come late with undetected or uncorrected refractive errors, showing awareness and screening not enough.

Considering all this, this study designed to determine pattern of refractive errors in eye hospital patients. By seeing frequencies by age, gender, occupation, study try to give baseline info which can help improve refractive services, prevention strategies, and eye health locally.

METHODOLOGY

This was a hospital based cross-sectional study conducted in Ophthalmology dept of tertiary eye hospital, during the study period all patients coming for eye complaints or routine checkup were included. Both genders and all age groups from kids to

elderly were considered and total 1,749 participants were examined. Non-probability consecutive sampling was used and no formal sample size calculation done. Inclusion criteria was age ≥5 years, willing to undergo exam, giving consent, while patients with recent surgery, active infection, trauma, dense cataract or systemic conditions affecting vision were excluded. Demographic data like age, gender, occupation was recorded and age later grouped into 0–15, 16–40, 40+ years and occupation into employee, self employed, unemployed. Visual acuity checked by Snellen chart for distance and near, objective refraction by retinoscopy/autorefractometry then subjective refinement done, cycloplegic refraction used in kids or suspected accommodation cases. Final refractive errors classified into myopia, hypermetropia, astigmatism, mixed, presbyopia, amblyopia etc. Primary variable was type of refractive error and independents were age, gender, occupation. Data entered in SPSS v24, descriptive stats used, frequencies and percentages calculated, chi-square applied for associations and $p<0.05$ considered significant. Ethical approval obtained, confidentiality maintained, participation voluntary and informed consent taken.

RESULTS

The overall results demonstrated a varied yet clinically meaningful distribution of refractive errors across gender, age, and occupational status, as summarized in Tables 1–3 and illustrated in Figure 1. On gender-based assessment (Table 1), females showed comparatively higher frequencies of several refractive anomalies, particularly hypermetropia and astigmatism, both of which reached statistical significance, along with simple myopic and simple hyperopic astigmatism. In contrast, myopia, compound variants of astigmatism, presbyopia, and amblyopia did not show any marked gender predilection. From a senior clinical perspective, this pattern suggests that female patients in this cohort tend to present more often with accommodative and cylindrical errors rather than isolated spherical defects, although the distribution remains somewhat irregular and not entirely uniform across all categories. The overall gender distribution of participants is depicted in Figure 1, providing a visual appreciation of the study population structure

Age-wise evaluation revealed more predictable and physiologically explainable trends (Table 2). Myopia was predominantly observed among younger and middle-aged individuals, especially those between 16–40 years, which correlates well with prolonged near tasks, educational exposure, and occupational visual strain commonly encountered in clinical ophthalmic practice. Hypermetropia demonstrated a gradual rise with increasing age, becoming more prominent after the fourth decade of life. Presbyopia, as anticipated, was almost entirely confined to participants aged 41 years and above, showing a strong statistical association with age. Certain forms of astigmatism and myopic astigmatism were clustered within the middle-aged group, whereas amblyopia appeared relatively more common in the younger population. Although these findings broadly follow the natural history of refractive development, the transitions are not strictly linear, indicating that environmental and behavioral influences likely play an additional role in refractive status

When refractive errors were analyzed according to employment status (Table 3), several significant associations became evident. Unemployed individuals exhibited a comparatively higher burden of myopia, hypermetropia, astigmatism, and multiple hyperopic astigmatic subtypes, while presbyopia was more frequently encountered among employed subjects, possibly reflecting an older working demographic or increased visual demands prompting earlier consultation. Amblyopia was also more noticeable among the unemployed group. From a practical surgical and public health standpoint, such disparities may not purely represent biological differences but could instead indicate inequalities in healthcare access, delayed refractive correction, or reduced screening practices. Collectively, these observations suggest that refractive errors in this population are influenced by a combination of physiological aging, lifestyle and occupational exposure, and health-seeking behavior, rather than a single isolated determinant

Fig 1: Shows the frequency of the participants based on Gender

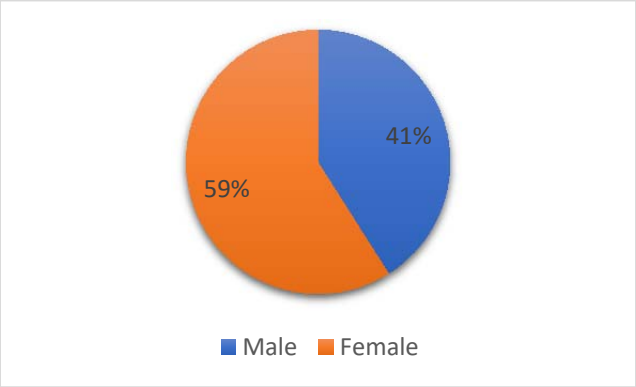

Table 1: Association of refractive error with gender

Refractive Error	Female n (%)	Male n (%)	P value
Myopia	18 (2.5%)	14 (1.4%)	0.971
Hypermetropia	45 (6.3%)	26 (2.5%)	0.043
astigmatism	53 (7.3)	35 (3.39%)	0.042
Myopic astigmatism	38 (5.3%)	25 (2.4%)	0.089
Simple myopic astigmatism	28 (3.9%)	21 (2.0%)	0.027
Compound myopic astigmatism	10 (1.3%)	4 (0.4%)	0.716
Hypermetropic astigmatism	9 (1.3%)	6 (0.6%)	0.697
Simple hyperopic astigmatism	5 (0.7%)	3 (0.3%)	0.049
Compound hyperopic astigmatism	4 (0.5%)	3 (0.3%)	1.376
Mixed astigmatism	6 (0.8%)	4 (0.4%)	1.796
Presbyopia	102 (14.2%)	111 (10.8%)	2.727
Amblyopia	6 (0.8%)	4 (0.4%)	1.973

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

Table 2: Association of refractive error with the employment status

Refractive Error	Employee	Self-Employee	Un-Employee	P value
Myopia	6	6	20	0.001
Hypermetropia	15	18	38	0.027
astigmatism	20	13	55	0.027
Myopic astigmatism	16	10	37	0.098
Simple myopic astigmatism	13	8	28	0.072
Compound myopic astigmatism	2	3	9	0.671
Hypermetropic astigmatism	1	3	11	0.036
Simple hyperopic astigmatism	1	0	7	0.049
Compound hyperopic astigmatism	0	3	4	0.049
Mixed astigmatism	3	0	7	0.048
Presbyopia	92	67	54	0.000
Amblyopia	1	2	7	0.015

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

DISCUSSION

The present hospital-based study was carried out to understand the clinical pattern and demographic distribution of refractive errors among patients attending our tertiary eye care centre. Refractive error, although often considered a simple optical defect, still it remains one of the most frequent causes of avoidable visual morbidity in daily ophthalmic practice. In routine OPD, many patients are not coming with complicated disease, but simply complaining of blurred vision, headache or eye strain, and on examination they are diagnosed with some form of refractive

abnormality. This again shows that the burden of uncorrected refractive error is still quite significant, despite the condition being easily diagnosable and correctable. Similar observations have been reported globally where refractive error continues to be a leading cause of visual impairment[7].

In our series, females were slightly more in number than males (Figure 1). This female predominance is something we commonly observe in clinic practice also. Whether it truly represents higher disease prevalence or simply better health-seeking behavior is not fully clear. Many previous studies have shown that women tend to utilize eye care services more frequently compared to men[8,9]. So it may not be purely biological difference, but more of social and behavioral reasons. In gender-wise analysis (Table 1), hypermetropia and astigmatism were significantly more common in females, and also simple myopic and simple hyperopic astigmatism showed similar trend. However, myopia, compound astigmatism, presbyopia and amblyopia did not show much statistical difference. From clinical point of view, it appears females are presenting more with cylindrical and accommodative problems rather than pure spherical errors, though the pattern is not fully consistent in all categories.

Age-related distribution showed more predictable findings (Table 2). Myopia was seen mostly in younger and middle age group, particularly 16–40 years, which correlates with prolonged near work, study habits and screen exposure, something we frequently see nowadays. Hypermetropia gradually increased with age, while presbyopia was almost entirely confined to patients above 41 years. This is physiologically expected due to loss of accommodation and therefore not surprising. Similar age-dependent refractive shifts are also described in epidemiological studies[10–12]. Astigmatism and some myopic astigmatic variants were clustered in middle age group, whereas amblyopia was relatively more among younger individuals. The transition is not exactly linear in all subtypes, but overall it follows the natural history of refractive development.

When refractive errors were analysed according to employment status (Table 3), some interesting associations were observed. Unemployed individuals showed higher numbers of myopia, hypermetropia and astigmatism, along with several hyperopic astigmatic subtypes. On the other hand, presbyopia was more frequently found among employed subjects. Possibly this is because employed group contains older working adults or those with more visual demand, so they seek consultation earlier. Socioeconomic disparities may also play role here, as people without stable employment may delay eye check-ups and present late with already symptomatic errors. Similar relationship between access to care and uncorrected refractive error has been described in previous public health studies[13,14]. So the difference may not be purely anatomical but rather related to healthcare utilization.

Another practical observation was that most of the patients attended only after they start experiencing noticeable visual difficulty, not for routine screening. Preventive eye care is still lacking in many communities. This is somewhat frustrating from clinician side, because refractive error is one of the easiest conditions to correct, yet still remains untreated in large population. Early detection and timely spectacle correction have shown to improve quality of life and productivity significantly[15], but still the uptake of services remains suboptimal.

This study has certain limitations. Being hospital-based, it does not exactly represent the true community prevalence, because asymptomatic or rural individuals may not attend hospital. Also, not all cases underwent cycloplegic refraction, which might have caused slight under- or over-estimation in some groups. Therefore, results should be interpreted with some caution.

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