Section: Ophthalmology

Original Research Article

A CLINICAL STUDY ON THE PATTERN OF REFRACTORY ERRORS IN PATIENTS ATTENDING GOVERNMENT GENERAL HOSPITAL/ GOVERNMENT MEDICAL COLLEGE, VIZIANAGARAM

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ABSTRACT

Background: Refractive errors are a major cause of visual morbidity and a public health concern, particularly in developing countries. Although they are readily treatable, they tend to be prevalent in underserved populations because of poor vision checking service facilities, social stigma in using spectacles and lack of awareness among affected individuals. Objective is to evaluate the prevalence and demographic pattern of refractive errors in patients seen in the ophthalmology outpatient department of Government General Hospital, Vizianagaram, Andhra Pradesh.

Materials and Methods: This is a hospital-based retrospective observational study from January to March 2025. The study included 320 patients, with the age range of 5 to 65 years, who complained of defective vision and were found to be suffering from refractive errors after automated and subjective refraction. Information on age, sex, occupation, literacy status, place of residence, and the type of refractive error was recorded. Statistical analysis was undertaken with SPSS version 22.0, including subgroup analysis and $\chi 2$ test for association between categorical variables.

Results: Myopia (35.5%) was the most common refractive error, followed by simple astigmatism (21.2%) and hypermetropia (15.8%). Myopic astigmatism (11.1%) and hypermetropic astigmatism (4.7%) and mixed astigmatism (5.6%) were identified in this study group. Presbyopia was observed in (6.4%) of cases. With respect to gender, more males revealed an increasing prevalence of myopia and myopic astigmatism, while females had more hypermetropia and presbyopia. Age- wise analysis showed that myopia was most prevalent in 5–35-year cohorts of age, hypermetropia, mixed astigmatism and presbyopia increased with age. The relationship between gender and refractive error was not significant ($p = 0.6127$).

Conclusion: The present study demonstrates a high prevalence of refractive errors in Andhra Pradesh. The results highlight the importance of periodic vision screening, particularly in school-aged children and the elderly, and targeted public health interventions to manage preventable visual morbidity.

Keywords: Refractory Errors, Ocular Disorders.

INTRODUCTION

Refractive errors are common and easily preventable causes of visual impairment and blindness throughout the world. They happen when the eye cannot focus light onto the retina well, causing vision to be blurry. The most common ones are myopia, hyperopia, astigmatism, and presbyopia. These visual aberrations reduce the quality of life and academic performance and overall social engagement especially in children. They also impair work productivity of working adults and vision related problems and mobility in elderly if not corrected.

The global burden of uncorrected refractive error continues to be concerning. World Health Organization (WHO) reported that more than 2.3 billion people are affected by vision impairment due to uncorrected or under corrected refractive errors and is the second leading cause of preventable blindness.[1] The effect is still higher in low- and middle-income groups where availability of eye care services, public awareness, and affordability of spectacles continue to be a significant challenge. Uncorrected refractive errors form >50% of visual impairment in India but they frequently remain undetected because of dearth of screening and socio-cultural taboos in wearing spectacles.

Children and young people are particularly susceptible with myopia now being described as a public health crisis. The increasing use of smartphones, tablets, and computers – combined with limited outdoor activity – has been associated with the early onset and progression of myopia in school-age individuals. Alternatively, hypermetropia and astigmatism, albeit not as likely to be symptomatic in the early stages, usually remain undetected and result in headaches, poor reading efficiency and amblyopia if not corrected. Presbyopia, a natural, age-related change in near vision, is experienced by most individuals after the age of 40, and if uncorrected, can have an impact on regular activities of daily living including work-related tasks.[2]

Despite the ease of diagnosing and providing refractive solutions in the form of spectacles or contact lenses, proper correction of the refractive errors in the population appears to be unmet in substantial sub-groups. It highlights not only a vacuum in providing eye care facilities but also about the failure of a public health initiative, particularly at the grass-roots level. This is mostly noted in rural and semi-urban community. Psychosocial beliefs, for example spectacles make the eyes weak or are cosmetically unattractive, particularly amongst school children, also contribute to delaying treatment.[3]

From a public health perspective, the treatment of refractive errors is an affordable, high-impact intervention. This has the potential to enhance education and decrease financial burden and overall well-being. Systematic school, workplace, and geriatric clinic-based screening along with public education drives and cost-effective optical services will reduce the burden of visual disability in developing countries like India.

Some population-based studies like the Andhra Pradesh Eye Disease Study (APEDS) and Refractive Error Study in Children (RESC) have reported regional and ethnic variations in the prevalence of refractive errors in India [4]. Nevertheless, there is less recent information on local data particularly from the secondary and tertiary levels of care. The knowledge of the pattern of refractive errors in this area of the world is crucial for planning focused visual screening programs and resource distribution.

Against this background, the current study was carried out to evaluate the spectrum and distribution of refractive errors among patients attending the Ophthalmology Outpatient Department at Government General Hospital, Vizianagaram. It also examines demographic associations including age, gender, occupation, literacy status and living background. This study may provide certain evidence that may help in planning of prevention, vision rehabilitation and policy development to decrease visual impairment due to refractive errors in this region.

MATERIALS AND METHODS

Methodology: A retrospective, hospital-based observational study was carried out in the Department of Ophthalmology, Government General Hospital (GGH), Vizianagaram, Andhra Pradesh. The period of this study was 3 months (January 1, to March 31, 2025). The OPD Registers were meticulously surveyed for the types of refractive errors.

Data of the Patients aged between 5 and 65 years who attended our ophthalmic OPD was taken. All the patients were subjected to complete optometric examination, which included pin-hole test, Automated refraction, and subjective verification. Those patients who had improved vision were included in the study. Patients with squint, cataract, glaucoma, retinal pathology, optic nerve dysfunction and any other neurological condition with visual loss were excluded.

Sample size was determined by the OpenEpi Version 3 open-source calculator. By using an estimated refractive error prevalence of 6% in the community, 95% confidence level, 5% absolute precision and estimated number of outpatients during study period (4680), the calculated sample size was 320. A convenience sampling was adopted to select qualified participants. Information was retrieved from outpatient registers and the patient's records using structured data collection proforma. Demographic data including age, sex, occupation, literacy status and place of residence (urban or rural) were collected, and type of the refractive error detected was documented. Ethical approval was obtained for this study. Clinical examination included unaided and aided visual acuity with Snellen chart and pinhole. Autorefractometry was performed for objective refraction, with results adjusted for subjective correction. Slit-lamp bio microscopy and fundus examination were also done to exclude any other ocular abnormalities.

Permission to conduct the study was obtained from the Institutional Scientific and Ethics Committee (IEC) of Government Medical College, Vizianagaram (Serial No: 60/IEC GMC/MAY 2025). As the study involved the analysis of anonymized data, written informed consent from individual patients was not required.

Data were processed with SPSS version 22.0 (IBM Corp., Armonk, NY, USA). Summary statistics comprising frequencies, percentages, means and standard deviation were used to characterize variables. A subgroup analysis was carried out to examine differences in the distribution of refractive errors according to age and gender. Associations between categorical variables were analysed using chi-square (χ^2) test, with levels of $p < 0.05$ being considered as statistically significant.

RESULTS

A total of 320 patients aged 5 to 65 years presenting with refractive complaints were evaluated at the Ophthalmology Outpatient Department of Government General Hospital, Vizianagaram, over a three-month period (January–March 2025). The socio-demographic characteristics and statistical associations among key variables are summarized in [Table 1]. Most participants were in the 21–35 years age group (31.9%), followed by 36–50 years (28.1%) and 5–20 years (25.9%). Individuals aged above 50 constituted 14.1% of the cohort. Males comprised 52.8% (n = 169) of the study population, with females accounting for 47.2% (n = 151), indicating a near-equal gender distribution. Regarding occupation, students (25.9%) and farmers (24.1%) formed the most prevalent groups, while employees, housewives, and others made up the remainder. A significant 79.1% of the participants were literate, and the majority (63.1%) belonged to rural areas, pointing to a high rural representation in undiagnosed refractive error presentations.

Table 1: Combined Demographic Profile and Chi-Square Test Results of the Study Population (N = 320).

Variable	Value
Age Group	
5–20 years	83 (25.9%)
21–35 years	102 (31.9%)
36–50 years	90 (28.1%)
51–65 years	45 (14.1%)
Gender	
Male	169 (52.8%)
Female	151 (47.2%)
Occupation	
Students	83 (25.9%)
Farmers	77 (24.1%)
Employees	64 (20.0%)
Housewives	60 (18.8%)
Others	36 (11.2%)
Literacy Status	
Literate	253 (79.1%)
Illiterate	67 (20.9%)
Residence	
Urban	118 (36.9%)
Rural	202 (63.1%)
Chi-Square Test (Gender vs Residence)	
Chi-Square Value (χ^2)	0.26
Degrees of Freedom	1
P-Value	0.6127
Statistically Significant ($p < 0.05$)	No

Source: Departmental registry, Government General Hospital, Vizianagaram (Jan–Mar 2025)
Footnote: Chi-square test was used to evaluate the independence between gender and residential background.

A chi-square test was conducted to determine whether an association existed between gender and residential status. The test yielded a chi-square value of 0.26, with 1 degree of freedom, and a p-value of 0.6127, indicating that the association was not statistically significant. Thus, males and females were equally represented across urban and rural areas, and gender did not appear to influence access to ophthalmic services in the studied setting.

Pattern of Refractive Errors: Among the 320 patients included in the study, a total of 406 refractive error diagnoses were recorded, as some patients exhibited more than one refractive condition. The distribution and relative frequency of each refractive error type are presented in Table 2. The most common refractive error encountered was myopia, identified in 144 patients (35.5%). This finding aligns with the global trend of increasing near work and digital screen exposure, particularly in younger populations. Simple astigmatism was the next most prevalent, affecting 21.2% of patients, followed by hypermetropia in 15.8% of cases.

Compound astigmatism was also notable:

- Myopic astigmatism was seen in 11.1%,
- Hypermetropic astigmatism in 4.7%, and
- Mixed astigmatism in 5.4% of patients.

Presbyopia, typically associated with advancing age, was diagnosed in 26 individuals (6.4%), all of whom were above 40 years.

Table 2: Pattern of Refractive Errors with Statistical Distribution (N = 406) *

Type of Refractive Error	Number of Patients	Percentage (%)
Myopia	144	35.5%
Hypermetropia	64	15.8%
Astigmatism (Simple)	86	21.2%
Myopic Astigmatism	45	11.1%
Hypermetropic Astigmatism	19	4.7%
Mixed Astigmatism	22	5.4%
Presbyopia	26	6.4%

Source: Clinical Refraction Log, Department of Ophthalmology, GGH Vizianagaram (Jan–Mar 2025) More than one refractive error could be present per patient; hence, total N exceeds 320.

The findings underscore myopia as the leading cause of visual impairment in the study population, followed closely by astigmatic errors, both simple and compound. These results highlight the importance of early screening and accurate refractive correction, particularly in young adults and school-age children. Presbyopic changes, though less frequent, underscore the need for regular vision assessments in older age groups.

Subgroup Analysis: Gender-wise Pattern of Refractive Errors

To assess sex-based variation in refractive error prevalence, a subgroup analysis was performed. The distribution of each refractive error type among males and females is detailed in [Table 3] and visualized in [Figure 1].

Table 3: Subgroup Analysis of Refractive Errors by Gender (N = 320)

Refractive Error	Male (n)	Female (n)	Total (n)
Myopia	78	66	144
Hypermetropia	30	34	64
Astigmatism (Simple)	42	44	86
Myopic Astigmatism	26	19	45
Hypermetropic Astigmatism	10	9	19
Mixed Astigmatism	14	8	22
Presbyopia	12	14	26

Source: Refraction Records, Government General Hospital, Vizianagaram (Jan–Mar 2025)
Note: Distribution derived from gender-wise clinical records, N = 320.

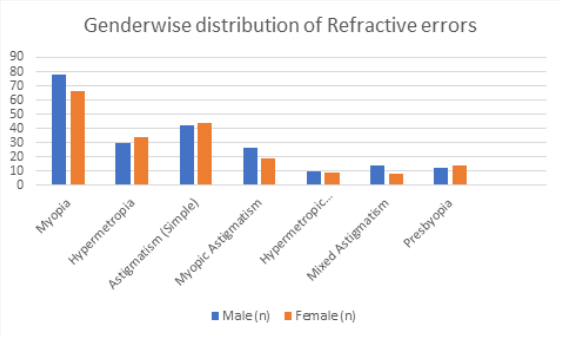

Figure 1: Gender-wise Distribution of Refractive Errors

The figure above illustrates the comparative distribution of various refractive errors between male and female patients.

Myopia was more frequently observed in males (n=78) than females (n=66), although the difference was not extreme. Hypermetropia and simple astigmatism were slightly more prevalent in females. Myopic astigmatism and mixed astigmatism showed higher male predominance. Presbyopia was more frequent among females, reflecting either higher reporting or care-seeking behaviour in older female patients.

Subgroup Analysis: Age-wise Pattern of Refractive Errors

A detailed subgroup analysis was conducted to evaluate how different types of refractive errors varied across age groups. The data are summarized in [Table 4] and visualized in [Figure2].

Table 4: Subgroup Analysis of Refractive Errors by Age Group (N = 320)

Refractive Error	5–20 yrs	21–35 yrs	36–50 yrs	51–65 yrs	Total (n)
Myopia	42	54	30	18	144
Hypermetropia	6	18	24	16	64
Astigmatism (Simple)	21	29	21	15	86
Myopic Astigmatism	8	15	12	10	45
Hypermetropic Astigmatism	2	5	6	6	19
Mixed Astigmatism	3	4	7	8	22
Presbyopia	1	2	7	16	26

Source: Clinical Refraction Logs, GGH Vizianagaram (Jan–Mar 2025)
Note: Age-wise classification is based on chronological grouping at the time of OPD registration.

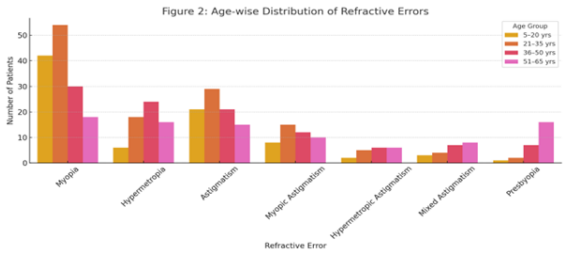

Figure 2: Age-wise Distribution of Refractive Errors

This figure visually compares the frequency of each type of refractive error across the four predefined age groups.

Myopia was predominant in the younger age groups, particularly 21–35 years and 5–20 years, reflecting early-onset myopia trends likely associated with digital device usage and near-work. Hypermetropia showed increasing prevalence with age, peaking in the 36–50 years and 51–65 years categories. Astigmatic errors (simple and compound) were relatively evenly distributed across all age groups but showed a slight rise with advancing age. Presbyopia was almost exclusively observed in patients over 40 years, with highest frequency in the 51–65 years group, consistent with physiological aging of the lens.

DISCUSSION

The present hospital-based cross-sectional study was conducted to assess the pattern and demographic distribution of refractive errors among patients in the Ophthalmology Outpatient Department of the Government General Hospital, Vizianagaram. Overall, 320 patients were recruited and followed for a duration of 3 months with data analysed through gender and age specific subgroup analyses for better understanding of epidemiological differences.

Refractive Error Distribution and Frequency

Myopia was the most prevalent refractive error (35.5%) present in our cohort, a finding that has been observed in other regional and international studies. Lifestyle factors such as extended near-work, decreased time spent outdoors, and excessive screen time have been blamed for the rising prevalence of myopia, particularly in youth. Simple astigmatism (21.2%) and hypermetropia (15.8%) were next in rank. This distribution is like that reported in southern Indian studies, which is because of large number of uncorrected corneal and lenticular irregularities and associated with astigmatic errors.[5-8]

It is worth noting that combined astigmatic errors (myopia, hyperopia, and mixed) represented more than 21% of cases. These errors are commonly under refracted in primary care and may greatly compromise visual quality if left uncorrected. Presbyopia (6.4%) was exclusively present in the older population (>40 years), which is consistent with the age-related loss of accommodation.[9-12]

Gender-wise Distribution: Gender-wise subgroup analysis showed a marginal male preponderance in total OPD attendance (52.8%). Myopia and myopic astigmatism were more frequent in men, hyperopia, simple astigmatism, and presbyopia had a slightly greater prevalence in women. Such distribution differences in population may be due to occupation visual demands, occupational visual awareness, and health-seeking behaviour for the males more than females. Nevertheless, the chi-square test showed that there were no differences between gender and residence ($p = 0.6127$), indicating a fair distribution of health care to male and female.

The same has been recorded in earlier Indian studies where females often reported late-stage symptoms or visual complaints due to hyperopic shifts.[13,14] However, the minor gender-associated variations in the pattern of refractive error in our study did not achieve statistical significance and warrant further investigation in larger population-based settings.

Age-wise Distribution: Trends in age-specific analysis were interesting. The prevalence of myopia was largest in age groups 5–35 years, corresponding to global worries of onset and progression of myopia in school-attending and young adult populations. The findings also highlight the importance of regular school-based eye screening and public health programs focused on myopia prevention strategies.[15-18]

In contrast hypermetropia and presbyopia showed increasing prevalence with age, reflecting age-related ocular anatomical changes and waning ability to accommodate. The percentage of compound astigmatic errors, mixed astigmatism, exhibited in older ages was higher than those in the younger ages, which suggests the existence of the senile changes in the corneal curvature or lenticular astigmatism.[19,20]

Comparisons and Implications: The distribution of refractive errors that we found in this study is in line with other Indian epidemiological data such as message monitoring (APEDS) and the RESC.[9,10] But as the high rates of myopia and astigmatism in rural communities demonstrate, there is a rising demand for early detection and inexpensive corrective care among underserved communities.[21,22]

In addition, our results also support the implementation of integrated vision screening programs according to specific indications for different subgroups (school children for myopia, working-age adults for astigmatic correction, and elderly populations for presbyopia).

Limitations

Limitations This was a retrospective, observational study performed at a tertiary centre using convenience sampling, potentially limiting generalizability. The information was based on OPD visit and might be biased for those with mild or undiagnosed visual complaints. In addition, not all patients had undergone cycloplegic refraction, which could have underestimated the presence of latent hypermetropia.

CONCLUSION

The survey demonstrates a high prevalence of myopia and astigmatism among rural as well as urban cohorts in coastal Andhra Pradesh; there were significant trends for both age and gender. There is an urgent need for strategic public health measures, including school screening, education, and provision of cheap optical service, to rectify this preventable cause of visual morbidity.

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