

Refractive Error in the Intellectually Disabled Population of Lucknow: A Community-Based Cross-Sectional Study

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ABSTRACT

Purpose: To identify the prevalence and pattern of refractive errors among intellectually disabled individuals in Lucknow, India, and to examine their association and correlation with the severity of intellectual disability.

Methods: This was a community-based cross-sectional study. A total of 187 intellectually disabled children and adults identified through community screening activities were examined. Visual acuity assessment was performed using Snellen picture charts and Cardiff Cards, depending on cognitive ability. Auto-refraction, objective, and subjective refraction were conducted. Intellectual disability (ID) was categorized as mild, moderate, or severe based on IQ criteria. Statistical analysis included chi-square testing and Pearson correlation.

Results: Females constituted the majority of the study population. Refractive errors were observed in 58.8% of the participants, with hyperopia (34.2%) being more common than myopia (24.6%). Other ocular conditions included strabismus, nystagmus, and ptosis. The association between severity of intellectual disability and the presence of refractive error was not statistically significant ($\chi^2 = 2.14$, $p = 0.34$). Similarly, correlation between IQ level and refractive error type was weak and non-significant ($r = -0.08$, $p > 0.05$).

Conclusion: Refractive errors are highly prevalent among intellectually disabled individuals in Lucknow; however, they do not significantly correlate with the severity of intellectual disability. Routine screening and early correction are essential to improve overall functioning and quality of life.

Keywords: Refractive errors; Intellectual disability; Prevalence; Hyperopia; Myopia; Visual impairment; Community-based study; Snellen chart; Cardiff cards; IQ correlation; Severity of disability.

INTRODUCTION

Refractive errors are among the most common causes of visual impairment worldwide and occur when the eye fails to focus parallel rays of light on the retina while accommodation is at rest.[1] These errors, collectively known as ametropia, include

myopia, hyperopia, and astigmatism. If left uncorrected, they can significantly reduce visual function, leading to difficulties in learning, mobility, and daily activities. Globally, uncorrected refractive error (URE) affects approximately 153 million people, including eight million individuals who are

blind as a direct consequence, highlighting the magnitude of this preventable public health problem. [2–4]

In India, refractive errors remain a leading cause of avoidable visual impairment, particularly among underserved populations with limited access to eye care services.[5] Studies from neighbouring countries, such as Pakistan, report similar challenges, with an estimated 3% of blindness attributable to uncorrected refractive errors.[6] Despite their prevalence, refractive errors often remain undiagnosed in vulnerable populations due to a combination of poor awareness, inadequate screening, and limited access to corrective services.

Individuals with intellectual disability (ID) are particularly susceptible to visual problems. Intellectual disability, previously termed mental retardation, is characterized by below-average intellectual functioning and limitations in adaptive behaviour. Children and adults with ID frequently present with a higher prevalence of ocular disorders, including refractive errors, strabismus, nystagmus, and amblyopia. [7–9] Communication difficulties and limited cooperation often delay the recognition and correction of visual deficits, which can further exacerbate functional limitations. Previous studies have reported refractive error prevalence ranging from 50% to 70% in institutionalized or special-school populations with intellectual disability.[10] Despite this high burden, there is limited data from community-based screenings in North India, particularly in Lucknow. Most existing studies focus on institutionalized populations, which may not represent the broader community. Understanding the prevalence and pattern of refractive errors in this population is essential for designing targeted interventions and ensuring early detection and correction.

This cross-sectional study aims to determine the prevalence and types of refractive errors among intellectually disabled individuals in Lucknow and to examine whether the severity of intellectual disability is associated or correlated with the occurrence of

refractive errors. Findings from this study will provide valuable evidence for planning eye care services and improving the overall quality of life for intellectually disabled individuals in the community.

METHODOLOGY

This community-based cross-sectional study was conducted through multiple screening camps organized in urban and peri-urban areas of Lucknow, Uttar Pradesh, India. A total of 187 individuals with a confirmed diagnosis of intellectual disability, aged 5 years and older, were enrolled. Only participants who were capable of undergoing basic ocular examinations were included, and informed consent was obtained from parents or guardians prior to participation.

Visual acuity assessment was adapted to the cognitive abilities of each participant. For those able to cooperate, Snellen picture charts were used, whereas Cardiff Cards were employed for participants with lower cognitive functioning. All subjects underwent objective retinoscopy and subjective refraction wherever feasible. Comprehensive ocular evaluation included external inspection and ophthalmoscopy to detect other ocular abnormalities.

Intellectual disability was classified according to standard IQ ranges into mild (IQ 50–69), moderate (IQ 35–49), and severe (IQ <34). Data were analysed using descriptive statistics to summarize demographic and ocular findings. Associations between the presence of refractive errors and severity of intellectual disability were evaluated using the chi-square test, while Pearson correlation was applied to examine the relationship between IQ levels and type of refractive error. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 187 intellectually disabled individuals were screened in this community-based study. Females (104, 55.6%) outnumbered males (83, 44.4%). The distribution of participants according to gender, intellectual disability severity, and

the presence of refractive errors is presented in Table 1. Among participants with mild intellectual disability, 25 of 48 individuals (52.1%) had refractive errors. In the moderate ID group, 49 of 78 participants (62.8%) were affected, while in the severe ID group, 36 of 61 individuals (59.0%) had

refractive errors. Although refractive errors were slightly more common in the moderate ID group, the association between the severity of intellectual disability and the presence of refractive errors was not statistically significant ($\chi^2 = 2.14, p = 0.34$).

Table 1. Participant demographics, intellectual disability severity, and refractive error prevalence (n = 187)

Characteristic	Number (%)	Refractive Error Present n (%)	p-value
Gender			
Female	104 (55.6)	62 (59.6)	—
Male	83 (44.4)	48 (57.8)	—
Intellectual Disability			0.34
Mild	48	25 (52.1)	
Moderate	78	49 (62.8)	
Severe	61	36 (59.0)	

Pearson correlation analysis between IQ level and type of refractive error revealed a weak and non-significant correlation ($r = -0.08, p > 0.05$), indicating that refractive errors occur across all levels of intellectual disability and are not strongly influenced by cognitive severity.

The distribution of refractive error types and other ocular abnormalities is summarized in Table 2. Hyperopia was the most common refractive error (64 participants, 34.2%),

followed by myopia (46 participants, 24.6%). Emmetropia was observed in 77 participants (41.2%). In addition, strabismus (16 participants, 8.5%), nystagmus (14 participants, 7.5%), ptosis (9 participants, 4.8%), and other minor ocular findings (6 participants, 3.2%) were detected. These results highlight the substantial ocular morbidity among intellectually disabled individuals in the community.

Table 2. Types of refractive errors and other ocular abnormalities (n = 187)

Condition / Refractive Error	Number (%)
Hyperopia	64 (34.2)
Myopia	46 (24.6)
Emmetropia	77 (41.2)
Other Ocular Abnormalities	
Strabismus	16 (8.5)
Nystagmus	14 (7.5)
Ptosis	9 (4.8)
Others	6 (3.2)

In summary, 58.8% of participants had refractive errors, with hyperopia predominating. Refractive errors were observed across all levels of intellectual disability, and no significant association or correlation with IQ severity was detected. Additional ocular comorbidities were present, emphasizing the need for

comprehensive annual eye screening in this population.

DISCUSSION

This community-based cross-sectional study conducted in Lucknow found a high prevalence of refractive errors (58.8%) among intellectually disabled individuals, with hyperopia (34.2%) being more common

than myopia (24.6%). These findings are consistent with previous reports from institutionalized and special-school populations, which documented refractive error prevalence rates ranging from 50% to 70% in intellectually disabled individuals. [7–10] The predominance of hyperopia may be attributed to developmental ocular factors, limited accommodative function, and neurodevelopmental influences commonly observed in this population. [7]

The study population consisted of females (55.6%) and males (44.4%), reflecting the demographics of community participation. Female predominance in screening may result from caregiver availability or health-seeking behaviour patterns. While the moderate ID group showed a slightly higher prevalence of refractive errors (62.8%) compared to mild (52.1%) and severe (59.0%) ID, the association between ID severity and refractive error was not statistically significant ($\chi^2 = 2.14$, $p = 0.34$), as shown in Table 1. Furthermore, Pearson correlation analysis revealed a weak and non-significant correlation ($r = -0.08$, $p > 0.05$) between IQ level and refractive error type. These findings indicate that refractive errors occur across all levels of intellectual disability, and cognitive severity alone cannot predict the presence or type of refractive error. This is consistent with previous literature suggesting that ocular abnormalities in intellectually disabled individuals are multifactorial and not solely dependent on the degree of intellectual impairment. [8–10]

In addition to refractive errors, other ocular abnormalities were observed in the study population, including strabismus (8.5%), nystagmus (7.5%), and ptosis (4.8%), as summarized in Table 2. These rates align with prior studies highlighting a high burden of ocular morbidity in intellectually disabled populations. [7–10] The presence of such comorbidities underscores the importance of comprehensive ocular examination in addition to refraction.

The findings of this study have important public health implications. Regular,

community-based eye screening and early optical correction can significantly improve functional vision, learning, and independence in intellectually disabled individuals. Given that refractive errors were prevalent across all levels of intellectual disability, annual eye examinations should be recommended regardless of cognitive severity. The identification of associated ocular conditions further emphasizes the need for integrated eye care services tailored for this vulnerable population.

Limitations of this study include its cross-sectional design, which prevents causal inference, and potential selection bias due to reliance on participants attending community screening camps. Additionally, some low-functioning participants could not undergo subjective refraction, which may slightly underestimate the true prevalence of refractive errors. Future research with larger, randomized community samples and longitudinal follow-up would strengthen the understanding of ocular health in intellectually disabled populations.

CONCLUSION

This community-based study from Lucknow demonstrates a high prevalence of refractive errors (58.8%) among intellectually disabled individuals, with hyperopia being the most common. Refractive errors were observed across all levels of intellectual disability, and no significant association or correlation with cognitive severity was found ($\chi^2 = 2.14$, $p = 0.34$; $r = -0.08$, $p > 0.05$; Table 1). Additionally, ocular comorbidities such as strabismus, nystagmus, and ptosis were frequently identified (Table 2), highlighting the broader ocular health burden in this population.

These findings underscore the critical importance of regular, community-based eye screening and early optical correction for intellectually disabled individuals, irrespective of their level of cognitive impairment. Timely detection and management of refractive errors and associated ocular conditions can

significantly enhance functional vision, independence, and overall quality of life. Integrating routine eye care into community health programs for intellectually disabled populations is therefore essential for reducing preventable visual impairment.

Declaration by Authors

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