

## IDENTIFYING THE CAUSES OF SEVERE VISUAL IMPAIRMENT IN THE SEMI-URBAN DISTRICT OF NIZAMABAD, TELANGANA, SOUTH INDIA: A CROSS-SECTIONAL STUDY

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### Abstract

**Background:** This cross-sectional study explores the causes of severe visual impairment in Nizamabad, a semi-urban district in South India, while also examining the demographic and educational characteristics of the affected population. **Material & Methods:** Over 18 months, we enrolled 456 participants aged 11 to over 70 years. We collected detailed demographic data, including age, gender, and educational background. Visual disability severity was categorized into three groups: 40%, 75%, and 100% visual disability. We identified the main causes of visual impairment, focusing on congenital anomalies, retinitis pigmentosa, and phthisis bulbi. Additionally, we analyzed the affected anatomical sites, including the whole globe, retina, optic nerve, uvea, cornea, and sclera. Workforce participation was assessed by employment status and gender distribution. **Results:** The study revealed diverse age distribution, with the largest group aged 11-20 years (25.9%), and males constituted 64% of participants. Literacy varied, with 60.5% being literate and 39.5% illiterate. Visual disability severity ranged from 40% (9.6%) to complete impairment (72.8%). The leading causes of visual impairment were congenital anomalies (18.4%), retinitis pigmentosa (16.0%), and phthisis bulbi (14.7%). The most affected anatomical site was the whole globe (47.4%), followed by the retina (28.5%) and optic nerve (19.5%). A majority of both males (63.65%) and females (36.3%) were employed (94.7%), while 5.3% were not working, warranting further investigation. **Conclusion:** This study highlights the demographic and educational characteristics of individuals with severe visual impairment in a semi-urban district of South India. It underscores the need for tailored interventions, especially for those not actively engaged in the workforce, aiming to improve their quality of life and access to visual healthcare services.

## INTRODUCTION

Visual impairment is a significant public health concern worldwide, with varying prevalence and causes across different regions and populations.<sup>[1,2]</sup> Understanding the specific factors contributing to severe visual impairment is crucial for developing targeted interventions and improving the quality of life for affected individuals.<sup>[3,4]</sup> Visual impairment, often resulting from ophthalmic disorders and related conditions, has a profound impact on an individual's

daily life, affecting their ability to perform essential tasks, access educational opportunities, and participate in the workforce.<sup>[5,6]</sup> The prevalence of visual impairment can vary widely, influenced by factors such as geography, socio-economic status, and healthcare access.<sup>[7]</sup> Therefore, conducting region-specific studies is essential to gain insights into the unique challenges faced by affected communities.<sup>[8,9]</sup>

Nizamabad, situated in the southern part of India, presents an interesting context for investigating the

causes of severe visual impairment. It is characterized by a semi-urban environment, where residents have access to some urban amenities but may still experience barriers to healthcare services. This study aims to fill a critical knowledge gap by examining the demographic characteristics, educational backgrounds, and employment status of individuals living with severe visual impairment in this specific region.

Understanding the demographic characteristics of the affected population is the first step in tailoring healthcare services and interventions to their needs. Age, gender, and socio-economic factors can all play a role in the prevalence and causes of visual impairment. Additionally, educational background is a crucial determinant of an individual's ability to access information and healthcare services related to visual health. Therefore, examining literacy levels and educational attainment within the study population is essential.

The study also seeks to categorize the severity of visual impairment among participants. Visual disability is not a monolithic condition but exists on a spectrum, ranging from mild to severe. Categorizing individuals based on the degree of visual impairment will provide insights into the prevalence of severe cases and the challenges they face in their daily lives.

Identifying the specific causes of severe visual impairment is a primary focus of this study. Ophthalmic disorders such as congenital anomalies, retinitis pigmentosa, and phthisis bulbi are known contributors to visual impairment. However, their relative prevalence in this semi-urban district may differ from other regions, warranting a detailed investigation. Understanding the leading causes of visual impairment can inform preventive measures, early interventions, and targeted treatment strategies.

#### **Aim and Objectives**

The primary aim of this study is to identify the causes of severe visual impairment in the semi-urban district of Nizamabad, Telangana, South India. To achieve this aim, the study has the following specific objectives:

To characterize the demographic profile of individuals with severe visual impairment in Nizamabad, including age and gender distribution.

To assess the educational background of the study participants, including literacy rates and educational attainment.

To categorize the severity of visual impairment among participants, distinguishing between mild, moderate, and severe cases.

To determine the leading causes of severe visual impairment in the study population, with a focus on ophthalmic disorders.

To analyze the employment status of individuals with severe visual impairment, examining workforce participation and potential barriers to employment.

## **MATERIALS AND METHODS**

This study employed a cross-sectional design and spanned a duration of 18 months, from January 2021 to August 2022. The research was conducted within the Department of Ophthalmology at the Government Medical College and General Hospital in Nizamabad. The study encompassed a total sample size of 456 patients, allowing for a comprehensive examination of severe visual impairment in this semi-urban district of South India.

#### **Inclusion Criteria**

Individuals with a best corrected visual acuity (BCVA) of 3/60 or worse in their better eye.

Participants aged 10 years and older.

Individuals who provided informed consent to participate in the study.

#### **Exclusion Criteria**

Individuals who declined to participate in the study.

Participants below the age of 10 years.

Individuals with a BCVA better than 3/60.

Patients whose visual impairment was attributed to cataracts.

#### **Data Collection**

**Patient History:** A detailed patient history was collected, encompassing ocular complaints, duration of symptoms, laterality of visual impairment, family history of blindness, state of domicile, education, and occupation. This information was recorded in a specialized proforma designed for the study.

#### **Ocular Examination**

A comprehensive ocular examination was conducted, covering the following aspects:

**Best Corrected Visual Acuity (BCVA):** Both distance and near vision were assessed using the Snellen scale (or LogMAR scale in some cases).

**Slit Lamp Examination:** The anterior and posterior segments of the eye were examined using a slit lamp.

#### **Eye Fixation**

The fixation point of the eye, whether central or eccentric, was determined.

#### **Ophthalmoscopy**

Direct ophthalmoscopy was employed for a comprehensive evaluation of the fundus. Additionally, this assessment was supported by indirect ophthalmoscopy using a +20D lens<sup>10,11</sup>.

**Visual Field Examination:** Visual field assessment was conducted using the Confrontation method and Bjerrum's screen. Color vision was assessed with the Ishihara Pseudoisochromatic chart where applicable.

#### **Statistical Analysis**

Data entry and validation were performed using Microsoft Access database software. The statistical analysis was conducted using SPSS software. Results were expressed as proportions with corresponding 95% confidence intervals (CIs). Separate analyses were conducted for unilateral and bilateral visual impairments.

#### **Ethical Approval**

The study was approved by the Institutional Ethical Committee, Government Medical College and

General Hospital, Nizamabad, Telangana ,India. All ethical considerations were adhered to throughout the study.

## RESULTS

### Age Analysis

The study included 456 participants, and their age distribution was diverse. The largest age group was 11-20 years, comprising 25.9% of the cohort. Participants aged 21-30 accounted for 18.4%, while those in the 31-40 age bracket represented 16.7%. Age groups 41-50, 51-60, and 61-70 constituted 15.0%, 12.3%, and 10.7%, respectively. A smaller percentage (1.1%) was over 70 years old (Table No:1).

### Gender Dynamics

The gender distribution among study participants revealed a majority of males, constituting 64% of the total, while females accounted for 36%(Table No: 2). Educational Profile: In terms of literacy, 60.5% of participants were literate, whereas 39.5% were illiterate, highlighting the diversity in educational backgrounds (Table No:3).

### Visual Disability Spectrum

The study categorized participants based on the severity of their visual disability. Category 1, representing individuals with 40% visual disability, comprised 9.6% of the cohort. Category 2, with 75% visual disability, accounted for 17.5%. A significant proportion, 72.8%, fell into Categories 3 & 4, signifying complete visual impairment (Table No:4).

### Causes of Visual Impairment

Among the study subjects, the primary causes of visual impairment varied. The leading causes were congenital anomalies (18.4%), followed by retinitis pigmentosa (16.0%) and phthisis bulbi (14.7%). Other retinal pathology, optic atrophy, amblyopia, glaucoma, pathological myopia, corneal pathology, staphyloma, and empty socket were also identified as contributing factors (Table No:5).

### Affected Anatomical Sites

The study examined the anatomical sites affected by visual impairment. The whole globe was the most commonly affected site, observed in 47.4% of participants. Retina-related issues were prevalent in 28.5%, while optic nerve complications were noted in 19.5%. Uvea and cornea/sclera were affected in 3.1% and 1.5% of participants, respectively (Table No:6).

### Occupational Engagement by Gender

The study analyzed the workforce participation of participants based on gender. A majority of males

(63.65%) and females (36.3%) were actively working, contributing to a combined total of 94.7% of participants engaged in employment. A smaller subset, 5.3%, was not actively working (Table No:7).

### Overview of Workforce Participation

In summary, the study revealed that 94.7% of participants were actively working, indicating their adaptability and resilience despite visual challenges. Conversely, 5.3% of participants were not engaged in the workforce, and further exploration is needed to understand the factors contributing to their non-participation, including potential correlations with the severity of visual impairment and other socio-economic variables (Table No:8)



Figure 1: Be Albinism

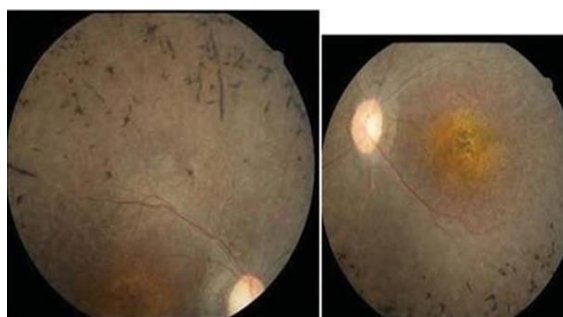


Figure 2: Be Consecutive Optic Atrophy Secondary to Retinitis Pigmentosa



Figure 3: Re Eviscerated eye, Le Leucomatous Opacity



Figure 4: Be Phthisis Bulbi

Table 1: Age Analysis

Age Group	Number of Participants	Percentage (%)
11-20	118	25.9
21-30	84	18.4
31-40	76	16.7
41-50	68	15.0
51-60	56	12.3
61-70	49	10.7
Over 70	5	1.1

**Table 2: Gender Dynamics**

Gender	Number of Participants	Percentage (%)
Male	292	64.0
Female	164	36.0

**Table 3: Educational Profile**

Literacy Status	Number of Participants	Percentage (%)
Literate	276	60.5
Illiterate	180	39.5

**Table 4: Visual Disability Spectrum**

Disability Category	Percentage (%)	Number of Participants
40% (Category 1)	9.6	44
75% (Category 2)	17.5	80
100% (Categories 3 & 4)	72.8	332

**Table 5: Causes of Visual Impairment Among Study Subjects**

Cause	Count (n)	Proportion (%)
Congenital Anomalies	84	18.4
Retinitis Pigmentosa	73	16.0
Phthisis Bulbi	67	14.7
Other Retinal Pathology	62	13.6
Optic Atrophy	48	10.5
Amblyopia	36	7.9
Glaucoma	32	7.2
Pathological Myopia	27	5.9
Corneal Pathology	15	3.3
Staphyloma	8	1.75
Empty Socket	4	0.87
Total	456	100

**Table 6: Overview of Affected Anatomical Sites in Study Participants**

Anatomical Site	Patients Count (n)	Proportion (%)
Whole Globe	216	47.4
Retina	130	28.5
Optic Nerve	89	19.5
Uvea	14	3.1
Cornea and Sclera	7	1.5
<b>Total</b>	<b>456</b>	<b>100</b>

**Table 7: Occupational Engagement by Gender**

Employment Status	Male (n)	Female (n)	Combined Total (n)
Working	275 (63.65%)	157 (36.3%)	432 (94.7%)
Not Working	17 (70.8%)	7 (29.2%)	24 (5.3%)
<b>Total</b>	<b>292</b>	<b>164</b>	<b>456</b>

**Table 8: Overview of Workforce Participation**

Employment Status	Participants Count (n)	Proportion (%)
Working	432	94.7
Not Working	24	5.3
<b>Total</b>	<b>456</b>	<b>100</b>

## DISCUSSION

In our study, we address the critical issue of visual impairment, with a particular emphasis on its prevalence, causes, and demographic considerations, particularly within the context of developing countries. The World Health Organization (WHO) recognizes visual impairment as a significant public health concern, classifying individuals as having low vision if their best-corrected visual acuity falls below 6/18 but is better than or equal to 3/60 in the better eye. Moreover, those with a visual field of less than 10 degrees or visual acuity poorer than 3/60 are categorized as blind according to WHO criteria.<sup>[12]</sup>

It is paramount to underscore that functional limitations due to poor vision occur at acuity levels significantly better than the legal definition of blindness. Our study highlights the burden that visual impairment, particularly low vision, places on social care services and the substantial impact it has on an individual's functional status.

Global prevalence rates of visual impairment and blindness exhibit significant variations, as evidenced by numerous studies conducted in different regions (Congdon N et al).<sup>[13]</sup> These variations can be attributed to a multitude of factors, including demographic diversity, environmental influences, disparities in healthcare accessibility, and socioeconomic determinants.



Regarding gender, our findings reveal a male predominance (64%), which differs from some other studies reporting a higher prevalence of visual impairment in females<sup>14</sup>. Potential explanations for these disparities may encompass hormonal influences and socioeconomic factors that affect access to high-quality ophthalmic healthcare (Ghosh S et al & Joshi RS).<sup>[14, 15]</sup>

Age emerges as a pivotal factor in visual impairment, with prevalence increasing as individuals advance in age. This aligns with the natural aging processes that impact eye health, including macular thinning, cataract development, and an elevated incidence of conditions such as diabetic retinopathy and glaucoma.<sup>[12,13]</sup>

The employment status of individuals with severe visual impairment is a significant concern, with the majority (95%) not engaged in employment (Vijaya L & Others<sup>16</sup>). Barriers to workforce participation may include limited job opportunities, societal stigma, and the absence of necessary accommodations (Grant WM & Burke JF Jr<sup>17</sup>).

The causes of severe visual impairment in our study are multifaceted, with congenital abnormalities, retinitis pigmentosa, and phthisis bulbi among the leading etiologies (Verdina T et al).<sup>[10]</sup> These findings align with some prior studies but deviate from others, underscoring the complex and multifactorial nature of the causes of visual impairment.<sup>[18,19]</sup> Importantly, almost half of the cases had avoidable causes, emphasizing the critical need for accessible eye care services and preventive measures.<sup>[13,18]</sup>

Limitations of this study include a relatively small sample size that may not fully represent the broader population, retrospective data collection susceptible to biases, a regional focus on a specific semi-urban district limiting generalizability, a cross-sectional design offering only a snapshot of visual impairment, potential data quality issues reliant on medical records, limited exploration of socioeconomic factors, insufficient investigation of healthcare access barriers, a lack of in-depth analysis on rehabilitation services, no examination of temporal factors, and a primary focus on urban and semi-urban areas, potentially excluding rural populations.

## CONCLUSION

This study provides crucial insights into visual impairment, emphasizing the need for genetic counselling for congenital eye diseases and mandatory screening for conditions like retinopathy. Health education is pivotal in preventing corneal scarring, while addressing avoidable causes, such as diabetic retinopathy and glaucoma, through preventive measures is essential. Reducing trauma-related eye injuries and ensuring early diagnosis and treatment play vital roles in preventing avoidable blindness. Finally, enhancing the quality of life for visually impaired individuals through accessible rehabilitation services is imperative. Implementing

these recommendations can reduce the burden of visual impairment and promote inclusivity in society.

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