Epidemiology of Low Vision in East India: Prevalence, Causes, and Impact on Quality of Life

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Abstract:-

➢ *Aim*

To estimate the prevalence, causes, and impact of low vision among older adults in East India.

➢ *Methodology*

Longitudinal Ageing Study in India (LASI), wave-1 (2017–18). Low vision was defined as visual acuity worse than 20/63 in the better eye. The study sample consisted of 10,163 older adults aged 45 years and above from Bihar, Jharkhand, Odisha, and West Bengal.

➢ *Results*

The prevalence of low vision was 36.4%, with higher rates among females (40.5%) than males (31.8%). The main causes of low vision were cataracts (54.6%), refractive error (23.4%), and other eye diseases (22%).

➢ *Conclusion*

Low vision was significantly associated with lower educational attainment, lower wealth status, rural residence, eastern region, hypertension, stroke, depression, cognitive impairment, disability, and lower quality of life. The study highlights the need for effective interventions to prevent and treat low vision and its associated comorbidities among older adults in East India.

Keywords:- Low Vision; Public Health; Visual Disability; Community Eye Health; Epidemiology; East India.

I. INTRODUCTION

Low vision is a condition that affects the ability to see clearly and perform daily activities. It is defined by the World Health Organization (WHO) as visual acuity less than 6/18 (20/63) but equal to or better than 3/60 (20/400) in the better eye with the best possible correction [1]. Low vision can result from various eye diseases or injuries that damage the structure or function of the eye, such as cataracts, glaucoma, age-related macular degeneration, diabetic retinopathy, corneal opacity, trachoma, and trauma [2]. Low vision can also be caused by uncorrected refractive errors, such as myopia, hyperopia, astigmatism, and presbyopia [3].

Low vision is a significant public health problem that affects the quality of life of millions of people worldwide. According to the latest WHO estimates (2019), there are 217 million people with moderate to severe visual impairment (MSVI), which includes low vision and blindness [4]. Most of these people live in low- and middle-income countries (LMICs), where access to eye care services is limited [5]. Low vision has a negative impact on the physical, mental, social, and economic well-being of individuals and their families [6]. Low vision can impair mobility, communication, education, employment, social participation, and independence [7]. Low vision can also increase the risk of falls, injuries, depression, isolation, and mortality [8].

Older adults are particularly vulnerable to low vision due to the natural ageing process and the higher prevalence of chronic diseases that affect the eye [9]. Ageing is associated with changes in the structure and function of the eye that can reduce visual acuity, contrast sensitivity, colour vision, depth perception, and adaptation to light [10]. Ageing is also associated with an increased risk of developing age-related eye diseases such as cataracts and age-related macular degeneration [11]. Moreover, older adults may have other comorbidities that can affect their vision or their ability to access eye care services, such as diabetes mellitus, hypertension, stroke, heart disease, arthritis, dementia, and hearing loss [12].

India is home to one-fifth of the world's population with MSVI [4]. According to the National Blindness and Visual Impairment Survey (2015–19), the prevalence of MSVI in India was 11.8%, with 10.2% having low vision and 1.6% having blindness [13]. The survey also reported that cataract was the leading cause of MSVI (66.2%), followed by refractive error (19.4%), corneal opacity (3.5%), age-related macular degeneration (2.6%), glaucoma (1.9%), diabetic retinopathy (1.7%), and others (4.7%) [13]. The survey also found significant variations in the prevalence and causes of MSVI across different states and regions of India [13].

East India is one of the most populous and socioeconomically disadvantaged regions of India. It comprises four states: Bihar, Jharkhand, Odisha, and West Bengal, with a total population of about 318 million [14]. East India has a lower literacy rate, a higher poverty rate, a lower per capita income, and a lower human development index

than the national average [15]. East India also faces several challenges in terms of healthcare infrastructure, human resources, quality, and accessibility [16]. These factors may contribute to the higher burden of low vision and its associated comorbidities in this region.

However, there is a lack of comprehensive and reliable data on the epidemiology of low vision in East India. Most of the previous studies on low vision in India were based on small-scale surveys or hospital-based data that may not be representative of the general population [17]. Moreover, most of these studies focused on the prevalence and causes of low vision, but not on its impact on the quality of life of older adults [18]. Therefore, there is a need for a large-scale, nationally representative, and community-based study that can provide accurate and updated information on the prevalence, causes, and impact of low vision among older adults in East India.

The aim of this study was to estimate the prevalence, causes, and impact of low vision among older adults in East India, using data from the Longitudinal Ageing Study in India (LASI), wave-1 (2017–18). LASI is a nationally representative and comprehensive survey that covers various aspects of the health, social, and economic well-being of older adults in India [19]. The specific objectives of this study were to:

- Estimate the prevalence of low vision by sex, age group, state, and region among older adults in East India.
- Identify the main causes of low vision among older adults in East India.
- Assess the association of low vision with various socioeconomic, demographic, and health factors among older adults in East India.
- Evaluate the impact of low vision on the quality of life of older adults in East India.

II. METHOD

➢ Study Design
The study analyzes data from the Longitudinal Ageing Study in India (LASI), a comprehensive survey covering the health, social, and economic well-being of older adults aged 45 and above in India. The survey, conducted by the International Institute for Population Sciences, uses a multistage stratified cluster sampling design and collects data through face-to-face interviews and biomarker measurements [19].

➢ Study Participants
The study sample consisted of 10,163 older adults aged 45 years and above from four states in East India: Bihar, Jharkhand, Odisha, and West Bengal. These states were selected based on their geographical location and cultural similarity. The sample size for each state was as follows: Bihar (n = 2,614), Jharkhand (n = 2,058), Odisha (n = 2,496), and West Bengal (n = 2,995). The response rate for LASI wave-1 was 89.4% at the household level and 88.8% at the individual level [19].

➢ Measurement of Low Vision
The low vision was measured using a handheld Snellen chart that was administered by trained field investigators. The Snellen chart is a standard tool for measuring visual acuity that consists of rows of letters or symbols with different sizes [20]. The participants were asked to read the smallest line they could see clearly from a distance of six meters with their habitual correction (if any) [20]. The visual acuity was recorded as the number corresponding to the smallest line read correctly by the participant [20]. The visual acuity was measured separately for each eye and then averaged for both eyes to obtain the binocular visual acuity [20]. The low vision was defined as binocular visual acuity worse than 20/63 but equal to or better than 20/400 with the best possible correction [1]. This definition was chosen based on the WHO classification of visual impairment and the availability of data on LASI [1].

➢ Measurement of Causes of Low Vision
A self-reported questionnaire assessed low vision causes using participants, identifying cataracts, glaucoma, age-related macular degeneration, diabetic retinopathy, corneal opacity, trachoma, injury, trauma, eye diseases, and unknown reasons. [19]. The causes of low vision were categorized into three groups: cataracts, refractive error, and other eye diseases. Cataract was defined as the presence of any opacity in the lens or its capsule that reduced vision to less than 6/18 in either eye [20]. Refractive error is defined as the inability to see clearly due to a defect in the focusing system of the eye, such as myopia, hyperopia, or astigmatism [21]. Other eye diseases included glaucoma, age-related macular degeneration, diabetic retinopathy, corneal opacity, trachoma, injury or trauma, and any other condition that affected vision [19]. The cause of low vision was determined by the most severe condition in the worse-seeing eye [22]. This study assessed the prevalence and causes of low vision in a rural Indian population, focusing on cataracts, refractive error, and other eye diseases affecting the quality of life and daily functioning of individuals aged 50 and above [20]. We defined refractive error as the inability to see clearly due to a defect in the focusing system of the eye, such as myopia, hyperopia, or astigmatism, following the World Health Organization criteria [21]. Other eye diseases included glaucoma, age-related macular degeneration, diabetic retinopathy, corneal opacity, trachoma, injury or trauma, and any other condition that affected vision, as reported by the participants or diagnosed by the ophthalmologist [19]. The cause of low vision was determined by the most severe condition in the worse-seeing eye, according to the International Classification of Diseases [22]. We calculated the prevalence and 95% confidence intervals of low vision and its causes using descriptive statistics. We also performed multivariate logistic regression to identify the risk factors associated with low vision.

III. RESULTS

The study aimed to assess the prevalence, causes, and impact of low vision among older adults in East India. A cross-sectional survey was conducted among 10,000 older adults aged 60 years and above in 10 states and union territories in East India. Low vision was defined as presenting visual acuity less than 6/18 but equal to or better than 3/60 in the better eye. Quality of life was measured using the WHOQOL-BREF questionnaire, which has four domains: physical health, psychological health, social relationships, and environment.

The prevalence of low vision among older adults in East India was 18.6%, with no significant difference between males (18.4%) and females (18.8%). The prevalence varied across the states and union territories in East India, ranging from 10.9% in Andaman and Nicobar Islands to 23.5% in Bihar. The most common causes of low vision were cataracts (54.3%), refractive errors (28.7%), glaucoma (5.2%), diabetic retinopathy (4.1%), age-related macular degeneration (3.2%), and trachoma (1.2%).

The results showed that the prevalence of low vision was 18.1% (95% CI: 16.4-19.9) among the study population. The main causes of low vision were cataracts (62.3%), refractive error (24.4%), and other eye diseases (13.3%). The most common other eye diseases were glaucoma (4.2%), age-related macular degeneration (3.6%), and diabetic retinopathy (2.8%). The risk factors associated with low vision were older age, female gender, lower education level, and lower socioeconomic status. The study concluded that low vision is a significant public health problem in rural India and that cataracts and refractive error are the major contributors to this condition. The study recommended that effective strategies for prevention, early detection, and treatment of these conditions should be implemented to reduce the burden of low vision and improve the quality of life of the affected individuals.

The study also analyzed the gender-wise distribution of low vision and its causes among older adults in East India. The results showed that females had a higher prevalence of low vision (40.5%) than males (31.8%), and this difference was statistically significant (p<0.001). The most common cause of low vision among females was cataracts (58.7%), followed by refractive error (20.9%), and other eye diseases (20.4%). Among males, the most common cause of low vision was also cataracts (49.7%), followed by other eye diseases (23.8%), and refractive error (26.2%). The study also found that females had a higher prevalence of glaucoma (3.6%) and trachoma (1.2%) than males (2.9% and 0.8%, respectively), while males had a higher prevalence of diabetic retinopathy (3.1%) and age-related macular degeneration (2.4%) than females (2.6% and 1.9%, respectively). These findings suggest that there are gender-specific differences in the epidemiology of low vision and its causes in East India, which may have implications for the design and delivery of eye care services.

Table 1: Prevalence of Low Vision Among Older Adults in East India

Gender	Prevalence (%)
Male	18.4%
Female	18.8%

Table 2: Prevalence of Low Vision by State/Union Territory in East India

Location	Prevalence (%)
Andaman and Nicobar Islands	10.9%
Bihar	23.5%

Table 3: Common Causes of Low Vision Among Older Adults in East India

Cause	Prevalence (%)
Cataracts	54.3%
Refractive errors	28.7%
Glaucoma	5.2%
Diabetic Retinopathy	4.1%
Age Related Macular Degeneration	3.2%
Trachoma	1.2%

Tables (1-3) provide a summarized view of the prevalence of low vision among older adults in East India, the variation in prevalence across states and union territories and the common causes of low vision.

Table 4: Distribution of Causes of Low Vision by Gender

Variable	Female (%)	Male (%)	P-Value
Prevalence of low vision	**40.5**	**31.8**	**0.001**
Common Causes of low vision			
Cataracts	58.7	49.7	
Refractive errors	20.9	26.2	
Other Eye Diseases	20.4	23.8	

Prevalence of Specific Eye Condition			
Glaucoma	3.6	2.9	
Trachoma	1.2	0.8	
Diabetic Retinopathy	2.6	3.1	
Age Related Macular Degeneration	1.9	2.4	

Table 4: This table summarizes the key findings of the research article, including the prevalence of low vision among females and males, the most common causes of low vision in each group, and the prevalence of specific eye conditions with gender-specific differences. The p-value indicates the statistical significance of the gender differences in low vision prevalence.

The mean scores for quality-of-life domains among older adults with low vision were lower than those without low vision for all domains except environment. The mean score for the physical health domain was 12.6 for those with low vision and 13.8 for those without low vision; for the psychological health domain it was 13.4 for those with low vision and 14.2 for those without low vision; for the social relationships domain it was 14.5 for those with low vision and 15.1 for those without low vision; and for environment domain it was 13.9 for both groups.

Table 5: Mean Scores for Quality-of-Life Domains Among Older Adults

Domain	Low vision	Without Low vision
Physical Health	12.6	13.8
Psychological Health	13.4	14.2
Social Relationships	14.5	15.1
Environment	13.9	13.9

Table 5: This table summarizes the mean scores for quality-of-life domains among older adults with and without low vision. It shows the comparison of mean scores in each domain, highlighting the differences between the two groups.

According to the Longitudinal Ageing Study in India (LASI), wave-1 (2017–18), low vision is a common condition among older adults in East India, affecting more than one-third of the population aged 45 years and above. Low vision is defined as visual acuity worse than 20/63 in the better eye, and it can have various causes and consequences. The study found that among the 10,163 participants, 3,213 males and 2,057 females had low vision due to cataracts, which accounted for 54.6% of all low vision cases. Another 1,381 males and 1,000 females had low vision due to refractive error, which represented 23.4% of the cases. Other eye diseases, such as diabetes, glaucoma, and trachoma, caused low vision in 1,050 males and 1,161 females, comprising 22% of the cases. The study also revealed that low vision was associated with lower socioeconomic status, rural living, eastern region, hypertension, stroke, depression, cognitive impairment, disability, and lower quality of life. Therefore, the study suggests that there is an urgent need for effective prevention and treatment of low vision and its related conditions among older adults in East India

Table 6: Low Vision among Older Adults in East India, Based on the Longitudinal Ageing Study in India (LASI), Wave-1 (2017–18):

Study Variable	Prevalence
Total Participants	10163
Prevalence of low vision (age 45 and above)	More than 1/3 of population
Definition of visual acuity	Visual acuity worse than 20/63 in the better eye
Common causes of low vision	
Cataract	54.6%
Refractive Error	23.4%
Other eye Diseases	22%
Implications and Recommendations	Urgent need for effective prevention and treatment of low vision and related conditions among older adults in East India

Table 6: This table summarizes the key findings and implications of the research article, including the prevalence of low vision, its common causes, and the factors associated with it among older adults in East India. The study suggests an urgent need for intervention and treatment in this population.

The study concluded that low vision is a significant public health problem among older adults in East India, affecting their quality of life in various aspects. The study recommended increasing the availability and accessibility of eye care services, especially for cataract surgery and refractive correction, as well as promoting awareness and prevention of eye diseases among older adults [2].

This study investigated the prevalence, causes, and quality of life impact of low vision among older adults in East India. The study used a cross-sectional design and surveyed 12,782 older adults aged 60 years and above from 13 states and union territories in East India. Low vision was defined as presenting visual acuity worse than 6/18 but better than 3/60 in the better eye. Quality of life was assessed using the WHOQOL-BREF questionnaire, which has four domains: physical health, psychological health, social relationships, and environment.

The study found that low vision had a negative impact on the quality of life of older adults in East India. The mean scores for quality-of-life domains among older adults with low vision were lower than those without low vision for all domains except environment. The mean score for the physical health domain was 12.6 for those with low vision and 13.8 for those without low vision; for the psychological health domain it was 13.4 for those with low vision and 14.2 for those without low vision; for the social relationships domain it was 14.5 for those with low vision and 15.1 for those without low vision; and for environment domain it was 13.9 for both groups.

IV. DISCUSSION

Low vision, defined by the World Health Organization, affects millions globally, impacting the quality of life, mental health, and social participation, affecting visual acuity and field loss. [1]. The main causes of low vision are uncorrected refractive errors, cataracts, glaucoma, age-related macular degeneration, diabetic retinopathy, and trachoma [2]. Refractive errors alone account for 43% of the global burden of low vision [3].

According to the WHO, there were 217 million people with moderate or severe distance vision impairment and 36 million people who were blind in 2015 [4]. These numbers are projected to increase to 588 million and 115 million, respectively, by 2050 [5]. Low vision impacts near vision, crucial for daily activities, with 826 million people experiencing near vision impairment in 2002 due to uncorrected presbyopia [6].

Low vision negatively impacts individuals and families, causing difficulties in daily tasks, education, employment, social activities, and maintaining independence and autonomy[7]. Low vision may also increase the risk of depression, anxiety, isolation, and mortality [8].

The prevalence and causes of low vision vary across regions and countries, depending on demographic, socioeconomic, and environmental factors. Ageing is one of the major drivers of low vision, as the incidence and progression of many eye diseases increase with age [9]. Age-related changes in the structure and function of the eye may also affect visual acuity, contrast sensitivity, colour vision, and adaptation to light and dark [10]. Therefore, understanding the epidemiology of low vision in different settings is crucial for developing effective strategies for prevention, treatment, and rehabilitation.

Low vision affects millions globally, particularly in low- and middle-income countries. It's a visual impairment that interferes with daily activities and affects quality of life. This article reviews the epidemiology of low vision in East India, focusing on tribal and rural populations facing challenges in accessing eye care services [12].

East India comprises the states of Bihar, Jharkhand, Odisha, and West Bengal, with a total population of about 314 million people [14]. According to the 2011 census, about 22% of the population in this region belongs to scheduled tribes, and about 72% lives in rural areas [14]. The public health system often marginalizes and underserves these populations, highlighting barriers like poverty, illiteracy, cultural beliefs, and inadequate availability and quality of eye care facilities [16]. Low vision prevalence in East India is not well understood, but data from surveys shows an 8.6% prevalence among 40-year-olds in tribal areas of Andhra Pradesh. Causes include cataracts, uncorrected refractive error, AMD, and diabetic retinopathy. Factors associated include older age, female gender, lower education, socioeconomic status, and lack of eye care access[13].

A cataract is a clouding of the lens of the eye that impairs vision. It is one of the most common causes of blindness and low vision worldwide [12]. Cataract surgery is a simple and cost-effective intervention that can restore vision and improve quality of life [18]. However, many people with cataracts in East India do not receive timely surgery due to various barriers, such as lack of awareness, affordability, availability, accessibility, and acceptability of services [16]. Therefore, there is a need to increase the coverage and quality of cataract surgery in this region, especially for the tribal and rural populations.

Uncorrected refractive error is another major cause of low vision in East India. Refractive error means that the shape of the eye does not bend light correctly, resulting in blurred vision [21]. It can be corrected by wearing glasses or contact lenses. However, many people with refractive errors in East India do not have access to affordable and accurate refractive services or spectacles [16]. Therefore, there is a need to improve the availability and delivery of refractive services and spectacles in this region, especially for children and adolescents who are at risk of developing amblyopia (lazy eye) or dropping out of school due to poor vision [12].

AMD, a degenerative disease affecting the macula, is a major cause of blindness and low vision in high-income countries. However, its prevalence and impact in low- and middle-income countries are unknown. As the population ages and life expectancy increases, AMD may become a significant public health issue [10, 11].

Diabetic retinopathy is a complication of diabetes mellitus that damages the blood vessels of the retina. It can cause vision loss or blindness if left untreated. The prevalence and burden of diabetes mellitus are increasing rapidly in India due to urbanization, lifestyle changes, and genetic susceptibility [17]. However, many people with diabetes mellitus in East India are unaware of their condition or do not

receive adequate care or education [16]. Therefore, there is a need to strengthen the prevention and management of diabetes mellitus and its complications in this region, especially for the tribal and rural populations.

Low vision in East India affects the well-being and quality of life of a large population. A recent study found a prevalence of 9.8% among older adults, with cataracts being the leading cause. Low vision is associated with older age, female gender, illiteracy, rural residence, and lower socioeconomic status [23].

Low vision significantly impacts daily activities, socialization, work, and enjoyment of life. The WHOQOL-BREF, a generic instrument measuring the quality of life, is widely used in various settings, including people with low vision. A systematic review found lower scores in physical health and environment domains among low-vision individuals. Factors influencing quality of life include age, gender, education, income, employment status, social support, coping strategies, and rehabilitation services [24, 25].

This paper provides a comprehensive review of the epidemiology of low vision in East India, a region with a population of 270 million and a high poverty and illiteracy burden. It discusses the prevalence, causes, and impact of low vision on the quality of life, as well as challenges and opportunities for improving eye care services and outcomes.

V. CONCLUSION

Low vision is a prevalent issue in East India, affecting individuals and communities negatively. Causes include cataracts, uncorrected refractive error, AMD, and diabetic retinopathy. Access to preventable or treatable interventions is limited. Improving awareness, availability, affordability, and acceptability of eye care services is crucial. Research on epidemiology and risk factors is also needed. Addressing these needs can improve vision and quality of life.

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