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Prevalence and Causes of Visual Impairment and Blindness Among Students of Blind Schools of Bihar, India

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Abstract:

Aim: Visual impairment and blindness are serious public health issues, especially in developing countories, like India. Data on causes of childhood visual impairment and blindness in Bihar are limited. The aim of this study was to determine the leading causes of visual impairment and blindness in blind schools of Bihar

Study design: A cross sectional study was done in seven blind schools of Bihar

Methods: Seven blind schools were visited after taking permission from principal. Written informed consent from parents was taken. Detailed ocular and systemic examination was done for all 218 students. Comprehensive eye examinations were performed, including distance visual acuity, anterior and posterior segment examinations, refraction, color vision, and visual field testing. Anatomical and etiological categorization of causes of visual impairment/Blindness was done.

Results: A total 218 students were examined. 90.82% of students were blind and 9.17% severely visually impaired. Major anatomical causes of visual impairment and blindness were Microphthalmos (24.31%), Anophthalmos (23.39%), Optic Atrophy (9.63%) and Corneal Scar (7.80%). Etiologically the most common cause was of unknown etiology followed by postnatal factors. Preventable or treatable causes, such as glaucoma, cataract, and refractive errors, represented 22.48% of the cases

Conclusion: Blindness and Low vision due to congenital ocular conditions affecting whole globe was the most common cause, further population based studies are needed to know the exact magnitude of problem and to make strategies to decrease the incidence. There is a need to strengthen current primary preventions strategies while tertiary referral centers, Low Vision setups, awareness program regarding Low Vision, special education, rehabilitation, ocular disability benefits and many more things need to be set up in the different health zones of the state to manage childhood preventable and avoidable blindness.

Introduction:

Visual impairment and blindness are major public health problems in developing countries. According to WHO approximately 285 million visually impaired live worldwide, of them 39 million are blind and 246 million have low vision[1]. Majority (about 90%) of visually impaired live in developing countries.

Prevalence of childhood blindness ranges from 0.3/1000 in high income countries to 1.5/1000 in low income countries[2]. Up to 75% of childhood blindness in developing countries are either avoidable, preventable or treatable which makes it a high priority area for public health intervention[3].Visual impairment and blindness in children though represent only a small fraction of total blindness, it become high priority due to number of years lost to blindness. Number of "blind person years" due to childhood blindness is 2nd only to cataract, the most common cause of blindness in terms of lifetime burden it imposes[4]. Additionally blindness in childhood has significant impact on their development, education and career opportunities.

Over 9 million visually impaired live in India of which an estimated 320,000 are blind children, more than any other country in the world[5], [6], [7]. In low income state like Bihar, which is located in eastern part of India, low vision and blindness remains a major health and social issue.

Bihar is among one of the poorest states of India, having significant proportion of it's population living below poverty line. Literacy rate in Bihar is poor and lies below national average. Poor literacy rate combined with high poverty in Bihar makes scenario worse, particularly for children with disabilities. Access to healthcare is limited in Bihar, with scarcity Hospitals and eye clinics that provide low vision services and are mostly located in urban areas leaving most of visually impaired people from rural areas unserved.

Education for visually impaired children in Bihar faces numerous problems due sparsity and uneven distribution of blind schools and rehabilitation centres, which are mostly located in urban areas. This uneven distribution leads to lack of access to specialized education and support services to visually impaired children from rural areas.

In developing countries, population based studies to determine the causes of visual impairment and blindness are difficult to do due to need of very large sample size and lack of registers of the blind. Examination of children from blind schools and rehabilitation centres can be an alternative way and becomes a practical approach to determine the causes of visual impairment and blindness. But possible source of bias of such studies should always be kept in mind.

To best of our knowledge there is very limited work done on causes of visual impairment and blindness in Bihar. Aim of our study is to determine the leading causes of visual impairment and blindness in Bihar, which will help to guide further work and planning for prevention and treatment of blindness

Methods:

This school based cross sectional study was conducted from 2021 to 2022. A total 7 school in rural and urban areas of Bihar were visited and 218 children were screened. Schools were contacted after taking list from Government site. Permission for school visit was taken from individual school principal. Written informed consent was taken from the parents. Ethical clearance was taken from institutional ethics committee of Akhand Jyoti Eye Hospital and adhered to the declaration of Helsinki.

Inclusion criteria: All the children who are visually impaired & blind irrespective of gender were included in study.

Exclusion criteria: Children with visual acuity >6/18, or those who were not willing to participate in the study was excluded from the study.

Demographic information, including age, gender and place of residence(urban or rural) was collected from the students. If student was not able to provide complete information then additional details were collected from the teachers or parents. Detailed History- including -Ocular history, Systemic history and medical history was taken.

A detailed history was taken including ocular, systemic and medical history. Family history including consanguinity of the parents were recorded.

A detailed eye examination was performed by a team of optometrists and low vision specialist.

1. Distance visual acuity: Measured using a log MAR -chart.
2. Anterior segment examination: Conducted using a handheld slit lamp.
3. Posterior segment examination: Performed using an indirect Ophthalmoscope.
4. Refraction: Objective Refraction with Retinoscopy [undialated] and Subjective Refraction with trail frame, trail lens was done.
5. Colour vision: Recorded by using Ishihara Chart.
6. Visual field testing: Arc perimeter and Confrontation method was used to record visual field.

After examination children with low vision and blindness due to treatable cause were advised and referred to tertiary center for further treatment.

The WHO definitions were used to categories the causes of severe vision loss, low vision and blindness. The WHO defines severe vision loss as best corrected visual acuity(BCVA) 3/60 and visual field less than 10 degree, in the better eye with the best possible correction. “LOW VISION “is defined as visual acuity less than 6/18 or equal to Perception of light positive and visual field less than 20 degrees in the best eye with best possible correction.

All collected data were entered into Microsoft Excel and analyzed to determine the prevalence and causes of blindness and low vision among the study population. Descriptive study was used to summarize the data.

Results:

A total of 218 students were examined from 7 blind schools located in different districts of Bihar. Of these 7 blind schools, 3 schools were in Patna, 3 in Chhapra and 1 in Muzaffarpur.

Among 218 students, there was almost equal distribution of males(48.62%) and females(51.38%). 59(22.06%) were from rural blind School and 159(72.93%) were from urban blind School. Mean age of the students were 14.66 with range of 5 to 28 years.

The demographic characteristic of the participants, including, age, gender, rural/urban distribution are summarized in Table 1.

Table 1: Demographic Characteristics of Participants

Characteristic	Frequency	Percentage
Gender		
Male	106	48.62%
Female	112	51.38%
Residence		
Urban	159	72.94%

Characteristic	Frequency	Percentage
Rural	59	27.06%
Age Group		
5-10 years	45	20.64%
11-15 years	85	38.99%
16-20 years	58	26.61%
21-28 years	30	13.76%

Of 218 students examined, 198(90.82%) students were blind and 20 (9.17%) were diagnosed with low vision.

Causes of low vision:

Causes of vision loss according to anatomical site of lesion is listed in table 2. Most common site of lesion was whole globe 118(%) followed by Retina 26(%), Cornea 23(%) and Optic nerve 21(%). Most common individual cause of vision loss was microphthalmos 53(24.31%) followed by Anophthalmos 51(23.39%), Optic atrophy 21(9.63%) and Corneal scar 17(7.8%).

Etiological causes of vision loss according to WHO/PBL classification system is shown in table 3. The most common cause of vision loss was unknown causes 138(63.30%) followed by Post natal 55(25.23%).

Table 2: Causes of Vision Loss According to Anatomical Site of Lesion

Disease	Frequency	Percentage
Whole Globe		
Phthisis bulbi	4	1.83%
Anophthalmos	51	23.39%
Microphthalmos	53	24.31%
Buphthalmos	2	0.92%
Glaucoma	8	3.67%
Cornea		
Staphyloma	6	2.75%
Scar	17	7.80%
Lens		
Cataract	7	3.21%
Pseudophakia	3	1.38%
Uvea		
Coloboma	4	1.83%
Retina		
Dystrophy	11	5.05%

Disease	Frequency	Percentage
Albinism	1	0.46%
ROP	2	0.92%
Retinal detachment	1	0.46%
Chorioretinal atrophy	2	0.92%
HMD	1	0.46%
Retinitis pigmentosa	8	3.67%
Optic Nerve		
Atrophy	21	9.63%
Globe Appears Normal		
Refractive error	3	1.38%
Amblyopia	9	4.13%
Cortical Blindness	1	0.46%
Prosthetic	3	1.38%
Total	218	100.00%

Table 3: Etiological Causes of Vision Loss According to WHO/PBL Classification System

Etiology Classification	Frequency	Percentage
Hereditary disease	21	9.63%
Intrauterine	2	0.92%
Perinatal	2	0.92%
Postnatal	55	25.23%
Unknown	138	63.30%
Total	218	100.00%

The distribution of low vision and blindness between urban and rural areas are summarized in table 4.

Table 4: Rural vs Urban Distribution of Blindness and Low Vision

Vision Status	Urban Frequency	Urban Percentage	Rural Frequency	Rural Percentage
Blindness	142	89.30%	56	94.00%
Low Vision	17	10.69%	3	5.00%

Potentially preventable or treatable causes of blindness or vision loss are summarized in table 5.

Table 5: Potentially Preventable or Treatable Causes of Vision Loss

Potentially Preventable or Treatable Cause	Frequency	Percentage
Buphthalmos	2	0.92%
Glaucoma	8	3.67%
Corneal Scar	17	7.80%
Cataract	7	3.21%
Retinal Detachment	1	0.46%
Refractive Error	3	1.38%
Amblyopia	9	4.13%
Retinopathy of Prematurity (ROP)	2	0.92%
Total	49	22.48%

Discussion:

Blind school based studies though has many advantages such as ease of study, relatively less expensive and large number of students with visual impairment can be examined in short period of time, but findings may not reflect true picture of the population. Enrolment in blind schools in developing countries are poor and these schools usually do not take admission of students with additional disability[8]. Poor enrolment in blind schools are mainly due to lack of awareness and unavailability of blind schools to accessible locations.

In our study representation of male and female students were almost equal (male 48.62%, female 51.38%). This was because out of 7 blind schools in the study, two schools were for girls students only. Students from rural areas (22.06%) were under represented in blind schools and that can be explained by lack of awareness and inaccessibility to blind schools to rural population.

Majority(90.82%) of the students in our study were blind that is consistent with study done in Andhra Pradesh India, in which 91.7% students were of severe visual impairment or blind[9]. Internationally, studies in Ethiopia also had similar result with 94% students under study were blind[10].

In our study congenital ocular conditions affecting whole globe (Microphthalmos, and Anophthalmos) were most common cause with a total of 47.70%. Other studies done in Allahabad (52.2%) and Maharashtra (46.3%) also had similar results[11], [12]. Other school based and population based studies in India also had similar results[9], [13], [14], [15]. Consistency of these findings across different regions suggest the universal challenges in addressing childhood blindness and emphasize the need of targeted interventions. Reason for high prevalence of congenital ocular anomalies are unknown and need further research to know the causes of these anomalies. Retinal causes is the second most common cause of blindness in our study and affecting 11% students, while study in blind schools of Andhra Pradesh, India has found Retinal causes as the most common cause of blindness[9]. Optic atrophy is the cause for blindness in 10%, similar result was found in study done in Northeast India[16].

Corneal causes (Scar and Staphyloma) 10% in our studies are significantly less than other studies[11], [16]. It is difficult to determine exact condition/disease causing corneal scar and staphyloma after many years of the disease and without a reliable history. Vitamin A deficiency and trauma likely to be the

initiating incident leading to scar and staphyloma. Children with Vitamin A deficiency has high under 5 mortality rate, that also explains the less number of students with corneal causes of blindness[17].

In our study the most common etiological cause of blindness was unknown (63.30%) followed by postnatal factors (25.23%). These findings are consistent with study done in northeast India[16]. This high percentage of unknown causes indicates substantial gap in diagnostic capabilities. Potential reason for this may include lack of advance diagnostic tools, insufficient medical histories and lack of genetic testing facilities.

Potentially treatable causes for blindness in our study included glaucoma 8(3.67%) cataract 7(3.21%), refractive error 3(1.38%) and retinopathy of prematurity 2(0.92%). This reflect the need of more pediatric ophthalmic services in Bihar. It has been recommended that one well equipped child eye care center should be there for every 10 million population[18].

This study has some potential limitations. First, students recall about the age of onset, cause and progression of blindness are unreliable. Second limitation is underrepresentation of pre-school children and children with multiple disability in blind schools.

Conclusion:

This study highlights the huge burden of congenital ocular conditions and unknown causes of blindness among students in blind schools of Bihar, indicating the need for improved diagnostic facilities.

Majority of the blind and visually impaired students were from urban areas. This disparity indicates limited access to specialized health care services to rural populations and necessitates a more focused approach to improve health care access in rural areas.

High proportion of potentially preventable or treatable causes emphasizes the importance of regular screening and timely medical/surgical intervention. Regular screening of children in schools could also identify children who might benefit from early intervention and low vision devices(LVD).

More than half of the students in this study were older than 10 years. That is showing lack of awareness regarding special education. Increasing awareness by conducting educational campaigns about visual impairments, importance of early diagnosis and available treatment can significantly improve health seeking behavior among parents and communities.

There is a need to strengthen current primary preventions strategies while tertiary referral centers, pediatric ophthalmic centres, Low Vision clinics, special education and rehabilitation centres, need to be set up in the different health zones of the state to manage childhood preventable and avoidable blindness.

Formulating health care policies that prioritize eye care and allocate resources for pediatric ophthalmology can enhance service delivery and access.

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