

Pattern Of Childhood Severe Vision Impairment And Blindness In Blind Schools Of Hilly State Of Himachal Pradesh

Vinay Gupta, *Kalpana Sharma, Ram L Sharma

Department of Ophthalmology, Indira Gandhi Medical College (IGMC),
Shimla, Himachal Pradesh, India.

*Correspondence: doctorkalpana.84@gmail.com

Received: Apr 19, 2022; Revised: May 12, 2022; Accepted: May 18, 2022; Published: May 31, 2022

COPYRIGHT: Gupta *et al.* This is an open-access article published under the Creative Commons Attribution License (CC BY) terms. This permits anyone to copy, distribute, transmit, and adapt the work, provided the original work and source are appropriately cited.

CITATION: Gupta V, Sharma K, Sharma RL. Pattern Of Childhood Severe Vision Impairment And Blindness In Blind Schools Of Hilly State Of Himachal Pradesh. *Recent Adv Biol Med.* 2022; 8(2): 1709780. DOI: 10.18639/RABM.2022.1709780

ABSTRACT

The aim of this study was to determine the pattern of severe childhood vision impairment (SVI) and blindness in blind schools in Himachal Pradesh. This study was carried out in 3 blind schools for children (<16 years). The vision was categorized, and the cause of vision loss was determined. A total of 96 children were examined. The main cause of SVI and blindness was congenital ocular defects (microphthalmos, anophthalmos, and coloboma in 33.33% of children). The second major cause was retinal dystrophies (20.83%), followed by optic atrophy (11.45%). The preventable and treatable causes in 15.63% of children attributed to vitamin A deficiency, trauma, retinopathy of prematurity, and cataract. Congenital ocular defects constituted a major cause of SVI and blindness, followed by retinal dystrophies and optic atrophy. The avoidable and preventable causes of SVI and blindness were present in 1/6th of children entailing the strengthening of comprehensive eye care services, blindness preventable, and rehabilitation programs.

KEYWORDS: Childhood Severe Vision Impairment, Blindness.

1. INTRODUCTION

Blindness is defined as visual acuity <3/60, according to WHO ICD-11 (<https://icd.who.int/en>). Globally, at least 2.2 billion people have a vision impairment or blindness, of whom at least 1 billion have a vision impairment that could have been prevented [1]. Childhood blindness constitutes a priority group due to the number of blind years having implications on quality of life, family, and society. It is estimated that there are approximately 1.42 million blind children, with about 3/4th of these belonging to developing nations [2]. The prevalence of blindness in children ranges from 0.3/1000 to 1.5/1000 children [3]. In India, there are approximately 320,000 blind children [4]. The present study aims to study the pattern and causes of childhood blindness in the blind schools of hilly and sub-Himalayan areas of Himachal Pradesh, which would help to ascertain the preventable and avoidable causes of childhood blindness and assist in policy making of preventable blindness and rehabilitation programs.

2. METHOD(S)

This cross-sectional study was carried out in 3 schools for children with disability in Himachal Pradesh. The two schools out of three, one located at Dhalli in Shimla district and the other at Sundernagar in Mandi district, are run by Social Justice and Empowerment, Govt. of Himachal Pradesh. The third school for blinds is managed by a non-Government organization, National Association for the Blinds, HP State Branch.

The study included all the blind and visually impaired children of 3 schools irrespective of age. After seeking due permission from the principal of the schools and their parents, an ophthalmologist and an ophthalmic officer examined the children of the schools mentioned above. The brief demographic profile, ophthalmic history in terms of age of onset, medical and systemic history along with other disabilities (physical handicap, epilepsy, hearing loss, mental retardation), family history including consanguinity, history of similar illness in other family members, pregnancy and birth history were obtained from child's parents, school and medical records.

The visual acuity was evaluated using Snellen tumbling 'E' chart for distant and near-vision was assessed using figures equivalent to N18. A well-trained ophthalmic officer did refraction and low vision assessment. The visual field was assessed using the confrontation method. Anterior segment examination was done using a torch, loupe magnifier, or handheld slit lamp. Posterior segment evaluation was done using a direct or indirect ophthalmoscope after pupillary dilatation.

The vision status was categorized according to WHO categories of visual impairment. The causes of vision loss were recorded according to the anatomical site involvement. The patients requiring further management in terms of investigations and treatment were referred to IGMC, Shimla.

3. RESULTS

A total of 96 children aged less than equal to 16 years in three blind schools in Himachal Pradesh were examined. The list of the schools is:

1. NAB School of Blinds at Kullu.
2. Deaf and Blind School, Dhalli Secondary School at Dhalli Mashobra, Shimla.
3. Institute for Children with Special Abilities, Sundernagar.

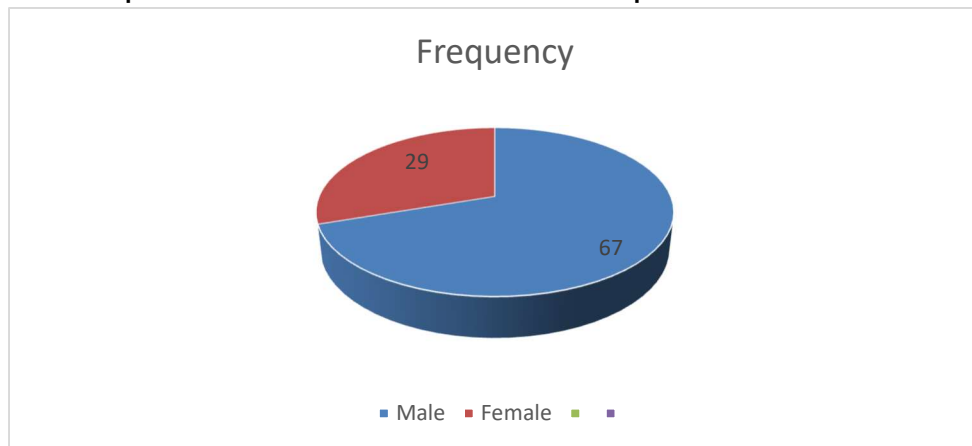
Out of 96 children, 29 (30.30%) were female, and 67 (69.79%) were males (Graph 1). After the vision and refraction assessment, it was found that 23 children (23.96%) were severely visually impaired, and 73 (76.04%) children were blind (Table 1).

On the basis of the involvement of anatomical sites, the present study revealed that the whole globe was involved in 26 (27.08%), the cornea in 11 (11.45%), uvea in 11 (11.45%), the lens in 7 (7.29%), retina 28 (29.17%), optic nerve 11 (11.45%), and cortical blindness in 2 (2.08%) children (Graph 2).

The major causes of severe vision impairment and blindness in these children were Retinal Dystrophy 20 (20.83%), microphthalmos, coloboma, and optic atrophy in 11 (11.45%) children each, anophthalmos 10 (10.42%), micro-cornea in 6 (6.25%), corneal scar/degeneration, phthisis bulbi and albinoid fundus in 5 (5.21%) each. Cataract, aphakia, or pseudophakia led to blindness and severe vision impairment in 7 (7.29%) children (Table 2).

The preventable cause of blindness due to corneal scar, which is attributed to nutritional deficiency of Vitamin A or trauma, was found in 5 (5.21%), and avoidable cause of blindness due to cataract or operated cataract with or without intraocular lens contributed to 7.29% of the cases.

Graph 1: Gender distribution of severe visual impairment and blindness.



Graph 2: Anatomical classification of causes of vision impairment in blind school children.

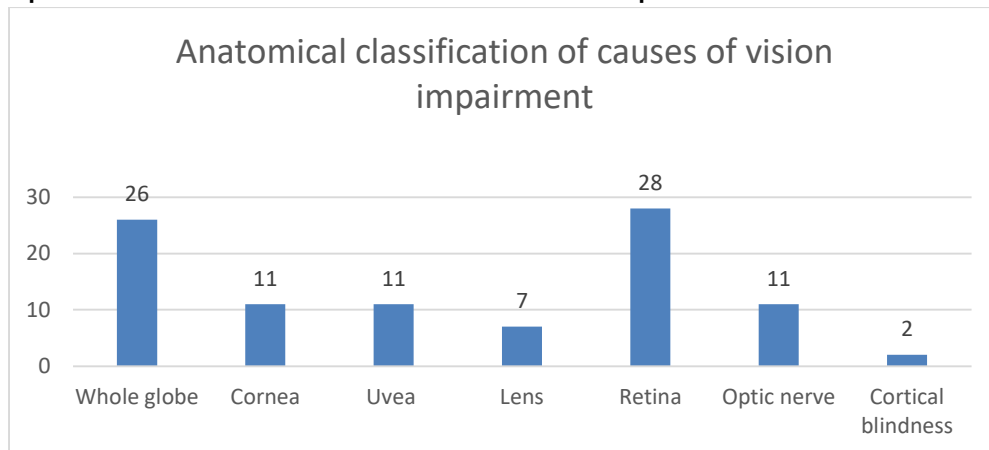


Table 1: Visual acuity distribution in blind school children.

WHO category of Vision impairment	Visual acuity	Number of children	Frequency
Moderate	6/18-6/60	0	-
Severe	6/60-3/60	23	23.96
Blindness	<3/60	73	76.04

Table 2: Causes of childhood blindness.

Anatomical site	Cause	Number	Percentage
Globe	Microphthalmos	11	11.45
	Anophthalmos	10	10.42
	Phthisis bulbi	5	5.21
Cornea	Corneal Scar	5	5.21
	Microcornea	6	6.25
Lens	Cataract	4	4.17
	Aphakia/pseudophakia	3	3.13
Uvea	Coloboma	11	11.45
Retina	Retinal dystrophy	20	20.83
	Albinism	5	5.21
	Retinopathy of prematurity	2	2.08
	Others(rubella retinopathy)	1	1.04
Optic Nerve	Optic Atrophy	11	11.45
Visual Cortex	Cortical blindness	2	2.08

4. DISCUSSION

The prevalence of childhood blindness is 0.3 per 1000 children in high-income countries and 1.5 per 1000 children in low to middle-income countries [4]. It is estimated that there are 1.4 million blind children worldwide, of which 1 million live in Asia and 3 lakhs in Africa. There are 5 lakh children going blind each year (one per minute) [5,6]. In the present study, out of 96 children, 29 (30.30%) were females, and 67 (69.79%) were males (Graph 1). A similar male preponderance was found in a study done by Gogate *et al.* [7], which is explained by gender inequality, cultural preferences, and economic restraints in developing countries [7].

The congenital ocular defects such as microphthalmos, anophthalmos, and coloboma (n=32; 33.33%; Table 2, Graph 2) constituted the major cause of vision loss, which corroborated with previous studies done by Gogate *et al.* [7] and Bhalerao *et al.* [8]. Various chromosomal, genetic, and environmental factors have been implicated in their development. The mutation in genes PAX6 and SOX2 results in lens induction failure, whereas genes OTX2, CHX10, and RAX mutations may lead to failure of retinal differentiation. Environmental factors such as intra-uterine acquired infections, maternal vitamin A deficiency, exposure to X-rays, and drugs such as thalidomide can result in these anomalies. It has also been hypothesized that genes responsible for retinoic acid signaling affect Indian children, as vitamin A deficiency is more common in Indian mothers [8,9].

Retinal dystrophies, the second major cause, led to severe visual impairment and blindness in 20 (20.83%, Table 2, Graph 2) children. It constituted the major cause of blindness in a study by Akinsola *et al.* [11]. Although the cases were sporadic in the present study, autosomal recessive, autosomal dominant, or X-linked modes of inheritance have also been observed in other studies. Approximately more than 200 genes have been responsible for various phenotypes of retinal dystrophy [10,11]. Genomic analysis in diagnosing these retinal dystrophies remains a challenge. Unfortunately, despite various advancements in genetic engineering, there still exists no cure or treatment for retinal dystrophy. Therefore, the role of ophthalmologists in providing low vision aids and adequate genetic counseling is indispensable in these dystrophies.

Optic nerve atrophy was the third major cause of children with severe visual impairment and blindness in 11 (Table 2, Graph 2). In a study by Rahi *et al.*, optic nerve disorders were among the most common causes of childhood blindness in developed countries [5]. Various etiologies have been associated with optic atrophy; however, only 2 out of 11 children had an infective cause of tubercular meningitis preceding optic atrophy. In a study by Olowoyeye *et al.* [12], the etiology of optic atrophy was unknown in 50% of cases, and infective causes include cerebral malaria and measles encephalitis. In a study by Wallang *et al.* [13], hypoxic-ischemic encephalopathy was the most frequent cause of childhood optic atrophy seen in 41%, followed by idiopathic in 30%, hydrocephalus in 7%, and infective in 6% of children.

The preventable causes of severe visual impairment and blindness included corneal blindness in 5 (5.21%) children attributed to vitamin A deficiency and trauma, other preventable causes being retinopathy of prematurity in 2 (2.08%) children

and rubella retinopathy in 1 (1.04%) child. These can be prevented through various strategies like strengthening primary eye care programs, establishing optical and low vision services, and activities like measles immunization, vitamin A supplementation, TORCH screening, and monitoring the use of oxygen in premature newborns. The treatable cause of severe visual impairment and blindness operated or un-operated cataracts were found in 7 (7.29%) children. Pediatricians, health care workers, and school teachers need to be trained to screen children with congenital or developmental cataracts.

5. CONCLUSION

Any public eye health care program must prioritize childhood blindness due to the number of disability years. In the present study, the avoidable and preventable causes of severe visual impairment and blindness were present in one-sixth of children. There should be a strengthening of primary eye care programs and the promotion of eye health education in schools. Primary health care workers and school teachers need to be trained to screen children with common congenital or developmental ocular diseases. There should be the establishment of optical and low vision services and therapeutic and surgical support services to manage avoidable causes of childhood blindness, such as cataracts and retinopathy of prematurity.

AUTHOR CONTRIBUTIONS

All others contributed equally to this study.

CONFLICT OF INTEREST

None.

REFERENCES

1. Vision Loss Expert Group of the Global Burden of Disease Study. Causes of blindness and vision impairment in 2020 and trends over 30 years: evaluating the prevalence of avoidable blindness in relation to "VISION 2020: the Right to Sight". *Lancet Global Health* 2020.
2. Dandona R, Dandona L, Srinivas M, Sahare P. Refractive error in children in a rural population in India. *Invest Ophthalmol Vis Sci*. 2002;43:615-22.
3. World Health Organization. Preventing blindness in children. Report of a WHO/IAPB scientific meeting. WHO/PBL/00.71. Geneva: WHO, 2000.
4. Wadhvani M, Vashist P, Singh SS, Gupta V, Gupta N, Saxena R. Prevalence and causes of childhood blindness in India: A systematic review. *Indian J Ophthalmol*. 2020;68(2):311-315.
5. Rahi JS, Cable N. British Childhood Visual Impairment Study Group. Severe visual impairment and blindness in children in the UK. *Lancet*. 2003;362(9393):1359-1365.
6. Johnson G, Minassian D, Weale W, West S. *Epidemiology of Eye Disease*. 2nd ed., UK: Arnold Publishers; 2003.
7. Gogate P, Deshpande M, Sudrik S, Taras S, Kishore H, Gilbert C. Changing pattern of childhood blindness in Maharashtra, India. *Br J Ophthalmol*. 2007;91(1):8-12.
8. Bhalerao SA, Tandon M, Singh S, Dwivedi S, Kumar S, Rana J. Visual impairment and blindness among the students of blind schools in Allahabad and its vicinity: A causal assessment. *Indian J Ophthalmol*. 2015;63:254-258.
9. Verma AS, Fitzpatrick DR. Anophthalmia and microphthalmia. *Orphanet J Rare Dis*. 2007;2:47.
10. Nash BM, Wright DC, Grigg JR, Bennetts B, Jamieson RV. Retinal dystrophies, genomic applications in diagnosis and prospects for therapy. *Transl Pediatr*. 2015;4(2):139-163.
11. Akinsola FB, Ajaiyeoba AI. Causes of low vision and blindness in children in a blind school in Lagos, Nigeria. *West Afr J Med*. 2002;21:63-5.
12. Olowoyeye AO, Musa KO, Aribaba OT, Onakoya AO, Akinsola FB. Pattern of childhood visual impairment and blindness among students in schools for the visually impaired in Lagos State: An update. *Niger Postgrad Med J*. 2018;25:105-11.
13. Wallang BS, Sachdeva V, Gupta A, Patil-Chhablani P, Kekunnaya R. Etiology and clinical profile of childhood optic nerve atrophy at a tertiary eye care center in South India. *Indian J Ophthalmol*. 2014;62(10):1003-1007.