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Research Article

Avoidable blindness and its correction in schools for the blind in Gujarat, India

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ABSTRACT

Background: The primary objectives of our study were to determine the causes of blindness in blind school students, to ascertain the need for spectacles and magnifiers as low vision devices (LVD) in these children with useful residual vision and to determine the acceptance of magnifiers in different ocular pathologies
Methods: The various causes of blindness were analysed in 179 blind female students in terms of the anatomical disorder present, the age of the child at the time of presentation with the visual disorder and the visual outcome observed after prescription of spectacles, magnifiers and non-optical devices.
Results: Microphthalmos (44%), corneal scars (13.4%), anophthalmos (11.7%), optic atrophy (10.6%) and retinal dystrophies (10.1%) accounted for the major causes of blindness. 63.1% of blind children had an undetermined age of onset of visual impairment. Majority of the cases with anophthalmos, retinitis pigmentosa, corneal degeneration, microphthalmos, buphthalmos, staphylomas and retinal dystrophies benefitted with the use of non-optical devices. 60% of the aphakic and pseudophakic eyes were prescribed magnifiers.
Conclusions: Spectacles and low vision devices do have a promising role in the visual rehabilitation of the 'incurably blind children'.

Keywords: Childhood blindness, Severely visually impaired, Magnifiers, Low vision devices, Non-optical devices

INTRODUCTION

A global initiative for the elimination of avoidable blindness under the title "VISION 2020: The Right to Sight" was launched in 1999 by the World Health Organization with an objective of reducing the prevalence of blindness worldwide by bringing together the resources needed to do so.[1] To be effective, this global initiative will have to be translated into practical action at the community level in each developing country through development of appropriate national plans to eliminate avoidable blindness.

Severe visual loss in children can affect their development, mobility, education and employment opportunities. In terms of the blind person years, they form the maximum burden of blindness on the community, next only to cataract, the commonest cause of avoidable blindness.[2,3] The prevalence of blindness in children ranges from approximately 0.3/1000 children in affluent regions to 1.5/1000 in the poorest communities. Globally, it is estimated that there are 1.4 million blind children, almost three-quarters of them living in developing countries.[2,3]

A significant proportion of children in blind schools receive formal education using Braille. There is an increasing awareness to provide print education to these blind children. Low-vision rehabilitation consists of providing the patient with devices and training to

improve the quality of life.[4] Blind school studies in various countries using the standard WHO proforma have found many causes of childhood blindness. The standard reporting form for recording the causes of visual loss in children, developed by the International Centre for Eye Health, London for the WHO prevention of blindness program has been used in various states of India.

This study was undertaken to determine the various causes of blindness in the children studying in the blind schools and find out the acceptance of spectacles, magnifiers and non-optical devices in different ocular pathologies.

METHODS

179 female children studying in three blind schools, all less than sixteen years of age were studied from January 2011 to December 2011. The records of medical history, family history and ophthalmologic evaluation were reviewed. Various causes of low vision and blindness were analysed according to the WHO Prevention of Blindness Programs (WHO/PBL) eye examination record for children with blindness and low vision.[5] Visual acuity was measured using the Cardiff cards for those aged 0-2 years, naming pictures or matching tests were used those aged 2-4 years and Snellens chart for children aged more than 4 years. A complete ocular examination including slit-lamp, fundoscopy, retinoscopy and tonometry was done. After establishing the diagnosis, medical treatment (glasses, LVD in form of magnifiers and non-optical devices) were given and surgical treatment was advised in appropriate cases.

The various causes of blindness were classified according to the anatomical site involved and the age of onset of the condition. The need of optical, medical or surgical interventions was recorded for every student and the visual recovery was assessed. The data were entered into a database and analyzed using SPSS for Windows.

RESULTS

3 out of 179 (1.6%) students had undergone cataract surgery, 1 (0.5%) had undergone glaucoma surgery, penetrating keratoplasties had been done in 5 (2.8%) children and tarsorrhaphy was done in 1 patient of Crouzen Syndrome. Family history of retinitis pigmentosa, anophthalmos, uveal coloboma was found to be positive in 20 out of 179 (11.2%) cases. Additional disability (deafness: 6 cases, mental retardation: 10 cases, polydactaly: 3 cases) was found in 19 (10.6%) children.

The whole globe (42.4%), cornea (24%), retina (11.7%), optic nerve (10.6%), uvea (3.9%) and lens (7.2%), were found to be the most frequently affected sites of abnormality (Table 1).

The etiological classification was based on the time of onset of the insult leading to visual loss (Table 2).

Table 1: Classification based on anatomical disorder of children with severe visual impairment and blindness.

Categories	No.	%	Causes	No.	%
Whole globe	76	42.4	Buphthalmos	8	4.4
			Microphthalmos	44	24.6
			Anophthalmos	21	11.7
			Others	3	1.7
Cornea	43	24	Staphyloma	13	7.3
			Scar	24	13.4
			Keratoconus	6	3.4
Lens	13	7.3	Cataract	3	1.7
			Aphakia	6	3.4
			Pseudophakia	4	2.2
Uvea	7	3.9	Coloboma	4	2.2
			Aniridia	2	1.1
			Uveitis	1	0.6
Retina	21	11.7	Dystrophy	18	10.1
			ROP	3	1.6
Optic nerve	19	10.6	Optic atrophy	19	10.6
Total	179	100		179	100

Table 2: Classification based on aetiology of the vision loss in children with blindness.

Category	No.	%	Causes	No.	%
Hereditary	18	10.1	Autosomal recessive Buphthalmos Retinitis pigmentosa Uveal coloboma	8 1 4 3	4.5
			Autosomal dominant Retinitis pigmentosa Aniridia	8 7 1	4.5
			Others	2	1.1
Intrauterine	0	0	None	0	0
Perinatal	3	1.7	Retinopathy of prematurity	3	1.7
Childhood (1-15 years)	45	25.1	Vitamin A deficiency	40	22.3
			Measles	2	1.1
			Trauma	3	1.7
Undetermined	113	63.1	Cataract	1	0.6
			Glaucoma	8	4.5
			Abnormality since birth	65	36.3
			Others	39	21.7
Total	179	100		179	100

Hereditary factors were identified in 18 (10.1%) cases, in which there was a positive family history of another similarly affected individual with proven genetic/chromosomal disorders. Amongst the postnatal

causes responsible for visual loss in 45 (25.1%) children, vitamin A deficiency and measles were the commonest causes.

In 113 (63.1%) children the underlying cause remained undetermined; amongst them the abnormality had been present since birth in 65 (36.3%) children, and cataract and congenital glaucoma were responsible for blindness in 1 (0.6%) and 8 (4.5%) children, respectively.

After refraction, 6 children (10%) had an improvement in visual acuity in the better eye with spectacles and were prescribed the same (Table 3).

Table 3: Major causes of visual impairment in children prescribed spectacles or magnifiers.

Anatomical diagnosis	Total number of children with anatomical diagnosis	Number of children prescribed spectacles (N)	Percentage of children prescribed spectacles (%)	Number of children prescribed magnifiers (N)	Percentage of children prescribed magnifiers (%)	Number of children prescribed non-optical devices (N)	Percentage of children prescribed non-optical devices (%)
Anophthalmos	24	0	0	0	0	22	91.6%
Retinitis pigmentosa	18	1	5.5%	4	22.2%	9	50%
K' degeneration (K'conus, K'globus, K'scarring)	30	2	6.8%	14	46.6%	14	46.6%
Microphthalmos	44	0	0	6	13.6%	23	52.2%
Buphthalmos	8	0	0	0	0	3	37.5%
Aphakia / pseudophakia	10	3	30%	6	60%	1	10%
Staphyloma	13	0	0	0	0	4	30.7%
Other retinal diseases (optic atrophy, ROP, rod-cone dystrophy, salt and pepper retino, retinal scar	19	0	0	3	15.7%	12	63.1%

None of the children examined, were using a LVD at the time of examination. Of the 58 (32%) children with low vision but having useful residual vision, 6 were able to read N-10 unaided or with distance spectacles and were not assessed for magnifiers. Thirty three (27%) children improved to N-10 with spectacle magnifiers and were prescribed magnifiers.

Out of 166 children with no useful residual vision, 88 (53%) children were prescribed non-optical devices which included letter writing guide, bold felt tip pens, sighted guide, talking books, talking scales, talking calculators and Braille. 39 children were not given any devices considering their age and mental status.

DISCUSSION

The redefinition of low vision has resulted in studies showing that more people with severe and profound low vision, can be rehabilitated with appropriate intervention. Low vision patients can improve their residual vision and possibly relearn to use lost functional vision, which often restores the ability to perform daily tasks like reading.[6] It has been estimated that the global prevalence of paediatric low vision is over 10 times that of paediatric blindness, with 7 million children worldwide having low vision due to ocular disease and a further 10 million children worldwide, with low vision due to uncorrected refractive error.[7]

Since UNICEF defines childhood as 0 to 16 years inclusive, this study was restricted to children 16 years and below. There are some biases inherent in any study. Children with multiple disabilities, preschool age children, those who have died, those from lower socioeconomic groups, and those from rural communities are likely to be under-represented in schools for the blind compared with population-based studies. In the present study, 10.6% children had an additional disability, which is higher compared to a survey done in Maharashtra and Delhi as children with multiple disabilities are often refused entry to schools for the blind in India.[8,9]

In our study, congenital abnormalities of the globe (microphthalmos, anophthalmos and buphthalmos) were responsible for 42.4% of Severe Visual Impairment (SVI) and blindness. This is slightly higher than the results of the blind school study in Delhi in north India (27.4%), Maharashtra in west India (35%) and Karnataka (28.7%) and Tamil Nadu in South India (20.6%).[8-10] Genetic factors were responsible in 18 (10.1%) children in our study which is lower than the results from schools for the blind in south India (23%),[11] likely to be attributed to the low rate of consanguineous marriages in most parts of our state.

A study of schools for the blind in South India had identified retinal dystrophies (including albinism) as the most common single cause of SVI and blindness, accounting for 26.1% cases.[12] In our study retinal dystrophies accounted for only 21 cases (11.7%). Causes of SVI and blindness, which required surgical ophthalmic interventions, were cataract/aphakia (5.1%), corneal pathologies (scar: 13.4%, staphyloma: 7.3%, keratoconus: 3.4%) and buphthalmos/glaucoma (4.5%).

125 (48.5%) of the children were blind from preventable or treatable conditions. Preventable causes (53 cases, 29.6%) included Vitamin A Deficiency (VAD) and measles (42 cases, 23.4%), trauma and Traditional Harmful Practices (TMP) (3 cases, 1.7%) and autosomal dominant conditions (8 cases, 4.5%). These findings suggest the importance of primary prevention, for example, high measles immunization coverage, promotion of breast feeding and education on health and nutrition. Easy availability of first aid and antibiotic eye drops would decrease the incidence of blinding corneal ulcers due to trauma. Treatable causes of blindness (30 cases, 16.8%) included cataract (3 cases, 1.7%), glaucoma (8 cases, 4.4%), aphakia (6 cases, 3.4), pseudophakia (4 cases, 2.2%), keratoconus (6 cases, 3.4%) and retinopathy of prematurity (3 cases, 1.6%).

Various studies have found low vision devices as an effective means of providing visual rehabilitation.[12,13] Sloan et al. showed that children, compared to adults, have a very high rate of successful LVD use, when aids are properly prescribed.[14] The importance of the present study is highlighted by the fact, that LVD were not available in any of the schools, emphasizing the need to improve awareness of LVD among parents and teachers involved in educating the blind in the developing countries.. In the present study, 3.3% children were prescribed spectacles, 18.4% children were prescribed magnifiers and 49% children were prescribed non-optical devices. The major anatomical causes for visual loss in children, who benefited from spectacles, were aphakia (30%), retinal dystrophy (5.5%) and corneal degeneration (6.8%). The major anatomical causes for visual loss in children who benefited from LVD were aphakia (60%), corneal degenerations (46.6%), optic atrophy (15.7%), microphthalmos (13.6%) and retinal dystrophy (22.2%). This is in contrast to the study conducted in 291 blind school children in Andhra Pradesh, India, wherein, 31.6% children with functional low vision improved with spectacles and 14.0% children with LVD.[15]

The overall visual function of a child has four major components: communication, mobility, daily living activities and sustained near vision tasks like reading and writing, including colour vision and contrast sensitivity assessment.[16] A more detailed evaluation of these parameters including psychological assessment, can aid in planning special education programmes for visually impaired children.[17] Substantial changes in environment which are not very costly, should be an integral part of the low vision care of these children. Depending on the educational need to use Braille or ability to use print as educational medium, additional wings of low vision care need to be setup within available rehabilitation services in blind schools. Some of these children with low vision, studying in blind schools, after being trained once, can possibly be integrated in regular schools and thus the blind schools can be reclassified as schools for the visually impaired.[18]

CONCLUSIONS

The ophthalmologists must be made aware of the potential value of spectacles and low vision devices in the "incurably blind children". The present study demonstrates the need for ophthalmic evaluation, refraction and assessment for low vision devices and spectacles, prior to admission to blind schools and the periodic review thereafter. In addition, training to use low vision devices with print education should be introduced in the blind schools, along with teaching Braille, keeping in mind both the short term visual outcome and the long term visual prognosis.

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