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Original Article

Ophthalmology Section

Profile and Causes of Low Vision and Blindness in Children from Two Schools for the Blind in Tamil Nadu, Southern India

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ABSTRACT

Introduction: World Health Organisation's (WHO) "Vision 2020" right to sight programme gives high priority towards control of ChildHood Blindness (CHB). Blind school screening provides data on the causes of CHB to focus on health care programmes towards prevention of CHB.

Aim: To determine the causes of CHB seen in local schools for the blind, to compare these with reports from India and focus on changes in the causes of CHB over the years.

Materials and Methods: A cross-sectional study was conducted in two schools for the blind in Tamil Nadu, India. Children less than 18 years were included. Best Corrected Visual Acuity (BCVA), anterior segment and dilated fundus examination was done for all children. Information was gathered as per WHO prevention of blindness (WHO/PBL) form.

Results: BCVA in the better eye was 6/24 to 3/60 in 31 children (16.8%), <3/60 to no perception of light in 154 children (83.2%). The causes of blindness based on anatomical site were retina 77(41.5%), whole globe 59(32%), cornea 14(7.5%), optic nerve 14(7.5%), lens 10(5.7%), refractive error in 7(3.8%) and uvea in 4(2%). Hence, 14(7.5%) of the causes were preventable and 21(11.4%) were treatable; thus 35(18.9%) were avoidable causes of blindness.

Conclusion: Retinal dystrophies were the major cause of CHB in our study. Posterior segment anomalies contributed to 50% of the causes for CHB. Our study showed that one-fifth of children had avoidable blindness. Regular screening in well baby clinics, schools and in the community is needed for early identification of avoidable blindness in children.

Keywords: Avoidable blindness, Childhood blindness, Visual impairment

INTRODUCTION

Prevalence of CHB varies based on the socioeconomic status of the community. It ranges from 0.2-0.3/1000 in developed countries to 1.0-1.5/1000 in poor socioeconomic communities [1]. In the World Health Organisation's (WHO) "Vision 2020" right to sight programme launched in 1999, control of CHB is given high priority [2]. "Blind person years" is the life time ahead for these children which causes a huge economic burden to the family, community and country [2]. Children with blindness also harbour social insecurity and the consequences of deep emotional disturbances.

Data on prevalence of CHB is often from community rehabilitation programmes, registers for the blind and population surveys, which include both adults and children [3]. A population-based survey done from 1996 to 2000, in India by Dandona R et al., reported the prevalence of CHB as 0.17% (CI 0.09-0.3) [4].

Studying the causes of CHB helps to identify avoidable causes of visual loss and to focus on measures to eliminate these aetiological factors. Further, this data is useful to monitor changing trends in the causes of CHB and blind school admissions. Change in the causes of CHB is probably due to varying socio-economic factors and the effect of health care programmes [1].

This study aimed to report on the causes of CHB, seen in two local schools for the blind, to compare these causes with those seen in other states of India and developing countries, and to report on changes in the causes of CHB over the years.

MATERIALS AND METHODS

A cross-sectional study was conducted in two schools for the blind from the districts of Vellore and Tiruvannamalai in Tamil Nadu (TN), South India after obtaining approval from the Institutional Review Board of Christian Medical College, Vellore (IRB No. 7794). The screening was conducted over 36 months from September 2012 to August 2015, among children less than 18 years who were enrolled in these schools. The first school was a government school and permission was obtained from the local government authorities and school principal. The second school was a private one with three sections for visually challenged children: a primary school, and separate senior schools for boys and girls; screening was conducted after obtaining permission from the principal.

All children 18 years and below whose parents were willing for their child to take part in the screening and gave informed consent were enrolled. Assent was obtained from children above eight years after explaining to them regarding the screening. Children enrolled in these schools had been enrolled either directly to the blind school or had been to a regular school for a few years before their visual impairment was noticed.

Parents were informed regarding the day and time of screening and were present during screening. They contributed to the information collected including onset of visual disturbance and past treatment history, as much as could be recollected.

A team comprising of an ophthalmologist and optometrists from our tertiary care centre visited the schools. Screening was done within the school class rooms. All children underwent distant visual acuity assessment using Snellen's either number or illiterate E chart based on child's literacy. The distance of the vision chart was based on child's vision. Those who could not read the chart at 1 metre were reassessed with counting fingers method followed by projection and perception of light. BCVA and dilated refraction was done for all children. Anterior segment was assessed with flash light examination. Dilated fundus examination was done with indirect ophthalmoscope using a 20 dioptre lens. Documentation was done as per WHO prevention of blindness (WHO/PBL) form [5]. Information was gathered regarding the age at onset of blindness, unaided vision and vision with child's spectacles, associated general disability and history of previous eye surgery. After ocular examination, the major causes for decrease in vision/ blindness based on anatomical

classification were noted. Children who had visual acuity equal to or better than counting fingers at 25 cm were referred to the base hospital for ocular examination and low vision assessment. They underwent slit lamp examination and indirect ophthalmoscopy for fundus assessment; B-scan was done when indicated.

Spectacles were given free of cost when improvement in vision was noted with BCVA. All children who had cataract underwent Lens Matter Aspiration (LMA) along with Primary Posterior Capsulotomy (PPC) and Partial Anterior Vitrectomy (PAV) when indicated. Those with aphakia and good capsular support received secondary Intra-Ocular Lens (IOL) implantation. Low vision assistive devices were dispensed as appropriate.

STATISTICAL ANALYSIS

Descriptive measures such as mean with SD and/or median with IQR was presented for all continuous variables, whereas frequencies and percentages were presented for all categorical variables. All the categorical variables were associated with ocular disability using Chi-square test with continuity correction, and for small sample sizes Fisher's-exact test was used. SPSS version 16.0 was used for analysis and p <0.05 was considered as statistically significant.

RESULTS

There were 185 students on the rolls of the two schools, and all of them participated in the screening; 121 (65.4%) were males. The mean age at the time of screening was 12.1±3.4 years. The age at onset of blindness was below one year in 108 (58.5%), 1 to six years in 65 (35.2 %) and above six years in 12 (6.3%). Age at the time of screening was <6 years in 15 (8.1%), 7 to 12 years in 54 (29.2%) and >12 years in 116 (62.7%). Positive family history of similar illness was seen in 78 (42%); among those with positive family history, parent/ siblings were affected in 71 (91.5%). History of consanguinity was seen in 118 (63.8%). Those with positive family history were compared with those with and without a history of consanguinity; the difference was not significant (p=0.075).

BCVA in the better eye was 6/24 to 3/60 in 31 (16.8%), <3/60 to no perception of light in 154 (83.2%). The causes for blindness based on anatomical site were retina 77(41.5%), whole globe 59 (32%), cornea 14(7.5%), optic nerve 14(7.5%), lens 10(5.7%), refractive error in 7(3.8%) and uvea 4(2%). Hence 14(7.5%) were preventable and 21(11.4%) were treatable, thus 35(18.9%) were avoidable causes of CHB.

None of the children had associated morbidity as these schools were for children with visual disability alone. Surgical intervention like LMA, PPC and PAV was done in two children and secondary IOL was placed in the sulcus for one child with surgical aphakia.

DISCUSSION

Population based studies are essential to determine the prevalence of CHB. It is time consuming and needs adequate manpower. It also has the limitation of missing children with blindness/multiple disabilities with visual impairment who could be away in schools for the blind/special schools at the time of screening. Blind school screening can provide details on various causes of blindness among children from the local population. Surveys done in schools for the blind also have their limitations. It cannot estimate prevalence of the causes of blindness. Moreover, children who are blind and do not access blind schools due to lack of awareness, distance and stigma will miss the screening. However, these screening programmes in blind schools can provide data on the various causes of CHB in a community, as well as to note changing trends over the years.

Our cross-sectional study in two blind schools showed retinal dystrophies as the most common cause for CHB, followed by whole globe anomalies. Hereditary forms of disease are common in the Indian population probably due to the culture of consanguineous marriage. In our study, history of consanguinity was seen in 63.8% and family history of similar illness was seen in 42%. Among those with positive family history, parent/ siblings were affected in 91.5%. However, those with positive family history were compared with those with/without a history of consanguinity; the difference was not significant (p=0.075).

Causes of CHB reported from various blind schools in India is shown in [Table/Fig-1] [1,6-12]. Prevalence of CHB and major causes of CHB in India obtained from various population surveys are shown in [Table/Fig-2] [4,13-16]. The causes of CHB from different blind school screening reports from other developing countries are shown in [Table/Fig-3] [17-22].

Author	Year	Population (n)	State/s	Major cause of blindness	Second major cause
Rahi JS et al., [7]	1995	1318	9 states across India	Cornea (26.4%)	WG (20.7%)
Titiyal JS et al., [11]	2003	703	Delhi	WG (27.4%)	Cornea (21.7%)
Hornby SJ et al., [6]	2000	291	Andhra Pradesh	Retina (31.1%)	Cornea (24.3%)
Gogate P et al., [12]	2007	1778	Maharashtra	CA (41.3%)	Cornea (22.2%)
Bhattacharjee H et al., [10]	2008	258	4 North-East States	Cornea (36.7%)	CA (36.1%)
Krishnaiah S et al., [1]	2012	113	Andhra Pradesh	CA (41.4%)	Retina (18.9%)
Bhalerao SA et al., [8]	2015	90	Allahabad	WG (54.4%)	Cornea (24.5%)
Prakash MV et al., [9]	2017	302	Tamil Nadu (Chennai)	Optic nerve (24.8%)	Retina (18.2%)
Present study	2018	185	Tamil Nadu (Vellore)	Retina (41.5%)	WG (32%)

[Table/Fig-1]: Major causes of CHB among children in schools for the blind in various states of India since 1995 [1,6-12].
WG: Whole globe; CA: Congenital anomalies

Author	Year	State	Prevalence of CHB	Most common cause of CHB
Dandona R et al., [4,13]	2001	Andhra Pradesh	0.17%	Refractive error (33.3%)
Nirmalan PK et al., [14]	2003	Tamil Nadu	6.2/10,000	Refractive error (0.55%)
Dorairaj SK et al., [15]	2008	Karnataka	1.06/1000	Lens (42.9%)
Kemmanu V et al., [16]	2016	Karnataka	0.08%	Retina (44.44%)

[Table/Fig-2]: Prevalence and causes of CHB in India: population based surveys [4,13-16].

A changing trend is noticed over the past few years in the major causes of blindness, with a change from corneal blindness to hereditary causes like retinal dystrophies and whole globe anomalies [9]. The decline in corneal causes is probably due to better Vitamin A intake and measles vaccination coverage. In India, until 2015, corneal blindness remained the first or second most common cause of CHB. A similar trend in the causes of CHB was reported from other developing countries where corneal blindness remained the first or second most common cause of CHB until 2015. Congenital anomalies and posterior segment pathologies were the most common causes of CHB in recent years [9].

In our study, more than 50% of children had developed defective vision before one year of age. Ocular morbidity occurring before one year of age will result in dense amblyopia. This emphasises the need for community programmes to screen for ocular morbidity in children. Community and school screening can help in early detection of cataract and refractive errors. Children should also

Author	Year	Population (n)	Country	Major cause of blindness	Second major cause
Sitorus RS et al., [17]	2007	504	Java	WG 35.9%	Retina 18.9%
Muecke J et al., [18]	2009	208	Myanmar	Cornea 49.5%	WG 21.2%
Njuguna M et al., [19]	2009	1062	East Africa	Cornea 19%	WG 15.7%
Sia DI et al., [20]	2010	95	Cambodia	Lens 27.4%	Cornea 25.8%
Fadamiro CO et al., [21]	2014	38	Nigeria	Lens 36.84%	Congenital glaucoma 13.6% Infection 13.6%
Farmer L D et al., [22]	2015	30	Bhutan	Lens 25%	WG 20%
Farmer L D et al., [22]	2015	23	Laos	WG 30.4%	Cornea 30.4%
Prakash MVS et al., [9]	2017	302	India	Optic nerve 24.8%	Retina 18.2%

[Table/Fig-3]: Major causes of CHB among children from schools for the blind in developing countries since 2007 [9,17-22].
WG: Whole Globe

be screened for ocular morbidity in schools, pre-schools and well baby clinics to reduce avoidable blindness in this amblyogenic age group.

LIMITATION

A limitation of our study was the lack of availability of documentation regarding child's previous ocular condition and previous treatment. Parents were often unaware of the cause and sequence of events.

This study was conducted among schools for the blind within a 50 km radius of our tertiary care hospital. Vellore and Tiruvannamalai districts have only one school each, for the blind, and all the children in these two schools were enrolled in our study but the overall numbers were limited.

CONCLUSION

Retinal dystrophies were the major cause of CHB in our population; one-fifth of children had avoidable blindness. Posterior segment anomalies contributed to more than 50% of the causes for CHB. More than half the children had developed defective vision before one year of age. This emphasises the need for regular community and school screening programmes, health education and to implement regular screening in well baby clinics for early identification of ocular morbidity and prompt management.

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