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Original Research Article

A SOCIO-CLINICAL STUDY ON CHILDREN IN BLIND SCHOOLS IN WESTERN ODISHA

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Abstract

Background: To determine the causes of severe visual impairment and blindness in children in blind schools in western Odisha. **Materials and Methods:** A total of 238 children attending 5 schools for the blind in western Odisha were examined. Visual acuity estimation, external ocular examination, fundoscopy and functional vision assessment was done where feasible. Anatomical and etiological causes of severe visual impairment and blindness were recorded using "World Health Organization/ Prevention of Blindness (WHO/PBL) Eye Examination Record for children with blindness and low vision" form. The study's findings were interpreted keeping in mind the study objectives using SPSS statistics software version 21.0. **Result:** Majority of children belonged to the WHO category of 'blindness' (87.8%) and 12.2% were severely visually impaired. Whole globe was the most common anatomical site of abnormality in 66.4% of children (microphthalmos 30.7%, anophthalmos 28.6%), followed by cornea (9.7%). Etiology of visual loss largely remained unknown (74.8%) out of which maximum children had the abnormality since birth (67.2%). The second most common etiological factors were those related to infancy/ childhood (19.7%). **Conclusion:** 15.1% children were visually impaired due to preventable causes (vitamin A deficiency, measles and hereditary causes being the majority) while 21.4% children had conditions that could be treated (corneal opacity, pseudophakia with posterior capsular opacity and buphthalmos being the majority) as etiologies of visual loss. Overall, more than one-third children were visually impaired due to potentially avoidable reasons.

INTRODUCTION

Childhood blindness is increasingly becoming a major challenge worldwide. Prevalence of blindness in children is estimated is estimated to be around 1.4 million, 1 million of whom reside in Asia alone (2001).[1] This may seem a small percentage of the estimated 5 million blind in India, it is significant because these children have a lifetime of blindness ahead, with an estimated 75 million blind years (number of blind X length of life), second only to cataract.[2]

Most of the causes of childhood blindness are avoidable, being either preventable or treatable. Corneal scar, staphyloma and phthisis bulbi, mainly attributed to Vitamin A deficiency, is the major cause of childhood blindness in India (2011).[3] Other significant causes include cataract, trachoma, keratoconus, retinal causes like dystrophies, retinopathy of prematurity, congenital glaucoma, microphthalmos, anophthalmos and coloboma.The prevalence of severe visual impairment and blindness in children in India is 0.8/1000 (2009),[4] Odisha is among the states with high prevalence of childhood blindness.[5] However, there is diversity even among the various districts of Odisha, regarding which there is lack of epidemiologically valid data. There are several factors responsible for childhood blindness at various levels- socioeconomic factors, lack of awareness regarding preventive measures, absence of treatment seeking behaviour at the appropriate time and lacunae in healthcare facilities. Therefore, the data from one country or state cannot be extrapolated to another.

Though there have been several studies on ocular morbidity in blind schools in various other states in

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India, no such study has been done in Western Odisha. Hence, this study is undertaken to study the socio-clinical profile of blindness in children in blind schools in Western Odisha, to aid in planning for the prevention of the avoidable causes and timely management of the treatable causes.

MATERIALS AND METHODS

A cross-sectional study was carried out on 238 children attending five schools for the blind in Western Odisha, which were identified from the website of 'Social security and empowerment of persons with disabilities department, Government of Odisha'(Appendix 1) between November 2015 and October 2017. All children at the blind schools present on the day of the study were included in the study.

Prior to initiation of this study, each school principal was sent an outline of the purpose of this study with a written request for permission to visit the school and carry out ophthalmic examination of all children present. After an affirmative response from the schools concerned, the schools were visited according to pre-intimidated date and the study was carried out. An ethical clearance was also taken from ethical committee of VSSIMSAR, Burla.

All children were seen in the presence of their parents or class teachers wherever possible. Socio-demographic data including age, sex, religion, place of residence was gathered. Detailed history regarding age of onset of visual loss, family history or any previous eye surgery was taken.

For each child, uniocular and binocular visual acuity, with correction if worn, was recorded using Snellen's chart. Functional vision, such as the ability to walk around unaided or to recognise faces, was assessed. Visual fields were assessed by confrontation wherever appropriate. Anterior segment examination was carried out with the help of torch light and a loupe magnifier. Posterior segment examination was done with the help of dilated direct and indirect ophthalmoscopy. Intraocular pressure was not routinely recorded, but assessed digitally wherever necessary. General examination and systemic examination for presence of any additional disability was carried out.

All the data collected was recorded in the "WHO/PBL (World Health Organization/ Prevention of Blindness) Eye Examination Record for children with blindness and low vision" form, in accordance with the coding instructions.

For each child, visual impairment was classified as per categorisation by International Classification of Diseases – 10 (Update and revision 2006).[6] The causes of visual loss were recorded using the anatomical and etiological classification used in the form. The anatomical classification of causes of visual loss defined that part of the eye which had been damaged leading to visual loss (such as cornea, lens, retina, optic nerve, whole globe). Where two or more anatomical sites were involved the major site was selected, or where two sites contributed equally, the most treatable condition was selected. The etiological classification was divided into five categories depending on the time of onset of the condition leading to blindness (hereditary, intrauterine, perinatal, childhood and unknown). For each child, the need of optical, medical or surgical interventions was recorded and the visual prognosis was assessed.The findings of the study were interpreted keeping in mind the study objectives using SPSS statistics software version 21.0.

RESULTS

A total of 238 students were examined in five schools for the blind in Western Odisha. Males (143; 60.1%) outnumbered the females (39.9%) in the study group. Male: Female ratio was found to be 1.5:1. The mean age of the study population was 12.68 ± 3.51 years. The age ranged from 6-22 years. Maximum number of children belonged to the age group of 11-15 years (120;50.4%) followed by 6-10 years (68;28.6%), 16-20 years (44;18.5%) and 21-25 years (6;2.5%) in the descending order. [Table 1]

In 211(88.7%) of children the onset of visual loss was since birth followed by during childhood in 21(8.8%) children and 6(2.5%) children had onset in the 1st year of life. There was a positive family history of visual impairment/ blindness in only 22(9.2%) children. Rest 216(90.8%) children did not have any history of blindness in the family. Maximum number of children belonged to the WHO category of 'blindness' among whom 113(47.5%) had visual acuity in the range of <3/60 – PL (Perception of light) and 96(40.3%) had no PL. 29(12.2%) were severely visually impaired [Table 2].

51(21.4%) children could see to walk around while 33(13.9%) could recognize faces. In maximum number of children (154;64.7%) the functional vision could not be tested. The visual field (tested by confrontation) was constricted to less than 10 degrees in 41(17.2%) children and full field was found in 35(14.7%) children. The visual field could not be tested in 148(62.2%) children.

21(8.8%) children had undergone cataract surgery in one or both eyes; 4(1.7%) had undergone keratoplasty; 3(1.3%) had undergone evisceration/ enucleation; in 2 cases the nature of the surgery was not known. In addition to visual impairment, 3(1.3%) children had hearing loss, 4(1.7%) had mental retardation, 4(1.7%) had physical handicap while 4 others had speech impairment. Whole globe was found to be the most common anatomical site of abnormality in 158(66.4%) children among which majority of children (73; 30.7%) had microphthalmos followed by anophthalmos (68; 28.6%). Second most common site was found to be cornea (9.7%: scar 5.9%) followed by lens (9.2%: pseudophakia with posterior capsular opacification

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5.9%). Uveal coloboma comprised of 17(7.1%) cases. Retina was involved in 16 cases (6.7%) among which retinitis pigmentosa comprised of 4.2% of cases [Table 3].

Table 1: Gender and age-wise distribution of children in the blind schools in western Odisha

Characteristics		Region of blind school					Total
		Burla	Bargarh	Sundargarh	Bhawanipatna	Titlagarh	
Gender	Male	26(10.9)	32(13.4)	33(13.9)	29(12.2)	23(9.7)	143(60.1)
	Female	11(4.6)	23(9.7)	17(7.1)	26(10.9)	18(7.6)	95(39.9)
Age group (years)	6-10	5(2.1)	19(8.0)	14(5.9)	19(8.0)	11(4.6)	68(28.6)
	11-15	14(5.9)	30(12.6)	23(8.1)	29(12.2)	24(10.1)	120(50.4)
	16-20	16(6.7)	6(2.5)	11(4.6)	5(2.1)	6(2.5)	44(18.5)
	21-25	2(0.8)	0(0.0)	2(0.8)	2(0.8)	0(0.0)	6(2.5)

Table 2: Visual acuity in the better eye classified

Visual acuity	Who categories of visual impairement	No. Of children	Percentage
6/6-6/18	No/Mild visual impairment	0	0.0
<6/18-6/60	Moderate visual impairment	0	0.0
<6/60-3/60	Severe visual impairment	29	12.2
<3/60-PL	Blindness	113	47.5
No PL	Blindness	96	40.3
Total		238	100.0

Table 3: WHO categorisation of major anatomical site of abnormality leading to visual loss

CATEGORIES	Number	%	SUB-CATEGORIES	Number	%
Whole globe	158	66.4	Phthisis	5	2.1
			Anophthalmos	68	28.6
			Microphthalmos	73	30.7
			Buphthalmos	9	3.8
			Removed	3	1.3
Cornea	23	9.7	Staphyloma	6	2.5
			Scar	13	5.5
			Other opacity1	4	1.7
Lens	22	9.2	Cataract	5	2.1
			Aphakia	3	1.3
			Other2	14	5.9
Uvea	17	7.1	Coloboma	17	7.1
Retina	16	6.7	Dystrophy3	10	4.2
			ROP	2	.8
			Retinoblastoma	3	1.3
			Other4	1	0.4
Optic nerve	2	0.8	Atrophy	2	0.8
Total	238	100		238	100

[1]failed graft
[2]pseudophakia with posterior capsular opacity (PCO)
[3]Retinitis pigmentosa
[4]retinal detachment

Table 4: WHO categorisation of Etiology of visual loss

Categories	NO	%	Sub-categories	NO.	%
Hereditary disease	11	4.6	Autosomal dominant	3	1.3
			Autosomal recessive	2	0.8
			Cannot specify	6	2.5
Intrauterine factor	0	0.0		0	0.0
Perinatal/ neonatal factor	2	0.8	ROP	2	0.8
Postnatal/ infancy/ childhood factor	47	19.7 .	Vitamin A deficiency	10	4.2
			Measles	7	2.9
			Trauma	5	2.1
			Other1	25	10.5
Unknown etiology	178	74.8	Cataract	5	2.1
			Glaucoma/ Buphthalmos	10	4.2
			Retinoblastoma, no FH2	3	1.3
			Abnormality since birth	160	67.2
Total	238	100		238	100

[1]Post surgery complications, unknown factors
[2]Retinoblastoma with no family history

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Table 5: Avoidable causes of blindness and visual impairment in children in the blind schools in western odisha

CAUSES	NO.	%
PREVENTABLE CAUSES		
Vitamin A deficiency	10	4.2
Measles	8	3.4
Hereditary causes	11	4.6
Trauma	7	2.9
Total	36	15.1
TREATABLE CAUSES		
Cataract	5	2.1
Total avoidable causes	87	36.5
Buphthalmos/ Glaucoma	10	4.2
ROP	2	0.8
Corneal opacity	17	7.1
Pseudophakia with PCO	14	5.9
Aphakia	3	1.3
Total	51	21.4

The aetiology of visual loss remained unknown in most (178 cases; 74.8%), of which most were children with abnormality since birth (160 cases; 67.2%). The second most common etiological factors were those related to infancy/ childhood (47; 19.7%). Post-surgery complications were responsible for visual loss in 24 cases followed by vitamin A deficiency in 10 cases. Hereditary causes were found to be responsible in 11(4.6%) cases [Table 4].

In all cases with hereditary disease as the etiology, visual loss was present since birth. Among cases where childhood factors were responsible, 23 had onset of visual loss since birth and 21 had onset in 1-15 years of age. Maximum number of children in whom the etiology was unknown had the onset of visual loss at birth. The correlation between age of onset of visual loss and its etiology was found to be statistically significant (p value <0.001).

The visual status was likely to remain stable in maximum cases with whole globe as the major anatomical site and in all cases with uvea, retina and optic nerve as the major site. In 14 cases with cornea and in all cases with lens as the major site, the visual status was likely to improve with some intervention. The correlation between main anatomical site of involvement and prognosis for vision was found to be statistically significant (p value <0.001).

It was found that 36 (15.1%) children were visually impaired due to causes that were preventable (vitamin A deficiency, measles and hereditary causes being the majority) while 51 (21.4%) children had treatable conditions (corneal opacity, pseudophakia with posterior capsular opacification and buphthalmos being the majority) as etiologies of visual loss. 87 (36.5%) children were visually impaired due to potentially avoidable reasons [Table 5].

DISCUSSION

Prevention of childhood blindness is an important aspect of any child or eye care service whether it is considered in economic, social or health terms. The poorer a country or state, the larger is the pool of preventable blindness. Odisha is one of the eastern coastal states of India, and is plagued with very poor health care services. In addition to lack of access to these services, low levels of income and a lack of awareness lead to different diseases including visual impairment and blindness. But Odisha is rapidly developing and the pattern of childhood blindness observed in the study reflects this situation.[6]

In the present study, congenital ocular anomalies (whole globe as the most common anatomical site, mainly microphthalmos and anophthalmos) accounted for the majority of severe visual impairment/blindness (66.4%). This has been a common finding in studies on blind children in India. In a study by J S Titiyal et al. in schools for the blind in Delhi between July 2000 and May 2001, whole globe (27.4%; microphthalmos followed by anophthalmos) was found to be the most frequent site of abnormality.[7] Similarly, in a study by S. Krishnaiah et al. in a coastal district of Andhra Pradesh in 2009, anophthalmos, microphthalmos, and phthisis were the most frequent globe abnormalities leading to visual loss, accounting for 41.4% of cases.[8] The reasons of these congenital anomalies are not known as most causes of blindness are sporadic. The reason for the high proportion of congenital anomalies in our study is not clear and deserves special attention.

Corneal blindness was the second most common cause of SVI/BL (9.7%) and the major preventable cause identified. Although it is difficult to specifically ascertain the etiology of corneal scarring so many years after the original pathology, vitamin A deficiency appears to be the major cause. The major cause of childhood blindness has seen a changing trend over the years as corneal diseases attributed to most cases (26.4%) in a study by J.S. Rahi et al in 1993.[9]

The importance of hereditary factors and childhood factors (24.3%) contrasts with the small contribution from perinatal and intrauterine factors (0.8%). However, this study may underestimate the importance of genetic and intrauterine factors, as in most children, the etiology could not be determined (74.8%) due to failure to establish the cause of known blinding conditions such as cataracts, glaucoma and congenital ocular anomalies. Similar

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were the observations In a study by J. B. Shrestha et al. in Nepal (2012), where the underlying etiology of visual loss could not be determined in 46% of cases.[10] Similarly, In a study by S. A. Bhalerao et al. in Allahabad (2012-13), in more than two thirds (69.2%) of children, an underlying cause could not be determined.[11] This reflects the limited investigations available and the lack of inclusion of parents in the study in many cases.

Over one-third of children were blind from potentially preventable or treatable conditions. Preventable causes included vitamin A deficiency, measles, trauma, and hereditary causes (15.1%). These findings suggest the importance of primary prevention—for example, high measles immunization coverage, promotion of breast feeding, health and nutrition education, and continued programmes for the control of vitamin A deficiency. Public health approaches for preventing congenital anomalies are limited to health education concerning exposure to known risk factors during pregnancy and consequences of consanguineous marriages. Reduction in blindness due to genetic diseases will be more challenging as there are very few medical geneticists in India, and advice given will need to be sensitive to the complex social, economic, and cultural factors influencing marriage and child rearing.

Treatable causes included cataract, glaucoma, corneal opacity and pseudophakia with posterior capsular opacification (21.4%). There is a need to expand specialist pediatric ophthalmic services in Odisha. There is need for screening for early detection of cataract and glaucoma with appropriate referral to a tertiary care centre. It is important to screen for retinopathy of prematurity also because it is an increasing problem where neonatal intensive care is improving and expanding.

In order to develop control programmes to prevent childhood blindness in the state, it is necessary to identify important avoidable causes of severe visual impairment and blindness, and monitor changing patterns from time to time. Blind school studies have the advantage of taking up a large number of children for examination in a short period of time, are relatively inexpensive, can be done by a single observer, and provide an indication about the relative importance of the different causes of childhood blindness in the area under study. However, there are certain inherent biases in such studies: pre-school children, those with multiple disabilities, and those from lower socioeconomic groups or from rural communities are likely to be under-represented, as are causes in children who have died due to other co-morbidities. The results give an idea of the relative importance of different causes of childhood blindness in a particular region but do not give information on the cause-specific prevalence in that population.

Some other limitations encountered in this study included poor history by some students of the precise period of onset, cause, and process of visual impairment; this made correlation of findings and determining the exact diagnosis difficult. Including parents in the study would have helped arrive at a better etiological diagnosis. The children requiring further evaluation and who could potentially benefit from refraction or some treatment modality were referred to the nearest tertiary care centre.

The present study highlights that emphasis needs to be placed on providing low vision services to visually impaired children in schools for the blind so that they can maximize their residual vision and improve their quality of life. Moreover, data from the study could aid in various research and academic activities, in assessing the impact of the health programmes and in planning appropriate control measures.

CONCLUSION

15.1% children were visually impaired due to preventable causes (vitamin A deficiency, measles and hereditary causes being the majority) while 21.4% children had conditions that could be treated (corneal opacity, pseudophakia with posterior capsular opacity and buphthalmos being the majority) as etiologies of visual loss. Overall, more than one-third children were visually impaired due to potentially avoidable reasons.

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