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POSTERIOR SEGMENT CAUSES OF BLINDNESS AMONG CHILDREN IN BLIND SCHOOLS

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ABSTRACT: BACKGROUND: It is estimated that there are 1.4 million irreversibly blind children in the world out of which 1 million are in Asia alone. India has the highest number of blind children than any other country. Nearly 70% of the childhood blindness is avoidable. There is paucity of data available on the causes of childhood blindness. This study focuses on the posterior segment causes of blindness among children attending blind schools in 3 adjacent districts of Andhra Pradesh. **MATERIAL & METHODS:** This is a cross sectional study conducted among 204 blind children aged 6-16 years age. Detailed eye examination was done by the same investigator to avoid bias. Posterior segment examination was done using a direct and/or indirect ophthalmoscope after dilating pupil wherever necessary. The standard WHO/PBL for blindness and low vision examination protocol was used to categorize the causes of blindness. A major anatomical site and underlying cause was selected for each child. The study was carried out during July 2014 to June 2015. The results were analyzed using MS excel software and Epi-info 7 software version statistical software. **RESULTS:** Majority of the children was found to be aged 13-16 years (45.1%) and males (63.7%). Family history of blindness was noted in 26.0% and consanguinity was reported in 29.9% cases. A majority of them were belonged to fulfill WHO grade of blindness (73.0%) and in majority of the cases, the onset of blindness was since birth (83.7%). The etiology of blindness was unknown in majority of cases (57.4%) while hereditary causes constituted 25.4% cases. Posterior segment causes were responsible in 33.3% cases with retina being the most commonly involved anatomical site (19.1%) followed by optic nerve (14.2%). **CONCLUSIONS:** There is a need for mandatory ophthalmic evaluation, refraction and assessment of low vision prior to admission into blind schools with periodic evaluation every 2-3 years.

KEYWORDS: Blindness, Posterior segment causes, Avoidable blindness, Retinal dystrophy, Optic nerve atrophy.

INTRODUCTION: BACKGROUND: It is estimated that there are 1.4 million blind children in the world out of which 1 million are in Asia alone.¹The prevalence of childhood blindness ranges from as low as 0.3/1000 children in high income countries to as high as 1.5/1000 children in low income countries.^{2,3} India has the highest number of blind children (around 3,200,000) than any other country.⁴

Vision 2020, the Right to Sight Program of International Agency for Prevention of Blindness envisages control of childhood blindness as one of the priorities. Nearly 70% of the childhood blindness is avoidable.⁵

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In high income countries, congenital glaucoma, hereditary retinal dystrophies and lesions of optic nerve are predominant causes. In middle income countries, retinopathy of prematurity, congenital glaucoma and lesions of optic nerve are predominant causes while in low income countries, corneal scarring from Measles, Vitamin A deficiency, use of harmful traditional remedies, ophthalmic neonatorum and rubella cataract are the major causes.⁶

Reliable epidemiological data on causes of blindness in children in India are not available. It is necessary to identify important avoidable causes of severe visual impairment and blindness in children which will be useful for planning and control of blindness. There is a paucity of data available on childhood blindness in India and population based studies are difficult and expensive. Survey of children in blind schools is a cost effective and useful option for this purpose. Hence this present study was conducted to find out the posterior segment causes of blindness in children attending blind schools in Chittoor and neighboring districts of Andhra Pradesh.

MATERIAL AND METHODS: This is a cross sectional study conducted among four blind schools from three districts of Chittoor, Nellore and Kadapa in Andhra Pradesh. Permission for conducting the study was obtained by the Institutional Ethics Committee of SV Medical College, Tirupati. Prior permission was obtained from the Principals of the respective schools for conducting the study. Written consent from the parents/guardian was obtained for conducting the study. Using a predesigned interview schedule, the socio-demographic information, consanguinity of marriage, age of onset of visual loss was collected from study subjects. The study was conducted during July 2014 to June 2015 among 204 blind children aged 6-16 years of age. Those children with mental retardation were excluded from the study. Detailed eye examination was performed by the same investigator to avoid bias. Distance visual acuity was measured using a Snellen E chart while visual acuity was tested separately and together for both eyes. Functional vision was assessed to determine if the child had useful remedial vision for independent mobility (the ability to navigate without assistance between two chairs set 2 metres apart in a well-lighted room), social contact (the ability to recognize known faces at a distance of 2 metres) and near vision (the ability to recognize or describe the shape of three 5 mm size symbols at any near distance). Posterior segment examination was done after dilating pupil where indicated using a direct and/or indirect ophthalmoscope. Slit lamp examination was done wherever necessary.

The World Health Organization Program for Prevention of Blindness (WHO/PBL) protocol for blindness and low vision examination was used to categorize the causes of blindness and to record findings using the definitions in the coding instructions. A major anatomical site and underlying cause was selected for each eye and for each child. Those children requiring further investigations and treatment were referred to Sri Venkateswara Ram Narayan Ruia Hospital which is the teaching hospital attached to SV Medical College, Tirupati. The data was analyzed using MS excel and Epiinfo 7 version statistical software.

RESULTS: A majority of the children were aged 13-16 years (45.1%) followed by 9-12 years (39.7%). A higher proportion of them were males (63.7%) than females. Family history of blindness was noted in 26.0% cases only while consanguinity was reported in 29.9% cases. (Table 1). The visual acuity of majority of cases ranged from 3/60 to perception of light (52.0%)

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followed by visual acuity range of 6/60 to 3/60 (27.0%). It was found that a majority of them belonged to the WHO grade of 'blindness' (73.0%). In a large majority of the cases, (83.7%), the onset of blindness was since birth (congenital) (Table 2). The etiology of blindness was 'unknown' in a majority of the cases (57.4%) while hereditary causes accounted for 24.5% of cases. It was found that in 39.3% of cases, the blindness was due to avoidable causes (treatable-27.0% and preventable -12.3%) (Table 3).

Overall, anterior segment causes accounted for majority of the cases (46.6%) while posterior segment causes were responsible in 33.3% instances. Among the anterior segment causes, lens was the most common anatomical site (20.6%) followed by cornea (17.2%). Among the posterior segment causes, retina was the most commonly involved anatomical site (19.1%) followed by optic nerve (14.2%). Among the other causes, 'whole globe' was the common anatomical site involved (15.7%). (Table 4). It was found that within retina, retinal dystrophy accounted for a large majority of the causes (15.2%). Optic nerve atrophy was found to be the anatomical site of involvement in 14.2% cases. (Table 5).

Sl. No	Variable	Number of cases	Percentage
1.	Age group (years)		
(a)	5 – 8	31	15.2
(b)	9 – 12	81	39.7
(c)	13 – 16	92	45.1
2.	Gender		
(a)	Male	130	63.7
(b)	Female	74	36.3
3.	Family history		
(a)	Yes	53	26.0
(b)	No	151	74.0
4.	Consanguinity		
(a)	Yes	61	29.9
(b)	No	112	54.9
(c)	Not known	31	15.2

Table 1: Age, gender, family history and consanguinity in children (N=204)

Sl. No	Variable	Number of cases	Percentage
1.	Visual acuity		
(a)	6/60 – 3/60	55	27.0
(b)	3/60 – Perception of light	106	52.0
(c)	No perception of light	43	21.0
2.	Grading of vision		
(a)	Blindness	149	73.0
(b)	Severe visual impairment	51	27.0

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3.	Onset of blindness		
(a)	Congenital	170	83.7
(b)	Acquired	34	16.7

Table 2: Visual acuity, grading of vision and onset of blindness of children (N=204)

Sl. No	Variable	Number of cases	Percentage
1.	Etiological causes		
(a)	Unknown	117	57.4
(b)	Hereditary	50	24.5
(c)	Childhood	30	14.7
(d)	Perinatal	4	1.9
(e)	Intrauterine	3	1.5
2.	Avoidable causes		
(a)	Preventable causes	25	12.3
(b)	Treatable causes	55	27.0
	Total	80	39.3

Table 3: Etiological causes and extent of avoidable blindness in children (N=204)

Sl. No	Variable	Number of cases	Percentage
1.	Anterior segment causes		
(a)	Lens	42	20.6
(b)	Cornea	35	17.2
(c)	Uvea	9	4.4
(d)	Glaucoma	9	4.4
2.	Posterior segment causes		
(a)	Retina	39	19.1
(b)	Optic nerve	29	14.2
3.	Other causes		
(a)	Whole globe	32	15.7
(b)	Refractive error	9	4.4

Table 4: Anatomical site of cause of blindness in children (N=204)

Sl. No	Anatomical site	Number of cases	Percentage
1.	Retina		
(a)	Retinal dystrophy	31	15.2
(b)	Albinism	3	1.5
(c)	ROP	3	1.5
(d)	Retinoblastoma	2	1.0
2.	Optic nerve atrophy	29	14.2

Table 5: Detailed anatomical sites of posterior segment causes of blindness in children (N=68)

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DISCUSSION: In the present study, a majority of children were in the age group of 13-16 years (45.1%) followed by 9-12 years (39.7%). This may be due to parents admitting children to blind schools only after the age of 10 years with concerns that the child may not be able to adjust and cope up in a blind school before the age of 10 years. The findings are comparable to a study in nine states of India⁷ which found that 56.0% belonged to 13-16 years and 40.0% belonged to 9-12 years. A higher proportion of male children (63.7%) were found in this study. This finding was comparable to studies done in Andhra Pradesh,⁸ (65.0%), North east India,⁹ (58.9%), Nine states' study⁷ (58.0%) and another study in North east India¹⁰ (61.5%). This may be attributed to selective school admission of male children compared to female children.

In this study, a majority of children had visual acuity from 3/60 to perception of light (52.0%) which is comparatively higher than that of coastal Andhra Pradesh¹¹ study (47.8%) and rural AP study⁸ (36.8%). The differences may be attributed to differences in the degree and prevalence of blindness in these areas. In the present study, a majority of children had WHO grade of blindness (73.0%) which was comparable to studies by studies in AP,⁸ (60.8%), Nine states of India⁷ (85.4%) and North East India⁹ (92.3%). Family history of blindness was found in only 26.0% of children in this present study which correlates with other studies in AP⁸ (29.2%) and North east India⁹ (10.0%). In the current study, only 29.9% of children gave history of consanguinity. A relatively higher proportion was reported in coastal Andhra Pradesh¹¹ study (48.7%) while a lower proportion was reported in North east India⁹ study (6.4%). In the present study, the etiology was unknown in majority of cases (57.4%) which correlates well with findings in the north east India studies^{9,10} (51.9% and 56.5% respectively). This may be attributed to lack of certain investigations required in children and also lack of examination of family members in many cases. In the current study, hereditary causes were found in 24.5% subjects which correlates with findings of Nine states study⁷ (22.9%). Overall the present study had found that 39.3% children had potentially avoidable causes of blindness. A comparable proportion of 35.9% was reported in Andhra Pradesh⁸ study. A higher level was found in studies in nine states study⁷ and both studies in north east India^{9,10} (47.0% and 43.5% respectively). A lower proportion of 28.3% was found in coastal Andhra Pradesh study.¹¹

In the present study, the retina was the anatomical site involved in blindness in 19.1% cases. This finding was similar to observations by studies in coastal Andhra Pradesh¹¹ (18.9%) and nine states⁷ (20.7%). A higher proportion was reported in Andhra Pradesh study⁸ (31.1%) while lower proportion was reported by study in north east India⁹ (5.8%) and Pune study¹² (9.3%). Optic nerve atrophy as the cause was found in 14.2% children. A lower proportion was reported by studies in nine states⁷ (5.9%), coastal Andhra Pradesh¹¹ (6.3%) and in Andhra Pradesh⁸ (4.9%).

The present study is not population based and might have missed many cases of blindness in the areas studied. Further, many preschool children with multiple disabilities, those living in tribal areas and who died before the school age was not represented in the study. This study is also subject to selective bias like any other study in blind schools. Therefore the findings of this study are to be interpreted with caution. However the pattern of posterior segment causes of blindness studied reflects the current situation prevailing in Andhra Pradesh.

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CONCLUSIONS AND RECOMMENDATIONS: The posterior segment causes of blindness were found in 33.3% of blind children. The retina was the anatomical site of involvement in 19.1% cases while optic nerve atrophy accounted for 14.2% cases. This study demonstrates the need for mandatory ophthalmic evaluation, refraction and assessment of low vision prior to admission into blind schools with periodic evaluation every 2-3 years. The study has also found that as much as 39.3% blindness could be avoided as it is caused by treatable or preventable diseases.

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