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Original Article

Causes of vision impairment and assessment of need for low vision services for students of blind schools in Nepal

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Abstract

Background: The present study is first of its kind to evaluate causes of visual impairment of blind students in Nepal and assess their need for low vision rehabilitation services.

Aim: To evaluate causes of vision impairment of students enrolled in blind schools in Nepal and assess the need for low vision rehabilitation services in these students.

Materials and methods: A survey was conducted in 12 blind schools in Nepal, which were registered with Nepal Association for Welfare of Blindness (NAWB).It was conducted by a team of an ophthalmologist and an optometrist, by using standard eye examination protocols of the World Health Organization Prevention of Blindness Program (WHO/PBL).

Results: Of the 345 students enrolled in 12 schools, 285 students were examined (response rate of 82.61%). The students were in the 5 - 29 years age group. Nearly three-fourth of the children had become blind within one year of age and 52.3% visually impaired at birth and 20.7% developed vision impairment within one year of age. After refraction, 26 students (9.12%) had mild visual impairment, 21 students (7.37%) had severe visual impairment and 238 students (83.51%) were blind. The main cause of vision impairment was found to be corneal 35.79% and retina diseases, mainly dystrophy, 20.35% followed by problems with the whole globe, lens and optic nerve, accounting for 13.33%, 12.63% and 12.98% respectively. The major etiological factors were those of childhood such as Vitamin A deficiency, measles and similar causes (42.11%) followed by hereditary causes (25.26%). Of the total students examined, 48.07% were visually impaired due to preventable causes and 16.14% treatable aggregating to 64.21% of avoidable blindness. Fifty seven (28.22%) students could read smaller than 2 M print size after low vision assessment for near and 33(15.78%) students benefited with telescopic trial for distance low vision.

Conclusion: In Nepal, renewed focus on providing best possible quality of life for visually impaired children by proper low vision assessment and eye health education focusing on, general public and community health workers, with governmental and institutional support is required to achieve Vision 2020 objectives to decrease childhood blindness.

Key words: childhood blindness, Nepal, blind school study, low vision, vision impairment

In the world today, a child goes blind every minute. These children have a lifetime of blindness ahead, with an estimated 75 million blind-years (number blind x length of life), second only to cataract[1]. Blindness in childhood has negative impact on development of cognitive and social skills. It is estimated that out of the 1.4 Million blind children world-wide, one Million live in Asia[1]. Childhood blindness prevalence was estimated at 0.08 for the South East Asian Region (SEARO) that comprised of Nepal, India, Pakistan and Bangladesh[2]. As of 2006, there were an estimated 9.70 Million children aged below 15 years in Nepal accounting for 37.46% of the total population[3]. Nation-wide population-based studies on childhood blindness are relatively difficult as the target population is spread over a large geographical area. Therefore, the present study was conducted amongst students enrolled in blind schools in Nepal.

Materials and methods

Twelve out of 16 schools for enrolling blind children were selected for survey based on accessibility to transport and communication. Three clinical teams, each consisting of an ophthalmologist and an optometrist, conducted clinical examination and instituted detailed questionnaires, in the premises of the respective schools following strictly WHO/PBL eye examination protocol; Eye Examination Record for Children with Blindness and Low Vision (ERCB)[4].

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In each clinical team, the ophthalmologist took the history and performed eye examination to locate the site of abnormality leading to visual loss (anatomical classification), etiological classification of visual loss, diagnosis and formulation of future course of action required in addition to vision prognosis. The ophthalmologist also performed anterior segment examination using magnifying loupe and torch, while posterior segment examination was carried out using standard Heine direct ophthalmoscope with dilated fundus wherever indicated.

The optometrist recorded personal details of the child, visual assessment, general assessment, refraction & evaluated need for low vision aids. Distance visual acuity was recorded with Bailey Lovie Chart (log MAR chart) in external illumination at a distance of three meters. Distance visual acuity was measured separately for each eye and both eyes together. Lighthouse near visual acuity chart was used to test near visual acuity.

Refraction was done only in cases where, in the optometrist's judgment, visual improvement could be expected. Best corrected distance and near acuity of each eye after refraction using Heine streak retinoscope were recorded. LV Prasad Eye Institute (LVPEI)'s low vision kit for eye care professionals in developing countries was used for low vision assessment.

Data was collected on standard World Health Organization data forms and analyzed using SPSS, standard statistical software. Patient identity was protected by adopting appropriate security procedures in the collection, storage and analysis.

Results

A total number of 285 students out of 345 enrolled in 12 blind schools were examined. The mean age of the students was 14.41 years having a standard deviation of 3.69. The visual status of blind school students at presentation and after refraction is shown in the table below (**Table 1**). After refraction seven students visual status improved from category of blindness.

Regarding *onset* of visual impairment, 52.3% were visually impaired at birth and another 20.7% developed visual impairment within one year of age. Thus close to three-fourths (73.00%) of the total children had become blind within one year of age.

Anatomical Site of Abnormality Causing .Vision Loss:

Pie diagram depicts anatomical locations for causes of visual loss (**Fig 1**).

The main diseases in the top five anatomical sites of visual loss were as follows:

1) In the 102 children with abnormality in **cornea / phthisis,** 33 (11.58%) had abnormality in phthisis, 28 (9.82%) scar, 27 (9.47%) staphyloma, seven (2.46%) keratoconus, six (2.11%) dystrophy and one (0.35%) other opacity.
2) In the 58 children with abnormality in **retina**, 47 (16.49%) had dystrophy, one (0.35%) each albinism and retinopathy of prematurity and nine (3.16%) other causes.
3) In the 38 children with **whole globe abnormality**, 22 (7.72%) had microphthalmos, 10 (3.51%) buphthalmos, three (1.05%) each of anophthalmos and glaucoma.
4) In the 37 children with abnormality in the **optic nerve**, 34 (11.93%) had atrophy and three (1.05%) had hypoplasia.
5) In the 36 children with abnormality in the **lens,** 22 (7.72%) had cataract, ten (3.51%) had aphakia and four (1.40%) other causes.

Etiological Categories of visual impairment

Regarding the etiology of visual impairment diagram below is self explanatory (**Fig 2**).

Amongst 120 children with **postnatal / infancy / childhood factors**, 30 (10.53%) had Vitamin A deficiency, 29 (10.18%) meningitis, 21 (7.37%) harmful traditional eye medicine (HTEM), 14 (4.91%) measles, ten (3.51%) trauma, six (2.11%) encephalitis, five (1.75%) pyrexia of unknown origin, two (0.70%) each of amblyopia and typhoid and one (0.35%) neoplasm.

Amongst the 72 children with **hereditary causes**, 23 (8.07%) were auto recessive, nine (3.16%) had autosomal dominance and could not be specified for 40 (14.04%) children.

Of the 16 children blind due to **intrauterine factors**, 11 (3.86%) had rubella, two (0.70%) each due to toxoplasmosis and drugs / alcohol and one (0.35%) disc anomaly. Of the nine children blind due to **perinatal / neonatal factors**, seven (2.46%) had ophthalmia neonatorum and two (0.70%) had retinopathy of prematurity.

Etiology could not be determined in 68 children of whom 29 (10.18%) had cataract, 21 (7.37%) abnormality since birth, 13 (4.56%) glaucoma / buphthalmos, three (1.05%) retinoblastoma and two (0.70%) uveitis.

Avoidable Causes of Blindness: Of the total 285 children examined, 183 (64.21%) children were blind

due to avoidable causes, out of which 137 (48.07%) were preventable and 46 (16.14%) treatable conditions.

***Additional Findings**:* Five (1.75%) were found to be children of consanguineous marriage. Sixty nine (24.21%) children showed positive family history for conditions such as congenital cataract, congenital glaucoma, retinal dystrophy, microphthalmos and albinism. The most frequent additional disabilities were hearing loss (2.1%) followed by mental retardation (1.1%) and physical handicap (0.4%). Majority of surgical interventions already performed were for cataract (11.56%), glaucoma (2.10%) and increasing size of visual axis by optical iridectomy (0.7%).

***Low Vision Status**:* Out of 209 children with functional low, after distance correction nine (4.03%) students could read 1M print size without low vision device. Telescopic trial was done for all the 33 students who required distance correction and results are shown in the table below (**Table 2**).

The results of low vision assessment for near are shown in table below (Table **3).** In total, 57(48+9) (27.27%) students could read smaller than 2 M print size after low vision assessment including previous nine students who could read 1M print size after distance correction which means these students can read normal school text books (**Table 3**).

***Therapeutic Interventions Advised**:* Of the total 285 students examined, spectacles for refractive error correction was recommended for 48 (16.84%) students, low vision aids for another 62 (21.75%) students and surgical intervention (cataract surgery and optical iridectomy in selected cases) for ten (3.51%) students.

Table 1: Vision status at presentation and after refraction

Best Corrected Visual Acuity	WHO Categories	At Presentation				After Refraction			
		Age Groups				Age Groups			
		<=15	**>15**	**Total**	**%**	**<=15**	**>15**	**Total**	**%**
6/6 to 6/18	NI	0	0	**0**	0.00	0	0	**0**	0.00
<6/18 to 6/60	VI	15	5	**20**	7.02	21	5	**26**	9.12
<6/60 to 3/60	SVI	16	4	**20**	7.02	15	6	**21**	7.37
<3/60 to PL	BL	99	70	**169**	59.30	94	68	**162**	56.84
NPL	BL	40	36	**76**	26.67	40	36	**76**	26.67
Total	**No.**	**170**	**115**	**285**	100.00	**170**	**115**	**285**	100.00
	%	59.65	40.35	100.00		59.65	40.35	100.00	

Table 2: Low Vision Assessment – Either Eye – Distance *

	Frequency	**Percentage^**
6/5-6/18	19	9.09%
Less than 6/18-6/60	14	6.69%
Total	**33**	**15.78%**

* Assessed with LVA, VA with LVA

^ As a percentage of the total 209 students with functional low vision

Table 3: LVA Assessment – Either Eye – Near *

	Frequency	**Percentage^**
<2M	48	22.96%
2M-<4M	10	4.78%
4M-6M	1	0.47%
Total	**59**	**28.22 %**

* Assessed with LVA, VA with LVA

^ As a percentage of the total 209 students with functional low vision

Table 4: The following table summarizes the most common causes of visual impairment in Nepal and other developing countries:

	Nepal - *Present Study*	**Other Developing Countries - Recent Studies** [5,6,7,8,9]
Severe Visual Impairment / Blindness	90.85%	Ethiopia 92.2%; Malawi 83.9%; Uganda (76.5%) and Kenya (66.3%)
Anatomical sites of major causative pathology	Corneal scarring/phthisis (35.79%);Retinal disorder (20%),abnormalities of whole globe(13%), disorder of lens (12.63%) and lesions of the uvea (1.4%)	2003 Study of Blind Schools in Ethiopia: Corneal scarring / phthisis (62.4%); cataract / aphakia (9.2%) and lesions of the uvea (8.8%) 2000 Andhra Pradesh study in India: Retinal disorders (31.1%), corneal diseases (24.3%), abnormalities of the whole globe (20.2%), disorders of the lens (7.9%), Uvea (3.4%)
Corneal Visual Loss	Corneal scarring/phthisis (35.79%);	Malawi (48.9%), West Africa (35.9%) & India (26.4%)
Etiological Categories	Childhood factors (42.11%)	Kenya (45.5%), Uganda (43.4%) and India (46.0%), Andhra study (24%)

Table 5: Comparison of top 5 causes of childhood blindness in 1981 and 2006

1981 Nepal Blindness Study[10]	**2006 Nepal Blind Schools Study (*Present Study*)**
Ocular Infections 21.3%	Nutritional factor (Vitamin A deficiency and measles) 15.44%
Nutritional Causes 17.9%	Cataract / meningitis 10.18% each aggregating to 20.35%
Congenital Cataract 16.3%	Auto recessive hereditary factors 8.07% Harmful traditional eye medicine 7.37%
Trauma 9.0%	Glaucoma 4.53%
Amblyopia 8.5%	Rubella 3.86%
80% Avoidable	64% Avoidable

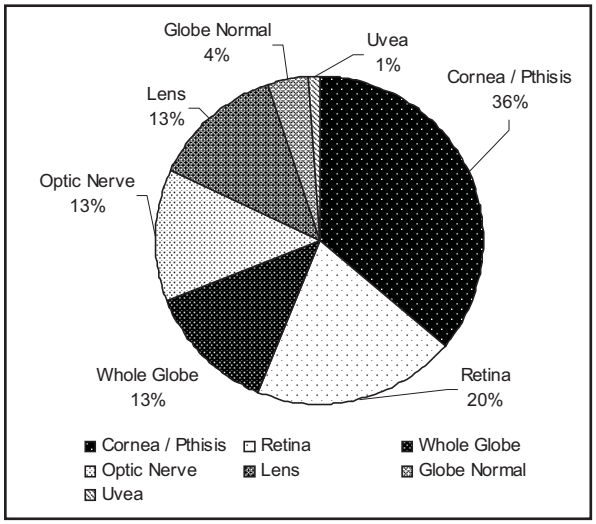

Fig 1: Major Anatomical Site of Abnormality Causing Vision Loss

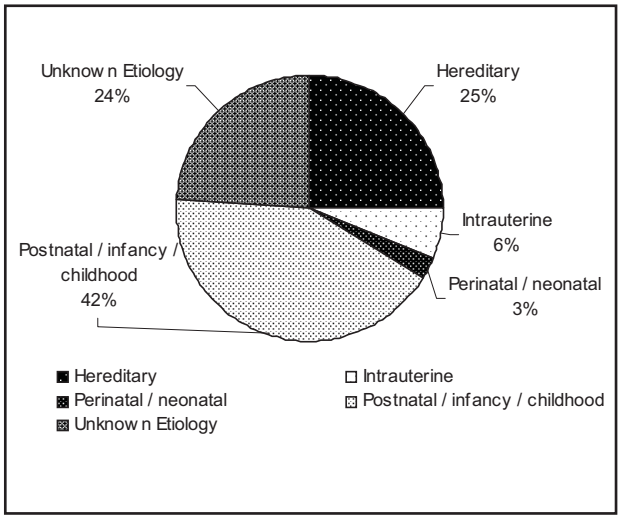

Fig 2: Etiological Categories of Low Vision and Blindness

Discussion

A systematic search of PubMed and database shows that this is the first of its kind of study in Nepal**.** With an estimated blindness prevalence rate of 0.08 in 9.70 million children [2,3], there are only 16 blind schools in the whole of Nepal. Total number of students enumerated in the 12 participating schools was only 345. It is, therefore, necessary to increase number of blind schools and enrollment of visually impaired students. A national database and monitoring system for visually impaired persons must be developed and corrective action to be taken at its earliest.

Comparison with other developing countries: In many developing countries, corneal ulceration leading to corneal scar, staphyloma or phthisis is commonest cause of visual impairment leading to blindness[5]. (**Table 4**)

Change over Time: Since the time when the 1981 Nepal Blindness Study [10] was conducted, infrastructure and human resource capacity has increased manifold and is reflected in the decrease in the proportion of avoidable childhood blindness from 80% in 1981 to 64% in 2006. However, there could be some ambiguity in this data interpretation as the present study includes 115 (40.35%) students aged above 15 years (**Table 5**).

Low vision status: A higher proportion of students benefited from low vision assessment in Nepal compared to a similar study of 291 students below 16 years of age done in the Andhra Pradesh district, India. Fifty seven (27.27%) students in Nepal benefited from low vision assessment and were able to read smaller than 2M print size compared to 41 (15.40%) students in Andhra Pradesh study [9].

In the present study, on telescopic trial for distance visual acuity 19 (9.09%) students had visual acuity better than or equal to 6/18. This shows that if low vision devices for near are provided to blind children they would be able to read normal text books instead of Braille and low vision devices for distance could help them see letters on the blackboard.

In this study, twenty six (9.11%) students who had visual acuity of <6/18 to 6/60 were enrolled as blind students despite admission criteria requiring a certificate of blindness. These children were generally from weak socio-economic background and probably enrolled as blind students as they are offered free lodging, food and, oftentimes, better education.

Further research is needed to explore causal relationships between socio-economic-demographic characteristics and childhood blindness and identify risk factors so that timely and effective intervention strategies may be devised.

Conclusion

In Nepal, while there has been significant decrease in childhood blindness due to avoidable causes, much is needed to be done for the achievement of the Vision 2020 objectives with respect to childhood blindness.

Corneal opacity has been consistently found to be the most common cause of visual impairment. Eye health education should focus on, increasing awareness of using harmful traditional eye medicine (HTEM), trauma prevention, and proper nutrition of children as they are mainstay of corneal blindness.

Genetic and general eye health counseling must be made part of peri-natal and post-natal care with emphasis on follow-up. With three out of four blind children visually impaired at birth or within one year of birth, neonatal ocular screening should be made part of standard post-natal child care.

Thorough workup by ophthalmologist of visually impaired children and proper low vision assessment should be made as standard protocol for admission in blind schools.

Strong governmental and institutional support is required for capacity building, and setting up low vision rehabilitation services across Nepal. It needs to be given renewed focus with strong community participation in the detection, counseling and provision of services, in order to ensure that each visually impaired child has the best possible quality of life envisioned by the Vision 2020.

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