

Evaluation of Causes of Visual Impairment in Students of Blind Schools in Kathmandu Valley



A PROJECT WORK SUBMITTED TO

BP KOIRALA LIONS CENTRE FOR OPHTHALMIC STUDIES

Institute of Medicine, Tribhuvan University

2001

Submitted by:
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CERTIFICATE



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A handwritten signature in black ink, which appears to read "Suraj Shakya", is written over a horizontal line.

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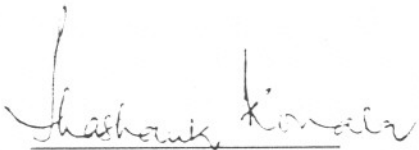
BP Koirala Lions Centre for Ophthalmic Studies

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CERTIFICATE

This is to certify that the project work of Santosh Khanal on "**Evaluation of Causes of Visual Impairment in Students of Blind Schools in Kathmandu Valley**" was conducted at BP Koirala Lions Centre for Ophthalmic Studies.



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ABSTRACT

Introduction: There are approximately 180 million visually impaired in this world among which 135 million have low vision and 45 million are blind. Children comprise 5% of this number. Childhood blindness, the second commonest cause of blind-person years demands more emphasis as a blind child will have to live many more years in blindness and the country loses more of productive years in terms of work and economy. A more devastating fact is that a blind child, impaired for life, loses the independence, social joys, economic stability and life choices. Since not many studies on visual impairment and childhood blindness have emerged from Nepal, a necessity was felt to conduct a study to help develop strategies to prevent avoidable childhood blindness and to initiate low vision services.

Methods: A total of 39 blind students, from three integrated schools for the blind in Kathmandu valley were included in the study. A thorough history followed by visual acuity assessment, refraction, ocular examination and visual field assessment was conducted for each blind student and recorded separately in a special pro-forma especially designed for that particular purpose.

Results: The demographic distribution did not show significant differences among different ethnic communities. Males were predominant in the blind schools. Corneal opacity (35.90%) was the commonest cause of visual impairment. On the basis of WHO classification of visual impairment, 89.7% were blind and the remaining 10.3% visually impaired. Approximately 31% of the blind students had been visually impaired due to acquired causes. It was estimated that 17.9% of the subjects would have benefited from low vision devices if intervention had been done at the proper time.

Conclusions: Most of the causes of visual impairment were due to infections. Early detection and management of the cause of visual impairment would have prevented the severity of visual impairment for those individuals. Eye-health services need to be extended into the rural areas to ensure the provision of quality eye services. This study ^{showed} ~~should~~ that approximately 15% of the blind students would have benefited from low vision devices. Low vision services should be integrated throughout the country to visually rehabilitate the visually impaired. Further research involving a large geographical area and a bigger sample size is required to develop strategies on a national basis to eliminate all causes of avoidable childhood blindness. This study has opened avenues for further research in the realm of visual impairment and low vision.

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INTRODUCTION

World Health Organization (WHO) has listed five categories of Visual impairment. The first category is visually impaired in which the best corrected vision in the better eye is less than 6/18 to 6/60. The second category is severely impaired in which the best corrected vision in the better eye is less than 6/60 to 3/60. Similarly the third, fourth and fifth categories are blind with best corrected vision in the better eye of less than 3/60 to 1/60, less than 1/60 to light perception (LP) and no light perception (NLP) respectively.¹

Currently, there are 180 million visually impaired people in the world, among which 45 million are blind and approximately 135 million have low vision. An astounding fact is that every 5 seconds, one person becomes blind and a child goes blind every minute. It is estimated that 7 million people go blind every year.² Ninety percent of the world's blind are living in developing countries. People in developing countries are 10 times likely to go blind than those who live in highly industrialized countries. The direct global economic burden of blindness is expected to be approximately US\$ 25 billion and this figure could double or triple if indirect costs are considered.³

In 1992, WHO estimated that there were 1.494 million children in the world were severely impaired to blind of which 1.084 million children were from Asia, which comprises 72% of the total blind children population. Thirty to seventy-two percent of paediatric blindness in developing countries is preventable. The major causes of childhood blindness World wide are measles, vit A deficiency and the deleterious effects of the use of traditional eye medicines. All of these

cases are preventable by proven public health measures- measles immunizations, periodic Vit A distribution at risk group (children younger than 6 years of age) and community education. The leading causes of treatable childhood blindness worldwide are cataract, retinopathy of prematurity and glaucoma.⁴

Hereditary factors are common causes of childhood blindness where consanguineous marriages are more common.⁵ Racial and ethnic differences also contribute to visual impairment.⁶ Blindness survey done in 1981 estimated that the major causes of childhood blindness in Nepal are infections (21.3%), cataract (16.3%), nutritional (15.7%), trauma (9.0%) and amblyopia (8.5%).⁷ This indicates that the majority of causes of childhood blindness in Nepal are avoidable.

In South-Asia, for centuries, handicapped people have lived their life, borne their impairments, coped with their disabilities, and overcome or adapted to the negative attitudes of society. The scenario has not changed much even in the brink of the 21st century. There are many rural communities that still consider impairments as a curse of god and try to ignore the impaired individual thinking that the spell will be transferred to them.

The South-Asian visual disability scene changed dramatically with the introduction of integrated blind school in Calcutta in the middle of 19th century. Now, there are many social organizations in Nepal providing various kinds of services to the blind population. These institutions provide education, vocational training, and rehabilitation services to the visually impaired. Educating a blind student costs much more in comparison to educating a normal student. It has been estimated that it is 15 times more expensive to educate a child in Braille as compared to regular print. If the visual performance of visually impaired be enhanced by any means, the expenditure on education can be reduced by a significant amount.

Low Vision Services is an integral part of eye service completely devoted to the enhancement of visual performance as to meet the requirements of the visually impaired individual. Low vision devices, both optical and non-optical, can be used to enhance the visual activities of many visually impaired individuals. Students of blind schools that have potential vision can benefit from low vision aids by being able to read regular print. This will enhance not only the visual performance of the otherwise blind student but also increase the efficacy, which in the long run, will be a benefit to the family, community and country.

Not many studies have been done in South East Asia to evaluate the common causes of Childhood blindness and how to make best use of their remaining vision. In a study done at Madurai, India, it has been found that considerable number of students in blind schools can benefit by giving spectacles, simple magnifiers or by surgery.⁸ It has also been reported that approximately half of all children in blind schools can be helped to read normal print, if they are carefully refracted and supplied with appropriate spectacles and magnifiers.⁹

A child is not only the most precious resource of families but also the future of his nation. A blind child becomes a tragedy for these families. A child going blind due to avoidable causes is an even greater disaster. Childhood blindness demands more emphasis as a blind child will have more blind years to live than an adult and the country would loose more of productive years in terms of work and economy. Childhood blindness is the second commonest cause of blind-person years. Globally, around 70 million blind years are caused by childhood blindness¹⁰. The most devastating fact is that a blind child is impaired for life and looses the independence, social joys, economic stability and life choices, which an otherwise healthy person enjoys. Approximately, one third of the economic cost of blindness is thought to be due to childhood blindness. Due to these reasons,

childhood blindness has been targeted along with cataract, onchocerciasis and trachoma in WHO's global initiative of Vision 2020: The Right to Sight , which aims to eradicate all causes of avoidable blindness by the year 2020.

There are about 135 million people in this world with low vision. The global initiative for elimination of blindness goes beyond elimination of blindness and targets on providing sufficient vision to the visually handicapped. Provision of low visual aids to the blind students is also suggested as one of the interventions to achieve this goal by the year 2020.

Nepal has recently launched the global initiative of Vision 2020: The Right to Sight. Childhood blindness and low vision have been given utmost importance in the global initiative. Not a single study on visual status of blind students and very few studies on childhood blindness have emerged from Nepal. Thus, a necessity was felt to conduct a study on the causes of visual impairment and the visual status of students of blind schools. It was thought that this study would help to develop strategies to prevent all causes of avoidable blindness and to initiate low vision services to the visually impaired, thus contributing in some way in achieving the ambitious goal of the global initiative of Vision 2020: The Right to Sight.

RESEARCH QUESTIONS:

- 1) What is the visual acuity of students of blind schools?
- 2) What are the common causes of visual impairment in students of blind schools?

OBJECTIVES:

General: To determine the causes of visual impairment of students.

Specific: 1. To measure the best-corrected visual acuity of students.

2. To find out their age and sex distribution.

3. To identify the causes of visual impairment.

Review of literature

In a study, Foster A and Gilbert C have shown that the prevalence of childhood visual impairment globally is 0.7 per thousand.¹¹ The prevalence of visual impairment varies with the socioeconomic status of different countries. In a study, Paul G. Steinkuller et al⁴ have reported that in developed countries like the North America, Europe and Japan, the prevalence of childhood visual impairment is 0.3 per 1000 in comparison to prevalence of 1.1 per 1000 in the underdeveloped countries in Africa. The blindness survey of 1981⁷ shows the prevalence of childhood blindness in Nepal is 0.63 per 1000⁷. Globally, only 5% of blindness involves children (0-15 years).⁴

Ninety percent of the world's total blind children live in developing countries, which accommodate 79% of the world's total population. Infectious causes and poor nutrition predominate the cause of visual impairment in developing countries.

B R Shamana et al¹² have stated that the economic burden of childhood blindness in India is US\$ 4.4 billion. The cumulative loss due to childhood blindness in India, assuming a working-life of 33 years of a blind child is US\$ 22.2 billion. The global financial burden of childhood blindness is even astounding. It is greater than adult blindness and has been estimated to be about US\$ 27000 million.¹³

Causes of visual impairment do tend to have geographical variations. In the Middle-east and Sri Lanka, where consanguineous marriages are more common in different ethnic groups, hereditary factors cause 60% of the childhood visual impairment.⁷

In a study done at Saudi Arabia, Khalid F Tabbana and Ishan A Badr have found out that genetically determined causes accounted for 84% of childhood blindness of which 56% were due to consanguineous marriages.¹⁴ In this same study, they have also reported that the globe is the commonest site of visual loss in Saudi Arabia, accounting for 23.5% of the visual impairment. Retina (24.9%), lens (18.18%), optic nerve (13.6%) are the other structures involved in being the causes of childhood visual impairment. The majority of blind students were males as found in this study.

The global scenario of causes of childhood blindness is gradually changing. Blindness due to nutrition and infections is less common than it was twenty five years ago. David Yorston states in his report that corneal scar (20%), cataract (13%), glaucoma (6%) and optic atrophy (6%) are the commonest causes of childhood blindness in low-income countries.¹⁵ In China, nutritional and infective causes of blindness have become uncommon, but hereditary and unknown factors have started to predominate.¹⁶

The report of Steinkuller et al⁷ has shown cortical visual impairment (19%), Retinopathy of prematurity (13%) and optic nerve hypoplasia (7%) to be the three leading causes of paediatric blindness in the United States. This reflects that the blinding conditions in the developing countries are untreatable and sometimes associated with other disabilities. The anterior segment is responsible for the cause of visual impairment in 35% of Asian blind children, among which 21% is of cornea and 14% is of lens. In this same study, Steinkuller et al also report in this that 25% of childhood blindness in Asian countries is hereditary.

A survey done in Hamoi College, New Zealand in 1992 has shown that the commonest causes of vision loss in children were congenital cataract (11.0%), optic atrophy (9.1%), albinism (8.8%), optic pathway lesions (6.1%), and

retinopathy of prematurity (6.1%).¹⁷ In a study of visual impairment in Nordic children, the population of visually impaired children with an additional morbidity, hearing or mental impairment is present in one third to one half of the visually impaired.¹⁸

Lalit Dandona et al have reported that in an urban population in India, refractive error (59.4%) is the commonest cause of visual impairment followed by cataract (25.3%).¹⁹

A population based survey done by Lalit Dandona et al revealed that the prevalence of childhood blindness in Southern India was 0.65 per 1000. The commonest site of visual impairment found in this study was whole eye globe, accounting for 24.2% of the visual impairment. Microphthalmos (29.2%), retinitis pigmentosa (12.7%), optic atrophy (16.7%), cataract (11.1%) and corneal opacity (11.1%) were the major causes of childhood visual impairment.²⁰

The 1981 Nepal Blindness survey reports that the common causes of childhood blindness in Nepal are infections (21.3%), cataract (16.3%), nutritional (15.7%), trauma (9.0%) and amblyopia (8.5%). Similarly, in a community survey done by MP Upadhyay et al in Bhaktapur, Nepal, bilateral microphthalmia with cataract, bilateral amblyopia with aphakia, bilateral buphthalmos, bilateral optic atrophy and associated mental and neurological deficit were the causes of bilateral blindness in children below 6 years of age.²¹

A study done in South Asia has revealed that 85% of the men and 58% of the women who regain their sight return to work, with a financial return of 1500% on the expense, in the year following surgery.²²

The number of blind children and adults are underestimated not only in less developed countries but also in developed countries. Population based surveys done in less developed countries usually fail to take into account children who are in residential schools for the blind.²³

Even in affluent and developed countries like the US, among persons of the normal working age group, only 43.7% are employed compared to 80% of persons without disability of this age.²⁴

A few population-based ocular disease prevalence surveys using random cluster sampling techniques have been done in developing countries, and they do not show an adequate picture of childhood visual impairment because only 5% involves this age group, and most population based ocular disease surveys are not large enough to sample enough children to generate significant data. Even though not a cent percent satisfactory, a common way to circumvent this problem is by tabulation of blind students enrolled in blind schools.⁴

Examining a child with visual loss need not be different than that of adult but the techniques need to be adapted to the child's age, personality, ability to cooperate and level of responsiveness. Taking a history and observing the child should be the initial examination of a visually impaired child. Ocular examinations should include testing assessment of visual acuity, examining pupillary reflexes, assessing eye movements and strabismus, examining the anterior segment and posterior segment, refraction, examining the family, visual fields and assessment of binocular vision.²⁵

In a ten-year study done at UKM-MAB Low Vision Clinic in Kuala Lumpur, Malaysia, Norhani Mohidin and Suzainah Yusoff found that majority of the Low Vision patients were from younger age group. The main cause of visual impairment among 0-29 age group were nystagmus(21.5%), cataract and aphakia(12.8%) and retinitis pigmentosa(12.8%).²⁶

MATERIALS AND METHODS

The Blind students of three integrated blind schools of Kathmandu Valley affiliated to Nepal Association for the Welfare of the Blind (NAWB) were included in the study. The study included all students who were willing to participate in the study .A detailed history was taken and ocular examinations were done to determine the common causes of visual impairment.

A pro-forma was developed as to meet the requirements of the study and all the findings were recorded separately for each individual participating in the study. Each student was interviewed and the following information regarding their identification, general and ocular health status were recorded.

Name

Age/ Sex

Ethnicity

School

Seanning medium

Age of entrance at school

Duration of schooling

Ocular/ Visual history

Medical history

Family history

Psyco-sociologic history

Additional disabilities

Previous medications

After taking the history, following examinations were done in a sequential order.

1. Visual acuity:

Visual acuity was measured monocularly and binocularly, for near and distance with a Bailey-Lovie Log MAR chart in external illumination. The findings were recorded as the smallest size of letters that the subject could see at a particular distance. The acuity was converted to metric snellen acuity mathematically. For those that could not make out the letters of the Chart, Visual acuity was recorded as Detection of Hand movement (HM), Light Perception (LP), or No Light Perception (NLP).

2. External examinations:

External examinations included the pupils, motility of extra-ocular muscles and the ocular deviations. Any abnormalities detected were recorded in the pro-forma.

3. Refraction:

Retinoscopy was done only on those eyes that had clear media and the retinoscopic reflex could be visualized. Standard, Radical, or Off-axis retinoscopy was done as required.

Subjective refraction was done on all individuals, on the basis of retinoscopy readings. If retinoscopy had not been possible, subjective retinoscopy was performed abruptly with large lens jumps. The lens jump required was determined by the JND formula (Just Noticeable Difference).

The best corrected Visual acuity both, monocularly and binocularly, and the spectacle prescription was recorded.

4. Ocular Health Examination:

Ocular health examination included slit-lamp biomicroscopy, IOP assessment, and fundus evaluation under mydriasis (FEUM).

Examination of external ocular structures including lids, conjunctiva, cornea, anterior chamber, lens and vitreous with a hand-held slit lamp. All the findings that could be the cause of or contribute to the identification of cause of visual impairment were recorded.

IOP was evaluated digitally and recorded as soft, normal or hard.

Tropicamide was used to dilate each eye of every individual. 20-30 minutes after instillation of the drop, the fundus was evaluated with a direct ophthalmoscope. Any abnormalities that could be the cause of Visual impairment were recorded.

The pro-forma was then thoroughly evaluated to determine the cause, type and category of Visual impairment. The cause of Visual impairment was identified on the basis of ocular examinations. The type of visual impairment was determined by evaluating the history and diagnosis. The standard WHO classification of Visual acuity was used as a guide-line to categorize the visual impairment.

Those that could benefit from medical and/ or surgical were referred to BP Koirala Lions Centre for Ophthalmic Studies (BPKLCOS) for further evaluation and management, and those having a potential of better visual performance with Low Vision Devices were referred to the Low Vision Clinic at BPKLCOS.

RESULTS

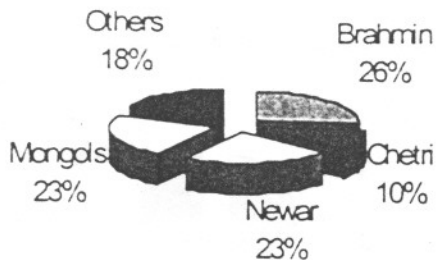
A total of 39 blind students of three integrated schools for the blind in Kathmandu Valley, one school each from Kathmandu, Lalitpur and Bhaktapur were included in the study. The mean age of the students participating in the study was 14.7 years with a standard deviation of 2.8. The oldest student was of 21 years and the youngest student was 8 years. There were 14 female students who participated in the study and the remaining 25 students were males. All of the participants of this study were being educated in Braille.

Table 1: Age and sex distribution

AGE	SEX		TOTAL
	MALE	FEMALE	
<10 years	2 (5.1%)	1 (2.6%)	3 (7.7%)
10-18 years	20 (51.3%)	13 (33.3%)	33 (84.6%)
>18	3 (7.7%)	0 (0.0%)	3 (7.7%)
TOTAL	25 (64.1%)	14 (35.9%)	39 (100%)

Table 1 shows the age and sex distribution of blind students. The majority of the students (84.6%) were from 10- 18 years. Males were found predominantly in the blind schools (64.1%).

Fig 1: Ethnic distribution



From Fig 1, it can be interpreted that the ethnic distribution is more or less uniform with Brahmins in majority, comprising 26% of the total blind students. People of almost all ethnic groups were found in these schools.

Table 2: Last eye examination

Time	Number of students
< 1 year	12 (30.8%)
1-5 years	16 (41.0%)
>5- 10 years	7 (17.9%)
>10 years	4 (10.3%)

All the students had opted for eye examination prior to the study. It is evident from table 2 that the majority of subjects (71.8%) had had their eye examined within the last 5 years. Of the total students, 30.8% had undergone an ocular examination within one year. Only 10.3% of the students had not had an eye examination since the last 10 years.

Fig 2: Ambition of blind students

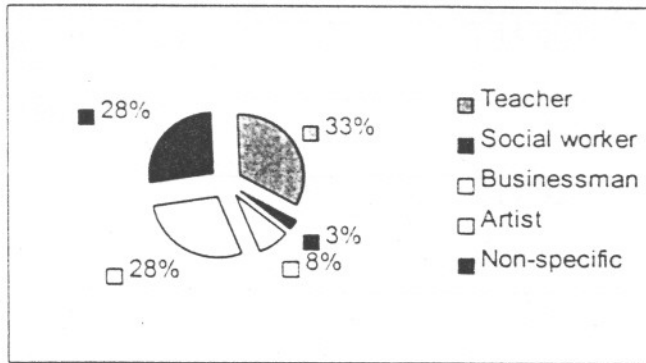


Fig. 2 indicates that the majority of the students (33%) wanted to be teachers in future. Social workers (28%), artists (28%) and businessman were other ambitions of the blind students.

Table 3: Additional disabilities

Additional disabilities	No. of students
None	36
Hearing impairment	3

Table 3 shows that almost all the students in blind schools (92.3%) did not have any additional disabilities.

Table 4: Causes of visual impairment

Causes of Visual impairment	Number of subjects	Frequency
Corneal opacity	14	35.90%
microphthalmos	7	17.95%
optic atrophy	7	17.95%
retinitis pigmentosa	2	5.13%
correctopia	2	5.13% *
anterior staphyloma	2	5.13%
cataract	1	2.56%
anophthalmos	1	2.56%
others (undiagnosed)	3	7.69%
TOTAL	39	100%

Corneal opacity was found to be the commonest cause of visual impairment, accounting for 35.90% of the causes of visual impairment. Microphthalmia (17.95%), optic atrophy (17.95%), retinitis pigmentosa (5.13%), correctopia (5.13%), anterior staphyloma (5.13%), cataract (2.56%) and anophthalmos (2.56%) were other causes of visual impairment.

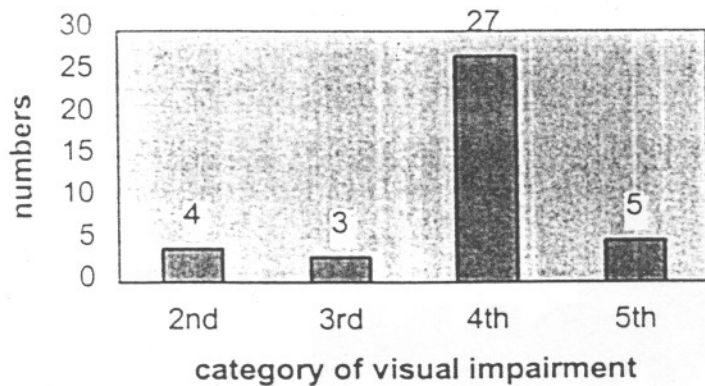


Fig 3: Visual status of the blind students

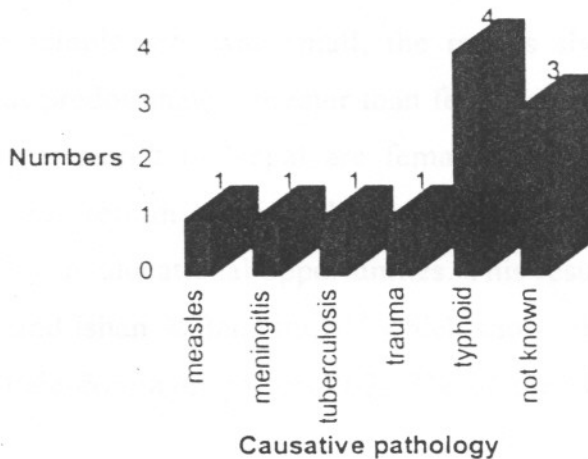
From Fig. 3, it is evident that 10.3% of the blind students were severely impaired and 89.7% blind as per the classification of WHO.

Table 5: Type of visual Impairment

Type	Number
congenital	19 (48.72%)
acquired	12 (30.77%)
not known	8 (20.56%)

Majority of the students (48.72%) had been visually impaired due to congenital causes.

Fig4: Causes of acquired Visual Impairment



On eliciting the history detect the causes of acquired visual impairment, typhoid, leading to opacification of the cornea, was found to be the commonest cause of visual impairment (36.4%), followed by measles, meningitis, tuberculosis and trauma.

Table 6: Referrals

Advice	Number (%)
none	30 (76.91%)
med sur Rx	3 (7.69%)
low vision evaluation	6 (15.4%)
Total	39 (100%)

To majority of the students (76.91%), it was explained that medical surgical therapy or low vision devices would not be of any benefit. Among all the Blind students, 7.69% were referred to BPKLCOS for further evaluation and management, and 15.4% were referred to the low vision clinic at BPKLCOS to be evaluated thoroughly for the possibility of low vision devices.

DISCUSSION

A total of 39 students from 3 Blind Schools were included in the study. This study showed that 64.10% of the students in blind schools were males. Even though the sample size was small, the results show that the number of male students was predominately greater than females in spite of the fact that 59.8% of the visually impaired in Nepal are females.⁷ This may be due to the cultural factors. People refrain sending their daughters away from home and boys are given priority in educational opportunities. This result is in agreement with Khalid F Tabanna and Ishan A Badr study¹⁴ which shows that in Saudi Arabia, which has a similar male-dominant society, 63.53% of the students in blind schools were males.

Unexpectedly, the age of blind students was within the normal school-going age group. Only 3 of the subjects (7.69%) were above 18 years of age. The oldest subject was of 21 years; an age that can be encountered even on screening regular schools. The reason behind this may be the admission criteria of Blind Schools.

Nothing could be inferred from the data based on ethnic distribution as there was not a significant difference in the number of students of different ethnic groups and they were inhabitants of different parts of the country. Besides, the sample size was too small to determine the ethnic distribution of a large geographical area as such.

Of the total study population, 71.8% had had an eye examination within the last 5 years and 30.8% had opted for an eye examination within this year. Among all the subjects, 17.9% had undergone an ocular checkup 5 to 10 years before. Only 10.3% of the subjects had been examined more than 10 years back. This can

be attributed to the easily available practitioners and eye-health services in Kathmandu. The general secretary of NAWB, on interview, stated that a letter from an ophthalmologist stating that the child is blind is required for a child to be admitted in a Blind school. But, he admitted that in rural areas, where eye services are not easily available, children have been admitted on the basis of their visual performance.

All the subjects knew about the limitations that their visual impairment would impose on them on choosing a career for life. Among all the subjects, 71.8% aim to be a teacher, social worker, businessman or artist, all of which are within the scope of Blind individuals.

As found in this study, corneal opacity was the commonest cause of visual impairment, accounting for 35.90% of the visual impairment of all the visually impaired children. Since most of the eyes with corneal opacity had total leucomatous scarring with excessive vascularization, penetrating keratoplasty was not advised. Some of the subjects having little or no vascularization, or thought to be suitable candidates for penetrating keratoplasty were referred to BPKLCOS for further evaluation and management.

Congenital cataract was the cause of visual impairment of one subject thus making a contribution of 2.56% to the causes of visual impairment. Because of the large nystagmoid movement of the eyes and the age of the subject, 16 years, it was predicted that surgery would not give good visual prognosis.

Correctopia had caused visual impairment in 5.13% of the students examined. The pupil size was not more than 1mm and did not dilate on instilling mydriatic drops, so it was not possible to view the fundus with an ophthalmoscope. Since these subjects had relatively good acuity on eccentric

viewing, it was assumed that the fundus was within normal limits. Optical iridectomy was thought to be a good surgical option, so these subjects were referred to BPKLCOS for further evaluation and management.

Optic atrophy was the cause of visual impairment in 17.95% of the students examined. The cause leading to optic atrophy could not be identified due to the lacking medical history. Nystagmus was present in 2.56% of the subjects with optic atrophy indicating a visual loss in early years of life. In 21.43% of the subjects with optic atrophy, relatively good visual acuity was found and were referred to Low vision clinic at BPKLCOS. The subjects who were visually impaired due to optic atrophy accounted for 50% of the referrals made to low vision clinic. These findings indicate that individuals with optic atrophy are relatively better candidates for low vision services.

Retinitis pigmentosa accounted for 5.13% of the visual impairment among all the blind students. It was unusual to see the blinding sequelae of retinitis pigmentosa at such an early age. Similarly, microphthalmos and anophthalmos were the causes of visual impairment in 17.95% and 2.56% of the blind students respectively. The subjects were explained about the visual prognosis.

The causes of visual impairment found in this study were similar to those of Lalit Dandona et al study²⁰ in India and David Yorsten's report¹⁵ on the causes of visual impairment in low-income countries. The results also showed a significant difference in causes of childhood visual impairment in this study and the studies done at New Zealand¹⁷ and USA⁴. These findings have stressed the fact that causes of visual impairment tend to have geographical and socio-economic variations.^{4,5,6,11,22}

Involvement of the whole globe accounted for 20.78% of the causes of visual impairment. Similarly, anterior segment was responsible for causing 50.65% of the visual loss. Retina and optic nerve were the anatomical sites of visual loss in 5.19% and 23.38% respectively. These results tally with Steinkuller et al study⁴, which has stated that anterior segment is responsible for 35% of the cause of visual impairment in Asian countries.

Out of all the subjects, 89.7% were categorized Blind and the remaining 10.3% as severely impaired on the basis of WHO classification of Visual impairment. The total percentage of referrals made to BPKLCOS for further management accounted for 7.69% and the visual outcome is yet to come. Studies have shown that individuals with visual acuity as low as 1/60 in the better eye, i.e. the 3rd category of visual impairment, can benefit from low vision devices⁹. Relying on these justifications, it can be inferred that approximately 17.9% of the students would have benefited from low vision devices by the enhanced visual performance if the intervention had been done at the proper time.

The medical, surgical treatment that would have been possible in the early years of life for the congenitally impaired could not be determined due to the limitations in eliciting history. Based on the history given by the subjects, typhoid (36.4%) was the commonest predisposing factor of the causes of visual impairment. This study showed that majority of the causes of acquired visual impairment were due to infections and if these conditions and their ocular manifestations had been managed appropriately, visual impairment could have been avoided for those individuals.

Conclusions and Recommendations:

This study was conducted to determine the causes of visual impairment of students of blind schools and to assess their visual status. Although many studies have been done in the west regarding childhood blindness and visual status of blind students, not many studies have emerged from South-Asia. It was expected that the results of this study would provide a baseline data to develop the strategies to prevent avoidable childhood blindness and to initiate the low vision services.

The sample size and the study area was not adequate to generalize the results of this study on a national basis, but the results have certainly given an insight to the prevailing ocular status of visually impaired children.

Corneal opacity was found to be the commonest cause of visual impairment, accounting for 35.90% of all causes of Visual Impairment in the blind students. Most of the visual impairment due to corneal opacity could have been prevented if proper medical/surgical therapies had been instituted at the early stages for the underlying cause of opacification. This study showed that majority of the causes of acquired visual impairment was due to infections.

This study has shown that early detection and management of most of the causes of acquired visual impairment could have prevented the severity of the visual impairment. A large proportion of the subjects would have had better visual acuity if they had got the opportunity to receive medical surgical therapy before the permanent visual loss. Thus public education is essential to make the general public aware that any abnormalities in and around the eye should not be neglected and that an eye practitioner should be consulted immediately.

Even though the study did not include blind schools outside Kathmandu valley, the situation of Nepal as reflected in this study is that the children with

potential vision or curable disorders are being educated in Braille and the actual visually impaired are being deprived of this opportunity. These findings indicate that eye-health services should be extended into the rural areas to ensure the provision of quality eye services to the general population at large and to achieve the ambitious goal of VISION 2020: The Right to Sight.

The blind students knew of their limitations in choosing a career for life. Thus, the society and nation can expect a contribution from the visually impaired on communal and national development. To make the visually impaired individuals active in their productive years and to bring the visually impaired in the arena of national development, it is necessary that the government and non-government organizations develop strategies to provide opportunities and preferences to visually impaired in areas in which they can expertise.

This study has shed light on the visual status of children of blind schools. As this study showed that approximately 15% of the blind students at blind schools may have benefited from low vision devices, low vision services should be integrated throughout the country to visually rehabilitate the visually impaired. On the long run, the cost of educating the blind students will go down in a proportional amount and the 'Blind' students who really need to be educated in Braille, will get the opportunity to do so.

Further research involving a large geographical area and a bigger sample size is required to develop strategies on a national basis to eliminate all causes of avoidable childhood. Even though the results of this study can't be generalised for the country, it has certainly paved a path for further research.

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APPENDIX:

EVALUATION SHEET FOR DETERMINATION OF CAUSES OF VISUAL IMPAIRMENT

RESEARCH PROFORMA

Name: _____ Date: _____
Age/Sex: _____
Ethnicity: _____
School: _____
Scanning medium: Braille (Residential/ Day scholar)
Can read large print
Age of entrance at school: _____ years
Duration of schooling: _____ years

HISTORY

Ocular/ Visual history:

Last eye examination:
Diagnosis:
Surgical Medical Rx:
Recent loss in vision:
Others:

Medical history:

Family history:

Psyco-sociologic history:

Living situations:
Help from family:
Mode of transportation:
Ambition:
Participation in social activities:

Additional Disabilities:

None Hearing loss
Mental retardation Physical retardation

Medications:

Allergies:

VISUAL ACUITY

Distance

Chart: _____

	Unaided	With glass
OD		
OS		
OU		

Near

Chart: _____

	Unaided	With glass
OD		
OS		
OU		

EXTERNAL EXAMINATION

Pupils: _____

EOM: _____

Binocularity: _____

REFRACTION

Retinoscopy:

OD
Possible/Not possible



OS
Possible/Not possible



Procedure: Standard/Radical/Off axis

Working distance: _____ cm

Standard/Radical/Off axis

_____ cm

Subjective: (JND/Retinoscopy reading)

VA

OD _____

OS _____

OU _____

Ocular Health Assessment

Slit Lamp Examination:

OD

OS

Lids

Conjunctiva

Cornea

Anterior Chamber

Iris

Lens

Vitreous

IOP measurement:

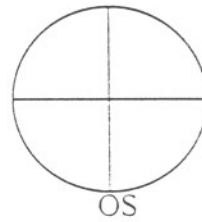
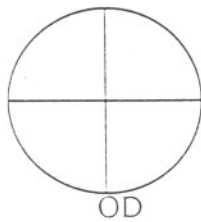
(Digital method)

Fundus Evaluation Under Mydriasis

	OD	OS
Optic Nerve Head		
CD Ratio		
Macula		
Vessels		
Periphery		
Other findings		

Visual Field Evaluation: Tangent Screen/Confrontation test

Target size:



Working Distance:

Special Procedures: (only if necessary)

Ultrasonography:

Keratometry:

Applanation Tonometry:

Dark Adaptometry:

Cause/s Of Visual Impairment

(Preventable/ Curable/ Congenital/ Acquired/ hereditary)

Prognosis:

Category Of Visual Impairment

1. < 6/18 - 6/60
2. < 6.60 - 3.60
3. < 3.60 - 1.60
4. < 1.60 - LP
5. NLP

Advice:

None

Refer to BPKLCOS for further evaluation and medical/surgical management

Refer to Low Vision Clinic at BPKLCOS for further management