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**Near Visual Acuity Improvement with Low Vision
Aids in Visually Impaired Students of Blind
Schools in Kathmandu, Lalitpur & Kavre
Districts**



SUBMITTED TO
NEPAL HEALTH RESEARCH COUNCIL
Ramshah Path , Kathmandu, Nepal
2003

Submitted by:
HARI BAHADUR THAPA

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B. P. Koirala Lions Center For Ophthalmic Studies

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CERTIFICATE

This is to certify that the project work of Hari Bahadur Thapa on "Near Visual Acuity Improvement With Low Vision Aids in Visually Impaired Students of Blind Schools in Kathmandu, Lalitpur and Kavre Districts" was conducted at BP Koirala Lions Center for Ophthalmic Studies.



Prof. Dr. Shashank Koirala, MD

Executive Director

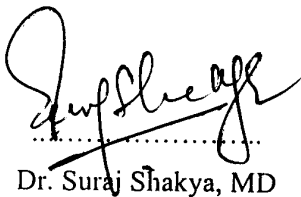
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This project work submitted to the faculty of B. P. Koirala Lions Center For Ophthalmic Studies, Institute Of Medicine, Tribhuvan University, in partial fulfillment of requirement for the degree of Bachelor of Optometry (B. Optom.) was conducted under my supervision and guidance.



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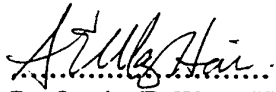
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Hari Bahadur Thapa

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ACRONYMS

WHO: World Health Organization

BPKLCOS: BP. Koirala Lions Centre for Ophthalmic Studies

VA: Visual Acuity

MORR: Maximum Oral Reading Rate

EVD: Equivalent Viewing Distance

LVAs: Low Vision Aids

TPS: Threshold print size

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INTRODUCTION



INTRODUCTION

Low vision starts with the term disorder, which is considered to be any deviation from the normal state of vision. Low vision knows no barriers. It affects rich and poor, old and young, all races and ethnic backgrounds. The low vision disorder comprises a myriad of conditions, which can bring about permanent, temporary or no effect on vision. However, any disorder when affects a functional component of eye, it results in visual impairment. Due to this, individual loses his capacity to perform his special tasks and acquires disability. This leads to psychological, social and economical disadvantages to the person and he is considered to be visually handicapped.

World Health Organization (WHO) has listed five categories of visual impairment in terms of visual acuity. 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 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 the 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

The literal meaning of low vision is subnormal vision or partial sight. It is often defined as bilateral impairment to vision that significantly impairs the functioning

of patient and can't be adequately corrected with medical, surgical, vision therapy, conventional eyewear or contact lens. It is often a loss in sharpness or acuity but may present as a loss of field of vision, light sensitivity, distorted vision or loss of contrast². WHO has defined the low vision as the visual acuity of less than 6/18 but equal to or better than 3/60 with the best correction and visual field of less than 40 degrees but equal to or greater than 20 degrees in diameter¹.

In 1992, WHO estimated that there were 1.494 million children in the world who were severely impaired to blind of which 1.084 million children were from Asia, which comprises 72% of the total blind children population. 30 to 72% of pediatric blindness in developing countries is preventable. Regarding the gravity of low vision, a large population of the world is under the category of the low vision. They are found more frequently in the developing nations. In context of Nepal close to 3.5% of total population have some degree of visual disability. Approximately 1.85% of the total population falls in the category of low vision according to WHO criteria. Of the total blind 61.8% are over 60 years. Over 6% of total blinds are under 20 years. Almost 90% of blind people are located in rural area with little access to eye care.²⁰

The major causes of childhood blindness Worldwide are measles, vitamin A deficiency and the deleterious effects of the use of traditional eye medicines. We know "Prevention is better than cure". All of these cases are preventable by

proven public measures- measles immunizations, periodic vitamin A distribution to 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.³

The south-Asian visual disability scene changed dramatically with the introduction of integrated blind school in Calcutta in the middle of the 19th century. Now, there are many social organizations providing various kinds of services to the blind population. These institutions provide education, vocational training and rehabilitation services to the blind. There are altogether 33 schools for the blind in Nepal, 12 in eastern, 10 in central, 5 in western, 3 in mid -western and 3 in far-western regions. There are four schools in Kathmandu Valley that educate the blind students. In Nepal, one school is for the blind only and the remaining 32 schools are of integrated type. All the schools in the Kathmandu Valley are integrated.⁴

Childhood blindness should be looked into with more emphasis as they will have more blind years to live than the adult and the country would loose more of productive years in term of work and economy.

Low vision service is an integrated part of eye services completely devoted to the enhancement of visual performance as to meet the requirements of the visually

impaired individual. Low vision aids, 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 students but also increases the efficacy, which in the long run, will be a benefit to the family, community and country.⁴

Optical Aids are the devices that usually make the object size larger, bring the object closer and make the object appear closer and larger without changing size and distance. Some devices are helpful for distance and some are for near vision. There are a number of near magnification devices available. These include microscopes, handheld magnifiers, stand magnifiers, telemicroscopes and electronic magnification systems. Non-optical aids are the devices, which don't rely on lenses for their effect and usefulness but rather use relative size, illumination position, contrast, color or other sensory input for their effects.

Calculation of required near magnification by:

1. Reading goal: newspaper fluently- 1M.
 2. Required threshold print size (TPS) with magnification 0.5M (3 lines of acuity in reserve)
 3. Current TPS and viewing distance (near visual acuity)
- Calculate Near Equivalent Viewing Distance (EVD)

Required EVD = Required TPS x Current EVD / Current TPS.²¹

Near visual acuity improvement with low vision aids is also a part of rehabilitation services. Thus, this study had been undertaken to evaluate the profile of low vision in Nepalese population.

This is currently a concerted global effort to develop and implement to eliminate the avoidable blindness by the year 2020, through the World Health Organization and the International Agency for the Prevention of Blindness initiative vision 2020.

Statement of the Problem

In Nepal, few of the blind students in blind schools are really not the blind but have some amount of vision i.e. they are partially sighted students. The number of partially sighted students should be identified and give them appropriate magnifiers to use their available vision. Many researches have been done in this field outside Nepal. The advanced types of low vision aids are produced in foreign countries but not in Nepal. So, these instruments are not easily available. Due to the unavailability of these low vision aids and appropriate rehabilitation centers, many people are living as blind even though they are only visually

impaired. Many efforts have been done to upgrade quality services still the problems are as it is. Some of the researches have been done but the results have not been implemented due to the cost & technical reasons. So, in world, WHO estimated that there were 1.494 million children were severely impaired to blind of which 1.084 million children were from Asia, which comprises 72% of the total Blind children population. Low vision devices can be used to enhance the visual activities of those visual impaired individuals¹.

Rationale / Justification

A child is not only the most precious resource of families but also the future of the nation. Blind children become a tragedy for their families. A going blind due to avoidable causes is an even greater disaster. Childhood blindness demands more emphasis as a child will have more blind years to live than an adult and the country would loose more of the productive year in term of work and economy. The most devastating fact is that a blind child is impaired for life and looses the independent social joys, economic stability and life choices, which are otherwise healthy person enjoys. Approximately 1/3 of the economic cost of the blindness is thought to be due to childhood blindness. Due to these reason, childhood blindness has been targeted along with cataract, onchocerciasis and trachoma in WHO's global, initiative of vision2020 The Right to Sight, which aims to eradicate all causes of avoidable blindness by the year2020.

Moreover, a study conducted by Santosh Khanal in the three blind schools of Kathmandu valley had reported that 15% of total students studying in the blind schools are actually not blind but they are just visually impaired who could have benefited by low vision aids⁸. Keeping this in mind, an intense need was felt to re-evaluate these children and give them an opportunity to use low vision devices to lead their life comfortably. Therefore, a study was designed to evaluate blind children and to see the efficacy of using low vision devices in them.

This study is expected to provide the baseline data to tackle low vision problems and help them to rehabilitate in the society. This will also help us in creating eye health awareness in the community.

**RESEARCH QUESTION
AND
OBJECTIVES**

RESEARCH QUESTION:

What is the near visual acuity improvement with low vision aids among the visually impaired students of blind schools?

OBJECTIVES:

General:

To evaluate the near visual acuity improvement with low vision aids among the visually impaired students of blind schools.

Specific:

1. To find out the number of visually impaired students in blind schools.
2. To ~~evaluate~~ ^{measure} the best corrected visual acuity without low vision aids.
3. To categorize the visual status of visually impaired students according to WHO classification .
4. To find out the age and sex distribution in visually impaired students.
5. To ~~evaluate~~ ^{measure} the improvement of the near visual acuity with low vision aids.
- 6.. To identify the causes of visual impairment of the partially sighted students.
7. To find out the mean increment in maximum oral reading rate (MORR) with the low vision aids in 3 months period.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Evaluation of the improvement with correction of refractive error and low-vision devices (LVDs) was conducted by Hornby SJ, Adolph S, Gothwal VK, Gilbert CE, Dandona L, Foster A. in six blind schools of Andhra Pradesh. Two hundred and ninety one students under 16 years were examined, and after refraction, 267 (91.7%) were classified as being severely visually impaired or blind. 114 children (39.2%) had functional low vision (i.e. visual acuity < 6/18 to light perception with Navigational vision). In this group, 36 children improved with spectacles and 16 benefited by LVDs. 41 children (15.4%) were able to read <2M print size though they were studying Braille. One in seven children could read normal print with optical support.²⁵

A study was done by Silver J, Gilbert CE, Spoerer P, Foster A. on Low vision in east African blind school students: need for optical low vision services , London. The aim of this study was to assess the need for spectacles and optical low vision devices in students with low vision in schools for the blind in Kenya and Uganda and, finally, to evaluate simple methods of identifying those low vision students who could read N5 to N8 print after low vision assessment. A total of 230 students were examined (51 school and 16 university students in Uganda and 163 students in Kenya, aged 5-22 years), 147 of whom had a visual acuity of less than 6/18 to perception of light in the better eye at presentation. After

refraction, seven of the 147 achieved 6/18 or better. Eighty-two (58.6%) of the 140 students with low vision (corrected visual acuity in the better eye of less than 6/18 to light perception) had refractive errors of more than 2 dioptres in the better eye, and 38 (27.1%) had more than 2 dioptres of astigmatism. The result was that forty six per cent of students with low vision (n = 64) could read N5-N8 print unaided or with spectacles, as could a further 33% (n = 46) with low vision devices. Low vision devices were indicated in a total of 50 students (35.7%).²⁹

Ji YH, Park HJ, Oh SY suggested that the best corrected visual acuities without low vision aids were less than 0.3, but with the help of low vision aids, vision improved to more than 0.4 in 87% of the patients for near vision, and 56% for distance vision. Hand held magnifiers, high-powered spectacle lenses and stand magnifiers were the low vision aids commonly used by people for near vision¹⁰

In a study done by Temel A; 185 patients had undergone an examination and issued with a prescription for low vision. 77% patients benefited from the low vision aids. Spectacle-mounted magnifiers, high reading additions and telescopes were used as LVDs.¹¹

Margrain TH have stated that after the low vision assessment and provision of a suitable low vision aids, 88% of the new patients were able to read N8 or smaller text. Reading ability was assessed by the patients' own spectacles and with an appropriate low vision aids. Data of 168 people were collected over a 6 month

period .The mean functional visual acuity was equated to 6/36 and 77% of patients were able to read news prints (N8).¹²

Nilsson UI found that increased near addition and hyperocular lenses the main aids for reading and near vision, the mean power being 17D (glaucoma), 23.5D (RP) .The number of individuals able to read newspaper text increased from 16.1% to 100% for the glaucoma patients, from 14.8% to 100% for the myopes and from 50% to 95.5% for RP patients.¹³

Leat SJ, Fryer A, Rumney NJ stated in their special report on "Outcome of low vision aids provision; the effectiveness of a low vision clinic" that tests of the reading speed and questionnaires were administered in the patients' home after initial and follow up visit to a LV clinic. There was a discrepancy between ability to read 1M print in the clinic (75% of the patients) and the reported ability to read regular sized prints at home (35%). There was some association between perceived benefit and frequency of using LVAs, but not with the duration of the use¹⁴.

In a study done by Rinnert, Lindner H, Behrens-Baumann W, after a 3 months minimum period of using the low vision aids, the patients were visited at their homes. Near visual acuity was started under domestic and optimized condition of illumination. The main field of using LVD was reading (68%)¹⁵.

In a study done by Hornby S.J., Adolph. S, Gothwal VK, Gilbert CE, Dandona L, Foster A, the needs for low vision aids were assessed among 99 children. 8 unilateral cases were excluded. 91 bilateral cases were refracted and assessed for LVDs. 6 (8%) could read N10 with magnifiers.¹⁶

Collee CM, Jalkh AE, Weiter J.J, and Friedman G R studied 71 patients with Stargardt's disease to evaluate their potential for improvement in visual acuity with low vision aids. In 54 patients, the best-corrected reading acuity obtained was 4.00-point print. In all cases, low vision aids improved visual acuity for distance and near¹⁷

The result of the study done by leat S. J, karadsheh, S indicated that children do use & benefit from the low vision aids & that the child need for near low vision aids can be predicted from their age, unmagnified reading performance and visual field characteristics. Many visually impaired children both in mainstream special unit and in school for the blind were not being supplied low vision aids. Many had not had a low vision aid with in one year and others were experiencing difficulties with low vision aids that could be eliminated¹⁸.

Bowers AR, Lovie-Kitchin JE, Woods RL stated that silent reading rate & eye movement characteristic for text passages at critical print size of 21 subjects

aged 14 to 88 years with macular disease were measured with or without their preferred low vision devices. When reading at critical point size in terms of reading rate there was no advantage to use large print over optical low vision devices¹⁹

Ritchie JP, Sonksen PM, Gould E. were done a study on Low vision aids for preschool children in Wolfson Centre, Institute of Child Health, London.

The study was made of the use of low vision aids to augment the vision of children with very severe visual disability. This paper reported the results for 28 children, using a stand magnifier, 26 of whom were aged between 18 and 60 months. Success was evaluated by measuring functional vision for nursery-age learning material in aided and unaided conditions. Half the children showed improved functional vision and one-third retained the magnifier for continued use.. There was also a tendency for unaided functional vision to improve during the trial period with the magnifier at home.²⁸

MATERIALS AND METHODS

METHODOLOGY

Operational definitions

Blind schools: The integrated schools for the blind.

Rehabilitation services: Counseling, psychotherapy, communication, skill training, orientation and mobility therapy and vocational rehabilitation provided to the visually impaired individuals.

Childhood blindness: Visual acuity less than 3/60 in the better eye of children below 15 years of age.

Magnifier: An optical instrument used to magnify the apparent size of a near object.

Equivalent viewing distance: distance at which original object would subtend an angle that is equal to the angle subtended by the image at the observer's eye.

Magnification: an increase in apparent size, perceived size or an actual size of an object in relation to the object.

Study area

The 3 Blind schools in Kathmandu, Lalitpur and Kavre districts.

- 1) Laboratory Higher Secondary School, Kirtipur, Kathmandu.
- 2) Namuna Machhendra Boarding school, Lagankhel, Lalitpur.
- 3) Sanjivani Higher Secondary School, Dhulikhel, Kavre

Target population

Partial sighted students in Blind schools.

Study population

Blind children studying in Blind Schools.

Study period:

6 months. (Feb 1st-Aug 1st)

Inclusion criteria:

All students who were partially sighted

Exclusion criteria:

The students not willing to participate in the study.

The students not having near vision problem.

The students having only Perception of Light.

Sampling technique

Purposive sampling was done for this study

Type of study

Intervention, Qualitative study

Target population

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The students having only Perception of Light.

Sampling technique

Purposive sampling was done for this study

Type of study

Intervention, Qualitative study

Procedures of Examination

Patients' selection: Distance Visual Acuity was taken in all blind students of the 3 integrated blind schools of Kathmandu, Lalitpur and Kavre districts only after taking verbal consent from Headmaster of the schools. Those students having visual acuity greater than light perception were included in the study for further evaluation.

A Pro-forma was developed as to meet the requirements of the study and all the findings were included separately for each individual participating in the study.

1. History taking

History taking included ocular and visual history, medical history, family history, psychosocial history, medication and allergies, age of entrance at school and duration of school.

2. visual acuity measurement

Distance visual acuity was determined in external illumination first monocularly and then binocularly with Bailey Lovie chart (log MAR chart). If distance visual acuity could not be assessed by Bailey Lovie Chart then it was recorded as hand movement (HM), light perception (IP) or no light perception (NPL).

Near visual acuity (NVA) was measured monocularly & binocularly at a distance of 25 cm having the Lighthouse Near Acuity Test chart.

b. Subjective Refraction

Subjective refraction was done on all subjects with significant refractive error as determined by retinoscopy. If retinoscopy was not possible, subjective refraction was done with abrupt lens jumps (just notice as a difference). Best corrected DVA with corrective lens was recorded.

On the basis of the best distance visual acuity, all the students were categorized into 5 different visual impairments according to WHO classification.

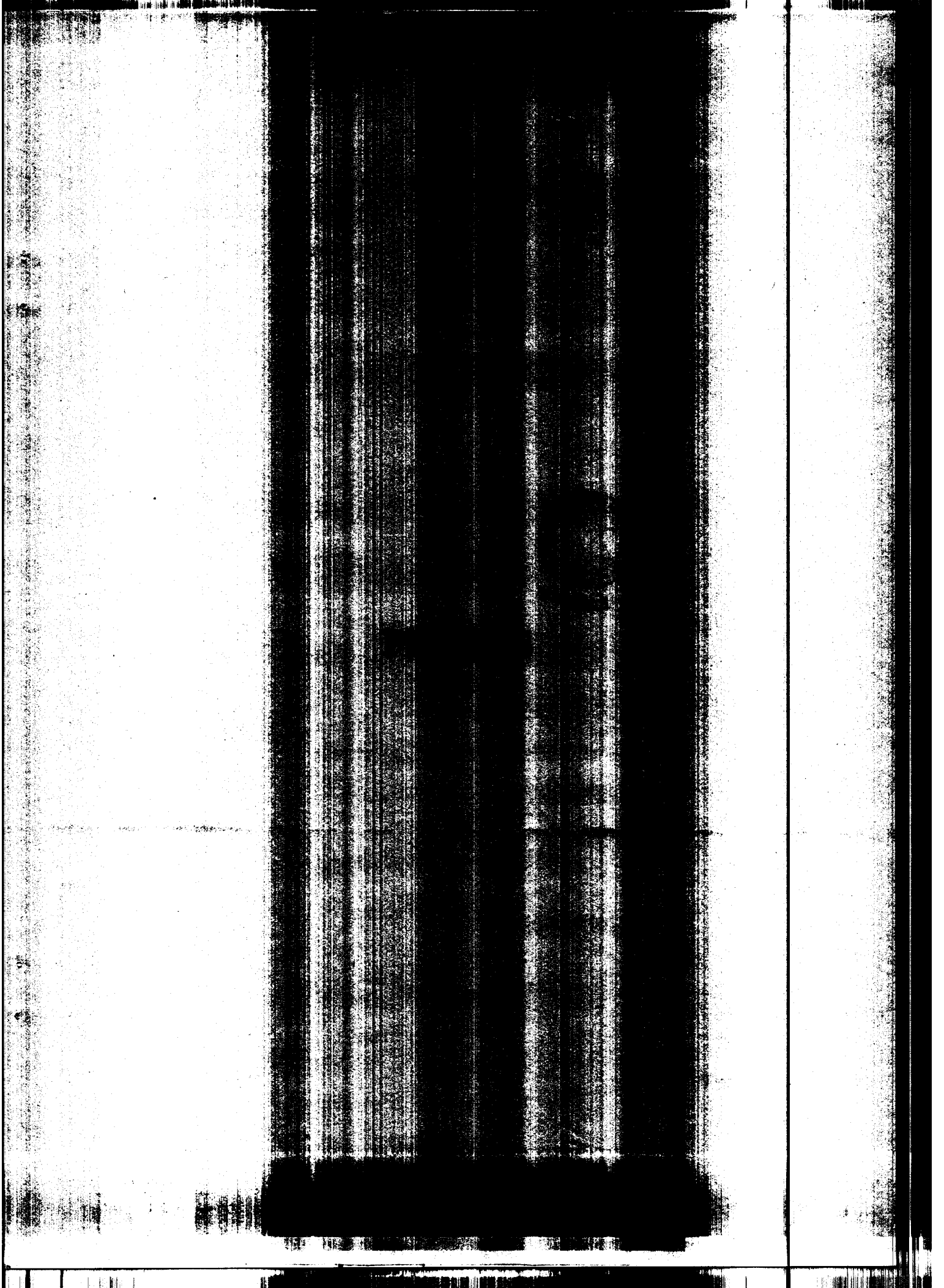
6. visual Field:

Visual field was assessed monocularly by confrontation method and Amsler grid and scotoma, field constricts or other abnormalities of visual field were recorded.

Those that could benefit from medical or surgery were referred to BPKLCOS for further evaluation and management and those having a potential of better visual performance with the low vision devices were evaluated thoroughly.

7. Near Visual Assessment with low vision aids

The power of the magnifiers was expressed as Equivalent Viewing Distance (EVD). The EVD that was required for the student was calculated with the low vision aids and on the basis of that , Near Visual acuity was recorded at different distances and the reading performance was taken. The most preferred LVAs were given. At the same times, maximum reading rate was recorded as letter per minute. On the three consecutive follow up in the intervals of one month, Near Visual Acuity, reading rate and wearing time per day were recorded each and every cases.



PHOTOS



Performing Low Vision Evaluation of Visually Impaired Students



Assessing Near Visual acuity Improvement with Low Vision Aids

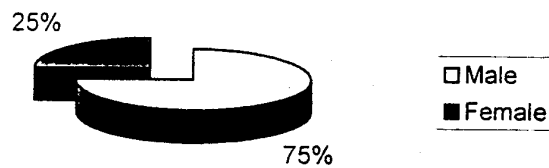
RESULTS

Figure-1: Bar diagram of age and sex distribution of the cases



Figure 2 showed that in this study, 15 (75%) males and 5 (25%) cases females were included.

Figure-2: Sex ratio



Ethnic distribution of the cases shows that the numbers of **Brahmin** students were maximum that account 50% of the cases. The number of cases in Chhetri and Mongols were found to be equal showed in table 2.

Table 2: Ethnic Distribution:

Ethnic group	No.	Percentage
Brahmin	10	50
Chhetri	4	20
Mongol	4	20
Newar	1	5
Others	1	5
Total	20	100

Figure-3: Pie diagram of ethnic distribution of the cases

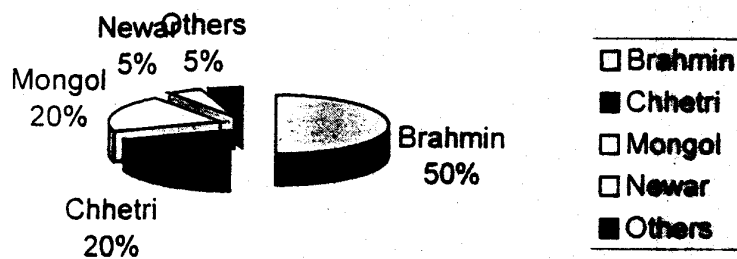


Table3:

Types of Non-optical aids used before intervention of optical aids.

Non-optical aids	No.	Percentage
Braille	6	30%
Can read large print	6	30%
Both	8	40%

Table 3 showed that most of the students (40%) were using Braille as well as large print books as a non-optical aids. However, 30% of the students were using only Braille during reading period.

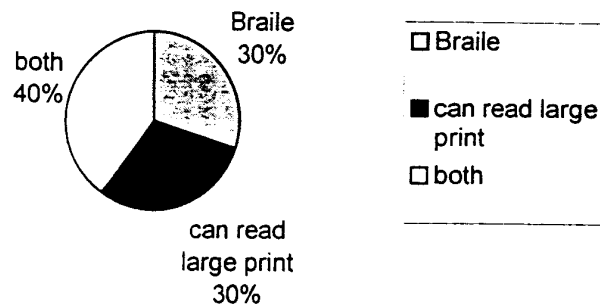


Fig .4: Types of Non-optical aids used before intervention of optical aids.

Majority of the students (45%) had visual acuity of $<3/60$ - $1/60$ falling in the 3rd category of visual impairment where as 35% of the students had 1st category of visual impairment.

Category of visual impairment	Number	Percentage
$<6/18$ - $6/60$	7	35%
$<6/60$ - $3/60$	2	10%
$<3/60$ - $1/60$	9	45%
$<1/60$ - $\rightarrow PL$	2	10%
Total	20	100%

Table 4: Visual Status of students - Distance Acuity (According to WHO Classification)

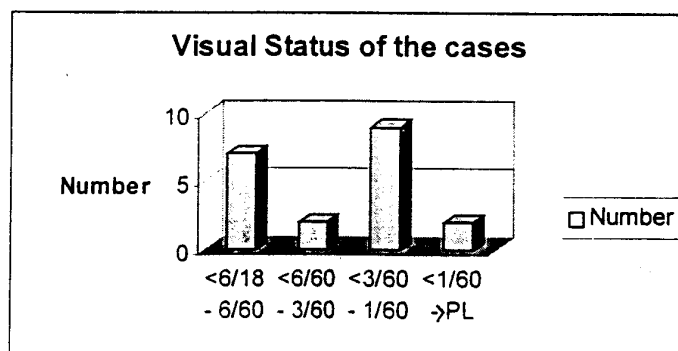


Figure 5

The table shows that majority of the students had near acuity of 2M -<4 M (30%) that indicated better prognosis for near vision. there was no students of <2M near acuity. The near acuity of 4 M - <6 M found in 20% of the students and 14M->14M in 15% of the cases.

Table5

Visual Status of students without low vision aids-Near Acuity

Near Acuity	No	Percentage
<2 M	0	0%
2 M- <4 M	6	30%
4 M - <6 M	4	20%
6 M - <8 M	0	0%
8 M -<10 M	3	15%
10 M- <12 M	3	15%
12 M-<14 M	1	5%
14 M- >14 M	3	15%

Table 6: Visual Status of students with low vision aids-Near Acuity

Near Acuity	No	Percentage
<2 M	9	45%
2 M- <4 M	7	35%
4 M - <6 M	2	10%
6 M - <8 M	1	5%
8 M -<10 M	0	0%
10 M- <12 M	1	5%
12 M-<14 M	0	0%
14 M- >14 M	0	0%

Table 6 showed that the near visual acuity improvement with low vision aids in which most of the students (45%) read the letter size <2M with low vision aids. The near acuity of 2M -<4M was found in 35% of the cases. This table indicates that there was no student of near acuity 14M ->14 M with LVA.

The table indicates that most of the students (^{55%}~~50%~~) were prescribed hand held magnifiers. 305 of the students were benefited with stand magnifiers. one student didn't use any magnifier. 10% of the students read the needed letter sizes even with their own spectacles.

Table 7: Types of Magnifiers used:

Types	No.	Percentage
Hand held	11	55%
Stand	6	30%
Only glass	2	10%
None	1	5%

Fig 8: Types of Magnifiers used:

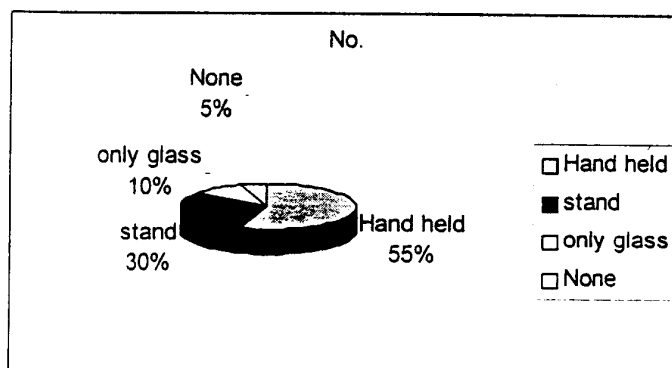
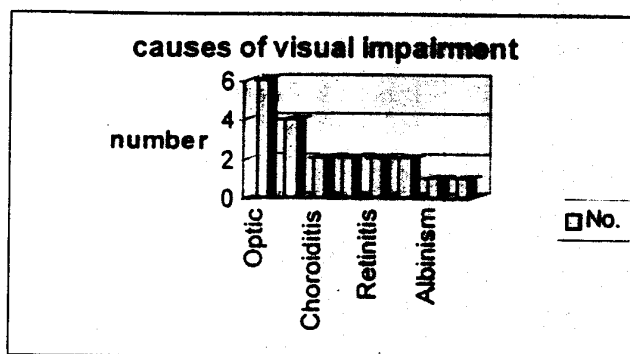


Table 8 shows that the cause of the visual impairment in most of the students was due to optic atrophy(30%).The second most common cause was the corneal opacity(20%).

Table 8: Causes of visual impairment

Causes of visual impairment	No.	Percentage
Optic atrophy	6	30%
Corneal opacity	4	20%
Choroiditis	2	10%
PHPV	2	10%
Retinitis Pigmentosa	2	10%
Amblyopia	2	10%
Albinism	1	5%
congenital glaucoma	1	5%
Total	20	100%

Fig.: Causes of visual impairment



Maximum oral reading rate (LPM) Exam period	Age	Near visual acuity	MORR (LPM) In last F/U	Difference
120	16	1M	120	0
80	14	1M	80	0
72	10	1M	84	12
60	15	1M	65	5
60	13	1M	65	5
36	15	2M	40	4
36	12	2M	40	4
32	15	1M	36	4
30	11	2M	30	0
30	12	1M	50	20
24	14	1M	30	6
24	16	2M	30	6
22	16	1M	26	4
20	13	1M	26	6
13	9	1M	20	7
12	15	2M	16	4
10	15	1M	10	0
10	9	2M	10	0
8	12	1M	12	4
8	11	4M	8	0
Mean difference				4.50

Near text visual acuity ranged from 1M to 4M print sizes. Maximum Oral reading rate increased by a mean of 4.5 letter per minute during 3 months for the students with partially sighted in this study.

DISCUSSION

DISCUSSION:

A total of 20 students from 3 blind schools were included in the study. This study showed that 75% of visually impaired students in the blind schools were males. Even though, the sample size was small, the results show that the number of male students were greater than females in spite of the fact that 59.8% of the visually impaired in Nepal are females²⁶. This study does correlate with most of the other studies done in different parts of the world. This study agrees with Khanal Santosh, Evaluation of causes of visual impairment in students of blind schools in Katmandu Valley, 2001 study⁸ done in Nepal that showed that males were found predominately in the blind schools (64.10%). This result is in agreement with Khalid F Tabanna and Ishan A Badr study²⁷ which showed that in Saudi Arabia, which has a similar male-dominant society, 63.53% of the students in blind schools were males.

The age distribution of blind students was within the normal school age group. All the students belonged to the group under 16 years i.e. children. The oldest subject was of 16 years. The involvement of this age group may be due to admission criterion of blind schools.

On evaluation of ethnic distribution of the students, many of the students belonged to Brahmin accounting for 50%, followed by Chhetri (20%) and Mongol

(20%). However, in study done by Khanal Santosh in Katmandu Valley, there was no significant difference in number of students of different ethnic groups.

There was almost equal number of students who were using Braille or Large print books or both for reading as non-optical aids. Optical low vision aids were not prescribed to anyone of them.

On evaluation the visual status (distance acuity) of the students, it was found that 35% of the students were legally blind and 30% had mild visual impairments on the basis of WHO classification of visual impairment.

While considering Near Acuity after refractive correction but without any optical aids, 30% of the students had vision 2M -<4M. 20% of the students could read only 12M or larger than 12M. There was not a single student having near vision <2M. On evaluation of Near Acuity with low vision aids, 45% of the students could read <2M print size. There was not a single student having near vision equal or less than 12M. This showed that low vision aids significantly improved their near visual acuity as well as were found to be more useful to those students who could read <2M letter size with LVAs. There was less prognosis for those students who could read letter size 6M or >6M with LVAs. In a study on Evaluation of the improvement with correction of refractive error and low-vision devices (LVDs) was conducted by Hornby SJ, Adolph S, Gothwal VK, Gilbert CE, Dandona L, Foster A.²⁵ in six blind schools of Andhra Pradesh in 291 students under 16 years, found 41 children (15.4%) were able to read <2M though they

were studying Braille. The discrepancy in the results between two studies may be due to small sample size in this study and may be some of the students were using large print books unlike the students in the above study who were only using Braille.

55% of the students were given Hand held magnifiers. 30% of the students were benefited with Stand magnifiers. One student suffering from congenital glaucoma did not use any magnifier due to insignificant improvement of near acuity with LVAs that was not sufficient for reading. 10% of the students could able to read the needed letter size with their own spectacles.

Optic atrophy and corneal opacity were the common causes of the visual impairment in 30% and 20% of the visually impaired students examined. Most of the eyes with corneal opacity were total leucomatous scarring with excessive vascularization.

After 3 months follow up, Reading rate increased by a mean of 4.55 letters per minute of the students using LVAs. In this study, result showed that the reading speed increment is directly proportional to the age. This is to be expected as children are still maturing in their basic reading skills during school years. Fellenius²² reported that visual acuity; the reading medium and the form of the magnification did not have a decision effect on reading ability.

Smaller the print size readable with LVAs, greater would be the reading speed. In this study, the student who could read smaller letter size (1M) obtained higher reading speed with maximum of 120 lpm whereas only 8 lpm of a student who could read 4M letter with LVAs.

CONCLUSION AND RECOMMENDATION

CONCLUSION:

After completion of the study, following conclusions were drawn:

Males were predominately seen in blind schools.

Out of 88 blind students, 27 (30.7%) students were visually impaired.

There were significant ethnic variations in blind schools. Most of the students were Brahmin accounting for 50%.

Most of the students included in the study had third category of visual impairment according to WHO criterion (legal blindness).

Optic atrophy was found to be the commonest cause of visual impairment, accounting for 30% of all the visually impaired students.

Best corrected near visual acuity without LVAs accounted for letter size 2M- <4M having 30%, letter size 12M or >12M having 10%. Not a single student could read <2M-letter size.

Majority of the visually impaired students had good near visual acuity improvement with LVAs.

Maximum Oral Reading Rate varied with near visual acuity .

After 3 months of using low vision aids, reading rate increased by a mean of 4.55 lpm for the students with visual impairment.

RECOMMENDATION:

From this study, it can be inferred that many of the students studying in blind schools as a blind can use their residual vision if appropriate LVAs are given. So, screening programs should be carried out in every blind school in Nepal to extract visually impaired population out of the blind students. So, development and strengthening of affordable and accessible low vision services in Nepal could help these populations for enhancing their quality of life.

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APPENDIX

**NEAR VISUAL ACUITY IMPROVEMENT WITH LOW VISION AIDS
IN VISUALLY IMPAIRED STUDENTS OF BLIND SCHOOLS IN
KATHMANDU, LALITPUR AND KAVRE DISTRICTS**

RESEARCH PROFORMA

Date: _____

Name:Age/Sex:

Ethnicity:(Brahmin/Chhetri/ Newar/Mongols/Others)

School: Class:.....

Age of entrance at school: _____years

Duration of schooling: _____ years

HISTORY

Ocular/Visual history:

Previous eye examination: Yes/No

If yes,

Diagnosis:

Surgical/ Medical Rx:(Yes / No) Specify;

Previous rehabilitation: (Yes / No) Specify;

Current devices: (Yes / No) Specify;

Spectacle wear: (Yes / No) Specify;

Duration of vision loss:

Present visit:

Mobility:

Extra light benefit for reading: (yes/ no)

Ability to perform the following tasks:

Read a newspaper Watch T.V.....

Recognize people Write.....

Tell timeIdentify money...

Medical history:(yes/No)

specify

Systemic history:(yes/No)

specify

Family history:(yes/No)

specify

Psycho-sociologic history:

Living situations:

Mode of transportation:

Ambition:

Participation in social activities:(Yes/No) Specify

Additional Disability

Hearing loss (Yes/No)

Mental retardation (Yes/No)

Physical retardation (Yes/No)

VISUAL ACUITY

Visual acuity without Rx.

Distance : OD_____ OS_____ OU_____

Chart:

Near: : OD_____ OS_____ OU_____

Chart:

Visual acuity with Rx.

Distance : OD_____ OS_____ OU_____

Near: : OD _____ OS _____ OU _____

EXTERNAL EXAMINATION

EOM:

Cover test:

Viewing: central/ eccentric (nystagmus)

Pupils:

REFRACTION:

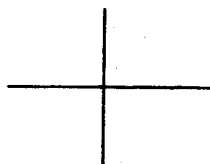
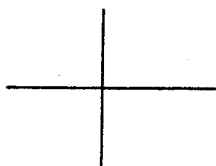
OD

OS

Retinoscopy:

Possible/ Not possible

Possible/ Not possible



Procedure:

Standard/ Radical/ Off axis

Standard/ Radical/ Off

axis

Working distance:

.....cm

.....cm

Subjective:

(JND/Retinoscopy reading)

Distance:

VA

OD _____

OS _____

OU _____

Near:

OD _____ OS _____ OU _____

Ocular Health Assessment

Slit Lamp Examination

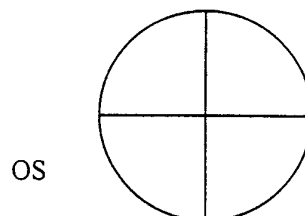
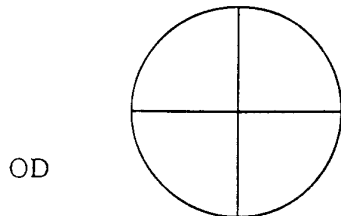
OD		OS
	Lids	
	Conjunctive	
	Cornea	
	Anterior Chamber	
	Iris	
	Lens	
	Vitreous	
	Fundus evaluation:	
	Optic Nerve Head	
	Cup-Disc Ratio	
	Macula	
	Vessels	
	Periphery	
	Others	

IOP measurement:(digital method)_____

Visual Field Evaluation: Confrontation Test

Amsler chart:

Target size:



Working Distance:.....

Special Procedures:(only if necessary)

Ultrasonography:

Keratometry:

Applanation Tonometry:

Dark Adaptometry:

Causes of Visual Impairment:

(Avoidable/unavoidable)

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

AIDS	PERFORMANCE/COMMENT
Near:	
ASSESSMENT	PLAN
Near:	

Distance Visual Acuity with LVAs

OD: _____

OS: _____

Near visual acuity with LVAs

OD: _____

OS: _____

Reading speed performance:.....LPM

First follow up:

Distance Visual Acuity with LVAs

OD: _____

OS: _____

Near Visual Acuity with LVAs

OD : _____

OS: _____

Reading speed:.....LPM

Wearing time/day:.....hrs

Improvement: (yes/no) _____

Second follow up:

Distance Visual Acuity with LVAs

OD: _____

OS: _____

Near Visual Acuity with LVAs

OD : _____

OS: _____

Reading speed:.....LPM

Wearing time/day:.....hrs

Improvement:(yes/no) _____

Third follow up:

Distance Visual Acuity with LVAs

OD: _____

OS: _____

Near Visual Acuity with LVAs

OD: _____

OS: _____

Reading speed:.....LPM

Wearing time/day:..... hrs

Improvement:(yes/no) _____