

# Evaluation of low vision and its rehabilitation in various disorders

Kamal Mohan Verma<sup>1,\*</sup>, M.P.Tondon<sup>2</sup>

<sup>1</sup>Director, Mohan Eye Care Hospital Pvt. Ltd.

<sup>2</sup>Professor Ophthalmology, M.L.N.Medical College Allahabad.

**\*Corresponding Author:**

E-mail: Kmv319@yahoo.co.in

## ABSTRACT

**Background:** A the most recent (1997) project estimates world blindness to some 45 million blind, and an additional 135 million visually disabled (those with low vision). About 90% of the world's blinds live in the developing world. It is estimated that there are 9-12 million blind people in India which amounts for one- fourth of all the blind people worldwide


**Objective:** To evaluate the low vision patient, to improve the quality of life with low vision aids of visually impaired patient and rehabilitation of low vision aids as per the need of the patient.

**Material and Method:** Total 110 patients were taken for the evaluation of low vision and its rehabilitation in various disorders. The patient underwent a comprehensive clinical low vision examination, functional evaluation, assessment of patients need and demonstration of low vision devices.

**Result and interpretation:** Majority of the patient were between the age group of 10-29 years, that is, about 45.46% of the total patients in study and males were slightly more 60(54.54%) as compared to females 50 (45.46%).The most patients have BCVA for distance before giving low vision is 5/60 – 3/60 in 60(54.54%) followed by 6/18-6/60 in 25 (22.72%) and 2/60-PL positive in 25 (22.72%) which is improved up to 5/60-3/60 in 50 (45.45%) followed by 6/18-6/60 in 40 (36.36%) and 2/60-PL positive in 20(18.18%) after prescribing low vision aids. The BCVA for near before giving low vision aids is  $\leq$ N/36 in 60 (54.54%) followed by N/12-N/18 in 40 (36.36%) and N/10 in 10 (9.09%) patients, which is improved up to N/10 in 55 (50%) patients followed by N/12-N/18 in 35 (31.81%) and  $\leq$ N/36 in 20 (18.18%) after prescribing low vision aids.

**Conclusion:** The incidence of low vision is mostly underestimated due to lack of knowledge about this condition. By proper diagnosis and evaluation, low vision patients can be rehabilitated to perform their day to day activities thus improving their quality of life.

**Key words:** Low vision, Rehabilitation

Access this article online	
Quick Response Code:	Website: www.innovativepublication.com
	DOI: 10.5958/2395-1451.2015.00017.7

## BACKGROUND

The most recent (1997) project estimates world blindness to some 45 million blind, and an additional 135 million visually disabled (those with low vision). About 90% of the world's blinds live in the developing world. It is estimated that there are 9-12 million blind people in India which amounts for one- fourth of all the blind people worldwide.

Until 1992, low vision was defined as a best corrected visual acuity of  $< 6/18 - 3/60$  in the better eye. However, there have been reports of useful residual vision in about 20% of children who were labeled as blind. Unfortunately the use of this residual vision has been ignored and children have been discouraged from its use. Hence a working definition of low vision was put forward in 1992 at WHO meeting in Bangkok.

“A person with low vision is one who has impairment of visual function even after treatment and/or

refractive correction, and has a best corrected visual acuity(BCVA) in the better eye  $< 6/18$  to light perception (PL), or visual field of  $< 10^\circ$  from the point of fixation, but who uses or is potentially able to use vision for the planning or execution of a task ”.

A survey in 1986 by the World Health Organization (WHO) and National Programmed on prevention and Control of (NPPCB) in India showed that 10% of the 9.61, that is 0.96 million persons, have incurable blindness and would require rehabilitation services. It has been observed that almost 90% of the so called blind population do not have total loss of visual function, but retain a degree of usable residual vision . So, there is a great need for comprehensive low-vision rehabilitation services in India and other developing countries.

The impact of low vision on a person's quality of life con is devastating. But people should not accept the statement that nothing could be done about their low vision. People with low vision can improve their quality of life through visual rehabilitation services. To teach them how to use their remaining vision more effectively using a variety of visual and adaptive aids, may bring them back or help them keep their independence. Low vision rehabilitation begins with a careful evaluation by an optometrist or ophthalmologist skilled in low vision rehabilitation.

Although there has been an awareness of low-vision rehabilitation among eye-care professionals in India, concrete steps have not been taken to develop low-vision services. Eye-Care professionals in the field have called for the improvement of vision rehabilitation services in India for many years. To appropriate and effective low-vision services, we need reliable and up-to-date information on low-vision patients in India.

### AIMS AND OBJECTIVE

- To evaluate the low vision patient
- To improve the quality of life with low vision aids of visually impaired patient.
- Rehabilitation of low vision aids as per the need of the patient.

### MATERIAL AND METHOD

This study was conducted at Regional Institute of Ophthalmology at M.D. Eye Hospital Allahabad during period of 2005 to 2006. The patients were selected for low vision and motivated for the use of low vision aids. The patient underwent a comprehensive clinical low vision examination such as name, age, sex, occupation, consanguinity history, medical history, visual history, psychological history, mobility history, activities of daily living, Illumination distance and near vision work, school and hobbies, past history of any ocular surgery using glasses.

#### Pre – examination assessment

**Functional evaluation:** This is very essential as it evaluates the patient's skill to carry out every day activities. The concept of functional vision means the use of vision for a particular purpose e.g., to carry out daily activities. Functional vision can be improved with refractive correction or by the use of low vision devices or by proper instructions and training for the use of visual aids.

**Functional assessment:** Various factors may affect person visual functions

**Phase 1:** Implement evaluative activities to assess visual function, this assessment is usually qualitative, but many also includes some quantitative measures. For example –testing the ability to discriminate geometric shape, contours of objects and details of patterns may assess a patients functional visual acuity.

**Functional Visual acuity:** For distance task (roughly 10 feet), for intermediate vision task (2-8 feet), for near vision task (2feet & closure).

**Functional visual fields:** For central vision loss, for peripheral vision loss and for visual blur that involve the entire fields. Ability to cope with challenges related to glare illumination and contrast Ease of mobility.

Assessing the quality and nature of independent functioning of patient by using a combination of interview and standardized and non-standardized assessment tools.

- Occupational profile of each patient.
- History of engagement in occupation
- Daily routines and habits, values, interests and needs related to their priorities & targeted outcomes.

**Phase 2:** Entails the clinical evaluation of eye health and visual status in orders to enable the low vision physician to recommend optical devices and relevant rehabilitation services.

**Phase 3:** Instructive and Adaptive Training phase, focus on instructing the patients in the use of optical aids, non-optical aids and adaptive strategies in order to enable to resume participation in daily activities with increase independence ,confidence and safety.

**Phase 4:** follow-up and beyond, emphasizes the continuum of low vision care now established for the patients living with low vision.

**Assessment of needs:** To help us to assess the individuals who will benefit from low vision training and low vision devices Vision is essential for mobility, social contact, communication and Employment.

**Demonstration of devices:** This can be used to aid and enhance vision.

**Giving other information:** It is necessary to free the patient of old myths; for e.g. that eyes may be damaged by using vision, or by holding object very close to the eye. The individual has to realize that. The more the vision used, better the chances of improving it. The importance of adequate lighting, size, distance, contrast and of an adequate rest periods should be emphasized.

#### Clinical Examination

- **Case history:** Assessment of practical, educational and psychological problems is important.
- **Distance activities and Illumination:** L.H visual acuity test symbols (Lea Hyvainen, MD) were used at 3 meters Illumination of 250 lux at the test cart was achieved with fluorescent room Illumination with reflectors.
- **Refraction:**
- **Keretometry:** To detect refractive errors of astigmatism when indicated.
- **Trial of Telescope:** hand-held monocular telescope with finger ring was used in the better eye to improve distance tasks.
- **Field studies:** Amselr grid was used for qualitative analysis of the macula, Humphrey visual field analyzer and Confrontation test was used for peripheral retinal depression, in most responsive patients.
- **Biomicroscopy:** Cornea, lens and anterior structure of the eyes were examined using a slitlamp.
- **Fundoscopy:**
- **Binocular testing:** Titmus fly stereotest chart.
- **Colour Vision testing:** this give functional information as to how the patient performs in his every day environment.

- **Near point acuities and Illumination:** LH near acuity test symbols 20 cms overhead lamp 11 W cold white Fluorescent bul and 60 Wincandescent bulb was used.
- **Determination of magnification:** Required visual acuity for task.
- **Trial of near vision aids:** Spectacles aid (upto 24 D) bifocal, optical and non-optical hand-held/stand Magnifier, CCTV, reading lamp & stand were used.
- **Prescription of appropriate devices:** Once the examination is complete, suitable low vision devices were prescribed.
- **Training-instructional:** In focal distance, localization, fixation, scanning and tracing, mobility and DLS.
- **Counselling:** For education, vocational and psychological problems.
- **Follow-up:** Is important in order to assess the person’s performance with the prescribed visual aids and periodic follow-up visits should be scheduled to assess the amount of progress made.

**Guidelines for prescribing in optical Low Vision Devices:**

To determine the best distance vision, measure the best corrected visual acuity, determine the goal and reference acuity (M=r’f), where M is the magnification required, r is the reference distance in meter and, f is the strength in diopters and demonstrate the appropriate.

The following formulas are useful in the day to day low vision practice

1. **“Kosten baum rule”:** Is the reciprocal of the distant snellen visual acuity, e.g., if distant snellen visual acuity is 6/60 then the reciprocal will be 60/6=10D, that is patient will require 10 D add for near work.
2. **Brazelton formula:** Here the magnification = Best corrected distant visual acuity ×2.5×.
3. **Light house method :** The light house near visual acuity card can be used at 40 cm test distance requiring an add of + 2.50 D. The add can be increased depending on test distance even up to

10 cm. The chart gives the letter size in 'M' units on left side and diopter add on right side.

**RESULTS & INTERPRETATION**

**Table 1: Age wise distribution of patients**

Age group	No. of patients	Percentage (%)
10-29	50	45.46
30-49	25	22.72
50-70	35	31.81

Majority of the patient were between the age group of 10-29 years, that is, about 45.46% of the total patients in study.

**Table 2: Sex wise distribution of patients**

Sex	No. of patients	Percentage (%)
Male	60	54.5
Female	50	45.46

Males were slightly more 60(54.54%) as compared to females 50 (45.46%).

**Table 3: Disease wise distribution**

Type of disease	No. of cases	Percentage (%)
Pathological Myopia	10	9.09%
Retinitis Pigmentosa	15	13.63%
Staragardt Disease	15	13.6%
Diabetic Retinopathy	20	18.18%
ARMD	25	22.72%
Choroiditis (Central healed)	10	9.09%
Retinal Coloboma (Macula on)	10	9.09%
Optic Atrophy	5	4.55%

Majority of the patients were of age related macular degeneration, 25 (22.72%) followed by diabetic retinopathy, 20(18.18%) retinitis pigmentosa 15(13.63%), stargardt disease 15(13.63%), high myopia 10 (9.09%), retinal coloboma 10 (9.09%), choroiditis (central healed) 10 (9.09%) and optic atrophy 5 (4.55%).

**Table 4: BCVA for distance before giving low vision aids**

Disease / Visual Acuity	6/18 – 6/60	5/60 – 3/60	2/60 – PL Positive
Pathological Myopia	5 ( 4.55 % )	5 ( 4.55 % )	-
Retinitis Pigmentosa	-	10 ( 9.09% )	5 ( 4.55 % )
Staragardt Disease	5 ( 4.55 % )	10 ( 9.09 % )	-
Diabetic Retinopathy	5 ( 4.55 % )	10 ( 9.09 % )	5 ( 4.55 % )
ARMD	5 ( 4 .55 % )	15 (13.63 % )	5 ( 4.55 % )
Choroiditis (Central healed)	-	5 ( 4 .55 % )	5 ( 4.55 % )
RetinalColoboma(Macula on)	5 ( 4.55 % )	5 ( 4 .55 % )	-
Optic Atrophy	-	-	5 ( 4.55 % )
Total	25 (22.72% )	60 (54.54 % )	25 (22.72% )

Majority of the patients had BCVA for distance before giving low vision aids in the range of 5/60-3/60 in 60 (54.54%) followed by 6/18-6/60 in 25 (22.72%) and 2/60-PL positive in 25 (22.72%) patients.

**Table 5: BCVA for near before giving low vision aids:**

Disease / Visual Acuity	N/10	N/12 – N/18	≤ N/36
Pathological Myopia	-	5 ( 4.55 % )	5 ( 4.55 % )
Retinitis Pigmentosa	-	5 ( 4.55 % )	10 ( 9.09 % )
Staragardt Disease	-	5 ( 4.55 % )	10 ( 9.09 % )
Diabetic Retinopathy	5 ( 4.55 % )	10 ( 9.09 % )	5 ( 4.55 % )
ARMD	-	10 ( 9.09 % )	15 ( 13.63 % )
Choroiditis (Central healed)	-	-	10 ( 9.09 % )
Retinal Coloboma	5 ( 4.55 % )	5 ( 4.55 % )	-
Optic Atrophy	-	-	5 ( 4.55 % )
Total	10(9.09%)	40(36.36%)	60( 54.54 % )

Majority of the patients had BCVA for near before giving low vision aids is ≤ N/36 in 60 (54.54%) followed by N/12-N18 in 40 (36.36%) and N/10 in 10(9.09%) patients.

**Table 6: BCVA for distance after giving low vision aids:**

	6/18 – 6/60	5/60 – 3/60	2/60 – PL Positive
Pathological Myopia	10 ( 9.09% )	-	-
Retinitis Pigmentosa	5 ( 4.55 % )	10 ( 9.09% )	-
Staragardt Disease	5 ( 4.55 % )	10 ( 9.09 % )	-
Diabetic Retinopathy	5 ( 4.55 % )	10 ( 9.09 % )	5 ( 4.55 % )
ARMD	5 ( 4.55 % )	15 ( 9.09 % )	5 ( 4.55 % )
Choroiditis (Central healed)	-	5 ( 4.55 % )	5 ( 4.55 % )
Retinal Coloboma	10( 9.09 % )	-	-
Optic Atrophy	-	-	5 ( 4.55 % )
Total	40 (36.36 % )	50 ( 45.45 % )	20 (18.18% )

Majority of the patients had BCVA for distance after giving low vision aids in the range of 5/60-3/60 in 50 (45.45%) followed by 6/18-6/60 in 40 (36.36%) and 2/60-PL positive in 20 (18.18%) patients

**Table 7: BCVA for near after giving low vision aids:**

Disease / Visual Acuity	N/10	N/12 - N/18	≤ N/36
Pathological Myopia	10 ( 9.09 % )	-	-
Retinitis Pigmentosa	5 ( 4.55 % )	5 ( 4.55 % )	5 ( 4.55 % )
Staragardt Disease	5 ( 4.55 % )	10 ( 9.09 % )	-
Diabetic Retinopathy	10 ( 9.09 % )	5 ( 4.55 % )	5 ( 4.55 % )
ARMD	10 ( 9.09 % )	10 ( 9.09 % )	5 ( 4.55 % )
Choroiditis (Central healed)	5 ( 4.55 % )	5( 4.55 % )	-
Retinal Coloboma	10 ( 9.09 % )	-	-
Optic Atrophy	-	-	5 ( 4.55 % )
Total	55	35	20

Majority of patients had BCVA after giving low vision aids is N/10 in 55 (50%)patients followed by N/12-N/18 in 35 (31.81%) and ≤ N/36 in 20 (18.18%) patients.

**Table 8: Types of low vision devices**

Low vision disease	No. of cases	Percentage (%)
Magnifying glasses	85	77.27%
Hand held magnifiers	15	13.63%
Stand Magnifiers	5	4.55%
Telescope	5	4.55%

Majority of low vision devices used as low vision aids were magnifying. Glasses 85 (77.27%) followed by Hand held magnifiers 15 (13.63%), Stand. Magnifiers 5 (4.55 %) and Telescope 5 (4.55%).

**Table 9: Improvement in Quality of life after 1 month:**

Quality of life after 1 month	No. of patients	Percentage %
Improvement in day to day near work activities according to their need	55	50 %
Improvement in near and distance vision and satisfactory day to day activities.	45	40.91 %
No satisfactory improvement according to their need	10	9.09 %

**Table 10: Improvement in Quality of life after 6 month:**

Quality of life after 6 month	No. of patients	Percentage %
Improvement in day to day near work activities according to their need	50	45.46 %
Improvement in near and distance vision and satisfactory day today activities.	40	36.36 %
No satisfactory improvement according to their need	20	18.18 %

**CONCLUSION**

This study was carried out at regional institute of Ophthalmology, M.D Eye hospital affiliated to M.L.N. Medical College, during the year 2005 to 2006.

Total 110 patients were taken for the evaluation of low vision and its rehabilitation. Evaluation of low vision patient begins with assessment of the clinical background, functional assessment, vocation, independence in daily living activities, mobility and social interaction, psychological reaction, reading and writing performance with patients need and optometric evaluation. It is more important to evaluate the patient as a whole, and holistic approach is required.

According to present study, the maximum number of patients was of age related macular degeneration, those 25 (22.72%) patients.

The majority of the patients were between the age group of 10-29 year i.e., 50 (45.46). patients.

As per our study, showed Pathological myopia patients are 10(9.09%), Retinitis pigmentosa 15 (13.63%), Stargardt disease 15 (13.63%), Diabetic retinopathy 20 (18.18%), Age related macular degeneration 25 (22.72%), Retinal coloboma 10 (9.09%), Choroiditis (central healed) 10 (9.09%) and Optic atrophy 5 (4.55%) patient.

In present study, the majority of cases had BCVA for distance before giving low vision aids are 5/60 – 3/60 in 60 (54.54%) patients and BCVA for near before giving low vision aids are  $\leq$ N/36 in 60 (54.54%) patients.

The visual acuity for distance after giving low vision aids was improved up to 5/60 - 3/60 in 50 (45.45%) and visual acuity for near after giving low vision aids was improved up to N/10 in 55 (50%) patients.

In this study, the low vision devices i. e., magnifying glasses were maximally used in 85 (77%), Hand held magnifier was used in 15 (13.63%), Stand magnifier in 5 (4.55%) and telescope in 5 (4.55%) patients.

In this study, improvement in quality of life that after is 1 month 55 (50%) patients showed improvement in day to day near work activity according to their need. 45 (40.90%) of the total patients showed improvement in day to day near and distance vision and satisfactory day to day activities and 10 (9.09%) of the total patients had no satisfactory improvement according to their need.

After 6 months follow-up, there was slight decline of improvement in day to day near work activities according to their need from 55 (50%) patients at 1 month to 50(45.46%) patients at 6 month and also decline in improvement near and distance vision and satisfactory day to day activities from 45 (40.91%) patients at 1 month to 40 (36.36%) patients at 6 months.

No satisfactory improvement was seen in day to activity in 20(18.18%) patients at 6 month follow-up which was 10 (9.09%) at 1 month follow-up i.e. 10 (9.09%) patients noticed deterioration in performing day to day activity.

The incidence of low vision is mostly underestimated due to lack of knowledge about this condition. By proper diagnosis and evaluation, low vision patients can be rehabilitated to perform their day to day activities thus improving their quality of life.

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