Original Article

Visual Outcome Of Low Vision Patients With Optical Low Vision Devices

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Abstract

Background: World Health Organization defines low vision patients as a person who has impairment of visual functioning even after treatment and/or standard refractive correction, and visual acuity of the better eye less than 6/18 to light perception, or a visual field less than 10 degrees from the point of fixation, but who uses, or is potentially able to use, vision for the planning and/or execution of a task for which vision is essential. The National Blindness and Low Vision Prevalence Survey of Bangladesh, 2000 revealed that the prevalence percentage of low vision was 3.2 % and blindness 1.0%. Population growth and ageing will increase the risk that more people acquire vision impairment. **Objective:** To assess visual outcome of low vision patients with optical low vision devices attending low vision clinic of National Institute of Ophthalmology and Hospital, Dhaka, Bangladesh. **Methodology:** This prospective observational study was conducted in low vision clinic of National Institute of Ophthalmology and hospital from April, 2018 to September, 2020. The study included 48 low vision patients aged 10-56 years who had best corrected visual acuity (BCVA) 6/60 or more in the better eye. Selected patients underwent detailed history taking and thorough ocular as well as systemic examination. Optical low vision devices (monocular or bioptic telescopes, handheld or bar magnifier and prism spectacles) were prescribed in all patients. They were evaluated without low vision aids then immediately and 3 months after prescription of optical low vision devices. Best corrected distance and near visual acuity and contrast sensitivity were assessed in each follow-up. Data were recorded in a pre-designed data collection sheet and analyzed by using IBM SPSS Statistics version 26, paired 't' tests were done to assess the level of significance. **Results:** The mean age of the study group was 25.79±12.14 years with the age range of 10-56 years. Out of 48 patients 32 (66.67%) were male. Mean value of best corrected visual acuity was for distance Log MAR unit 0.76±0.16 (about 6/36) for near Log MAR unit 0.65±0.22 (about N10/1.25M) and for contrast sensitivity Log CS unit 1.15±0.56. With optical low vision devices, mean value of visual acuity for distance immediately after prescription was Log MAR unit 0.41±0.19 and after 3 months 0.41±0.20, for near immediately after Log MAR unit 0.39±0.12 and after 3 months Log MAR unit 0.39±0.12, for contrast sensitivity immediately after Log CS unit 1.40±0.63 and after 3 months Log CS unit 1.40±0.63. Changes in distant and near visual acuity as well as contrast sensitivity in each follow-up was statistically significant ($p<0.001$). Optical low vision devices used for distant vision were 3X binocular telescopes (56.25% study subjects), 4X monocular telescope (27.08%), and 2.1X See TV binocular telescopes (16.67%). Optical low vision devices used for near vision were 3X handheld magnifier (89.58%), 1.5X bar magnifier (2.08%), base in prism spectacles (6.25%). Main causes of low vision were found to be macular dystrophy (27.1%), retinitis pigmentosa (20.8%), and myopic degeneration (14.6%). Conclusion: Visual acuity for distance and near as well as contrast sensitivity improves significantly with optical low vision devices in low vision patients.

Keywords: Visual impairment, Low vision, Optical low vision device.

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Introduction

Globally, it is estimated that 36 million people are blind and 217 million have moderate to severe vision impairment. About 80 million people have permanent vision impairment and can potentially benefit from low vision services (Bourne et al., 2017). In Bangladesh about 7.92% people above the age of 30 years are suffering from moderate visual impairment and furthermore 0.52% from severe visual impairment (Dineen et al., 2003). Population growth and ageing will increase the risk that more people acquire vision impairment.

Low vision not only affects the independence but also has significant psychosocial and economic impact on the individual, the family and society (Wittenborn et al., 2013). Major consequences of

vision impairment include a child's ability to pursue education (Kulp et al., 2016) and an adult's ability for gainful employment (O'Day, 1999), higher risk of death in road traffic accident (Kulmala et al., 2008), risk of falls (Crews et al., 2016; Lord, 2006), higher likelihood to suffer from depression and anxiety disorders (Kempen et al., 2012), difficulty in daily living and increased dependence (Brown et al., 2014; Haymes et al., 2002; Whitson et al., 2007, 2014). It is important to visually rehabilitate individuals with incurable visual impairment to improve their quality of life so that they can function as independently as possible. To lessen the degree of handicap related with visual problems by providing low vision aids as a part of a comprehensive low vision rehabilitative service is the most efficient mode (Hinds et al., 2003). Management of low vision through the provision of good quality services which are scalable, adaptable, cost effective and responsive to the population remains a VISION 2020 priority. The WHO's health systems framework, Education for All, Global Campaign for Education and United Nations Convention on the Rights of Persons with Disabilities provide the foundation for low vision services to reduce risk, promote best practice and so increase the quality of clinical and non-clinical care.

The World Health Organization defines low vision in regards to low vision care as "a person with low vision is one who has impairment of visual functioning even after treatment and/or standard refractive correction, and has a visual acuity of less than 6/18 to light perception, or a visual field less than 10 degrees from the point of fixation, but who uses, or is potentially able to use, vision for the planning and/or execution of a task for which vision is essential"

Optical low vision devices are varied and task specific. These devices can provide greatly increased magnification power and prescription strengths along with higher quality optics that are different from regular glasses and commercially available magnifiers. Optical low vision devices are cost effective and more available than other low vision devices. There are different types of optical low vision devices for distance, intermediate distance and near vision. Optical aids for distance and intermediate distance include telescopic system such as Galilean or Keplerian; Hand-held, spectacle-mounted, or clip-on; Monocular or binocular; Fixed focus, focusable telescope, or autofocus. Optical aids for near tasks include High-plus spectacles (microscopes), Hand-held magnifier, Stand magnifier, and Telescope system for near (telemicroscope).

This study aims to find out the visual outcome of low vision patients with optical low vision devices who attended the low vision clinic in National Institute of Ophthalmology, Dhaka, Bangladesh.

Methodology

This observational study was conducted at low vision clinic in National Institute of Ophthalmology and Hospital (NIOH), Dhaka, from April 2018 to September 2020. The study population was taken among low vision patients selected for optical devices attending in the Low Vision Clinic of National Institute of Ophthalmology and Hospital. The sampling method was purposive sampling. Inclusion criteria were Low vision patients selected for optical low vision device attending in the low vision clinic of NIO&H. Exclusion criteria were patients having worse than Log MAR 1 (6/60) best corrected visual acuity in their better eye, below 10 years and above 75 years of age, non-compliant to optical low vision device, unwilling to follow-up, suffering from diseases that renders them unable to communicate with the investigator and who are enrolled in any other study group.

Variables were age, gender, primary eye disease contributing to visual impairment, BCVA of better eye for distance, BCVA for near and Contrast sensitivity.

Selected patients underwent complete clinical evaluation including detailed history, general and systemic examination as well as detail ocular examination by slit lamp biomicroscope (Haag Streit BQ 900) and dilated fundus examination with the aid of a +78D and +90D (VOLK) condensing lens were done in the low vision clinic. Objective refraction was done by auto-refractometer (Nidek AR-310A) and subjective refraction by trial frame and trial lenses were done to determine best corrected

visual acuity (BCVA). Visual field was first evaluated by visual confrontation method and later by Humphrey visual field analyzer if BCVA of better eye is better than Log MAR 0.5 (6/18) but visual field restriction by confrontation method. The baseline visual parameters - BCVA for distance by LVRC 4 meter Tumbling Es Log MAR chart, BCVA for near by LVRC Log MAR near chart at 40cm, contrast sensitivity by Pelli Robson chart (Log CS) at 1 meter with overhead illumination. The aforementioned visual parameters were re-evaluated following application of optical low vision devices (2.5x, 3x, 4x monocular and binocular telescopes for distance and hand held, stand-mounted, dome magnifiers and spectacle mounted prisms of +6D to +20D, 9Δ base in prism for near) on first day and after 3 months following prescription of appropriate optical low vision aids. All the examination findings and relevant information were recorded in a pre-designed data collection sheet. An informed written consent was obtained from patient or legal guardian in every cases.

Statistical analyses

Statistical analyses were carried out by using the Statistical Package for Social Sciences version 26.0 for Windows (IBM SPSS Statistics). Normality was determined by plotting bell curve over 'outcome variable' histogram. A descriptive analysis was performed for all data. The mean values were calculated for continuous variables. The quantitative observations were indicated by frequencies and percentages. Paired t-test was used to compare mean value of visual status parameters following use of optical low vision devices with that of baseline. A "p" value ≤0.05 was considered as significant.

Results

This prospective observational Study was conducted over 48 diagnosed patients of low vision to assess the visual parameters with optical low vision devices. They were assessed first without optical low vision devices then immediately after and at 3 months following prescription of optical low vision devices. Best corrected visual acuity (distance and near) and contrast sensitivity with optical low vision devices were recorded in each visit.

Table 1: Age distribution of the study subjects (n=48)

Age group (Years)	Frequency	Percentage
<20	19	39.6
20 - 29	16	33.3
30 - 39	6	12.5
40 - 49	3	6.3
≥50	4	8.3
Total	**48**	**100.0**
Mean ± SD	25.79±12.14 years	

Table 1 shows the age distribution of the study subjects. Age was considered as discrete value in years and as stated by the study subject. Out of 48 patients 19 were below 20 years, 16 patients were within 20 to 30 years age, 6 patients were 30 to 40 years age, and 3 patients were 40 to 50 years age and 4 patients 50 years or more. The mean age of the study group was 25.79±12.14 years with the age range of 10-56 years.

Figure 1: Bar diagram showing gender distribution of the study subjects (n=48).

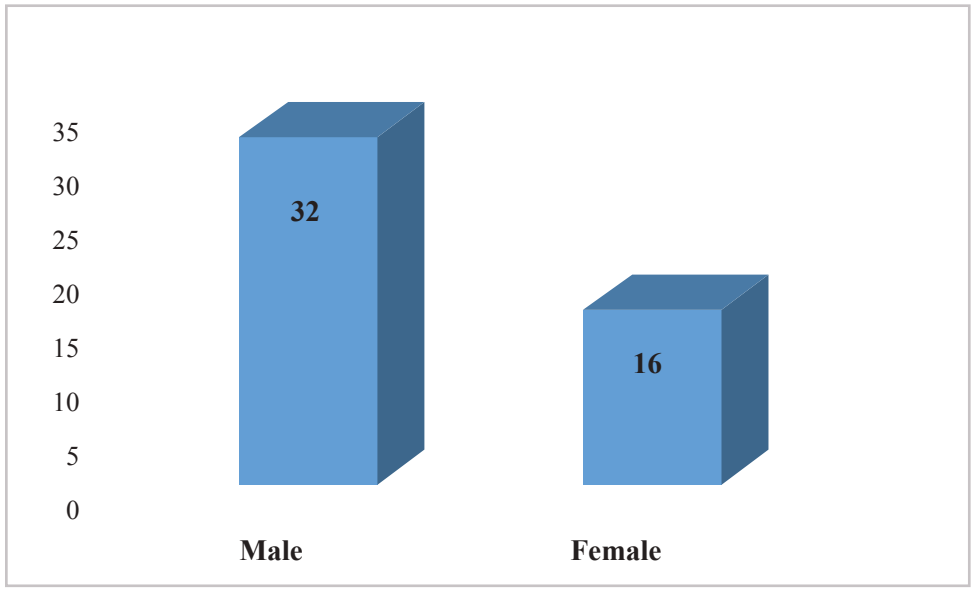

Figure-1 shows gender distribution of the study subjects, out of 48 patients 32 (66.67%) were male, and 16 (33.33%) were female. The Male: Female gender ratio is 2:1.

Figure 2: Pie chart showing distribution of primary eye diseases of the study subjects (n=48).

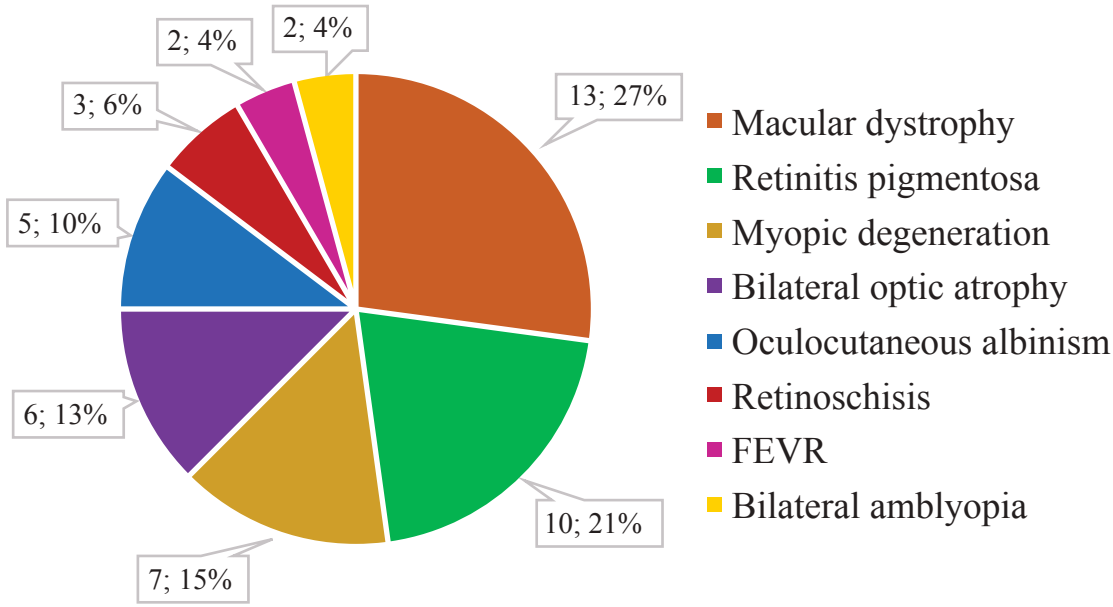

Figure 2 shows the distribution of primary eye diseases of the study subjects. Out of 48 patients 13 (27.1%) patients had macular dystrophy, 10 (20.8%) patients had retinitis pigmentosa, 7 (14.6%) patients had myopic degeneration, 6 (12.5%) patients had bilateral optic atrophy, 5 (10.4%) patients had oculocutaneous albinism, 3 (6.3%) patients had retinoschisis, 2 (4.2%) patients had FEVR and 2 (4.2%) patients had bilateral amblyopia.

Table 2: Distribution of minimum, maximum and mean value of baseline visual parameters of the study subjects (n=48).

Parameters	Minimum	Maximum	Value (Mean ± SD)
BCVA (Distance) (Log MAR unit)	1.00	0.60	0.76±0.16
BCVA (Near) (Log MAR unit)	1.20	0.30	0.65±0.22
Contrast sensitivity (Log CS unit)	0.15	2.10	1.15±0.56

Table 2 shows the distribution of minimum, maximum and mean value of baseline visual parameters (Distance BCVA, near BCVA, contrast sensitivity and color perception). At presentation Minimum distance BCVA was Log MAR unit 1 (6/60) in 41.67% study subjects and maximum distance BCVA was Log MAR unit 0.6 (6/24) in 22.92% study subjects, mean value was Log MAR 0.76±0.16 (about 6/36); Minimum near BCVA was Log MAR 1.2 (N50/6.3M) in 2.1% study subjects and maximum near BCVA was Log MAR 0.3 (N6.3/0.8M) in 2.1% study subjects, mean value was Log MAR 0.65±0.22 (about N10/1.25M). Maximum 11 (22.9%) study subjects had presenting near BCVA of Log MAR 0.4 (N8/1M) followed by 10 (20.8%) study subjects with near BCVA of Log MAR 0.6 (N12.5/1.6M). At presentation Minimum contrast sensitivity was Log CS 0.15 in 4.2% study subjects and maximum Log CS 2.10 in 2.1% study subjects, mean value was Log CS 1.15±0.56.

Table 3: Comparison of mean values of base line visual parameters and with optical low vision devices (n=48).

Parameters	Baseline value	Immediately after	p value	After 3 months	p value
BCVA (Distance) (Log MAR unit)	0.76±0.16	0.41±0.19	<0.001^{s}	0.41±0.20	<0.001^{s}
BCVA (Near) (Log MAR unit)	0.65±0.22	0.39±0.12	<0.001^{s}	0.39±0.12	<0.001^{s}
Contrast sensitivity (Log CS unit)	1.15±0.56	1.40±0.63	<0.001^{s}	1.40±0.63	<0.001^{s}

s=significant, p value obtained from paired t test, NA= not applicable as there is no difference

Table 3 shows the distribution of comparisons of mean value of visual parameters (distance BCVA, near BCVA, contrast sensitivity and color perception) with optical low vision devices on first day and at 3 months follow-up. On first day 85.42% study subjects had improvement of distant BCVA in 0.2-0.5 Log MAR unit range (about 2-4 Snellen lines) with optical low vision devices, mean value was Log MAR unit 0.41±0.19. After 03 months only 2 (4.17%) study subjects showed improvement of 0.1 Log MAR for distance from day one with optical LVDs. On first day 68.7% study subjects had improvement of near BCVA in 0.1-0.3 Log MAR range with optical low vision devices, mean value was Log MAR 0.39±0.12. After 03 months only 2 (4.17%) study subjects showed improvement of 0.1 Log MAR for near from day one with optical LVDs. The mean value of contrast sensitivity with optical LVDs was 1.40±0.63 Log CS, no improvement was seen after 3 months from immediately after.

Table 4: Change of distant visual acuity with optical LVDs in relation to primary eye diseases (n=48).

Primary eye disease (Frequency)	Distance BCVA (Mean±SD, Log MAR unit)		Change (percentage)	p value
	Baseline	With low vision device		
Macular dystrophy (13)	0.68±0.12	0.39±0.17	29	<0.001[s]
Retinitis pigmentosa (10)	0.84±0.15	0.53±0.14	31	<0.001[s]
Myopic degeneration (7)	0.74±0.19	0.24±0.17	50	<0.001[s]
Optic atrophy (6)	0.82±0.20	0.53±0.30	29	0.005[s]
Oculocutaneous albinism (5)	0.72±0.16	0.34±0.17	38	0.001[s]
Retinoschisis (3)	0.67±0.06	0.33±0.06	34	0.050 [s]
FEVR (2)	1.00±0.00	0.45±0.07	55	0.058
Amblyopia (2)	0.65±0.07	0.40±0.00	25	0.126
Total (48)	**0.76±0.16**	**0.41±0.19**	**35**	**<0.001[s]**

s=significant, p value obtained from paired t test, NA= not applicable as there is no difference

Table 4 shows the relationship between primary eye disease and change of distant BCVA with optical LVDs. Patients with FEVR (4.17% study subjects) showed 55% improvement from baseline followed by myopic degeneration (14.58% study subjects) and oculocutaneous albinism (10.42% study subjects) 50% and 38% respectively. The least improvement (25%) was shown by study subjects with amblyopia (4.17% study subjects). Study subjects with macular dystrophy (27.08%) and retinitis pigmentosa (20.83%) had shown 29% and 31% improvement from baseline respectively. Overall the average improvement from baseline with optical LVDs was 35%. Optical LVDs used for distant vision were 3X binocular telescopes (56.25% study subjects), 4X monocular telescope (27.08% study subjects), and 2.1 X See TV binocular telescopes (16.67% study subjects).

Table 5: Change of near visual acuity with optical LVDs in relation to primary eye diseases (n=48).

Primary eye disease (Frequency)	Near BCVA (Mean±SD, Log MAR unit)		Change (percentage)	p value
	Baseline	With low vision device		
Macular dystrophy (13)	0.59±0.21	0.40±0.13	19	<0.001[s]
Retinitis pigmentosa (10)	0.75±0.19	0.47±0.13	28	<0.001[s]
Myopic degeneration (7)	0.50±0.15	0.31±0.04	19	<0.011[s]
Optic atrophy (6)	0.87±0.21	0.43±0.15	44	<0.001[s]
Oculocutaneous albinism (5)	0.54±0.17	0.32±0.04	22	0.20
Retinoschisis (3)	0.57±0.15	0.33±0.06	24	0.192
FEVR (2)	0.85±0.21	0.40±0.00	45	0.205
Amblyopia (2)	0.70±0.14	0.40±0.14	30	ns
Total (48)	**0.65±0.22**	**0.39±0.12**	**26**	**<0.001[s]**

s=significant, p value obtained from paired t test, NA= not applicable as there is no difference

Table 5 shows the relationship between primary eye disease and change of near BCVA with optical LVDs. Patients with FEVR (4.17% study subjects) showed 45% improvement from baseline followed by optic atrophy (12.5% study subjects) and amblyopia (4.17% study subjects) 44% and 30% respectively. The least improvement was shown by study subjects with macular dystrophy (27.08%) and myopic degeneration (14.58%), 19%. Overall the average improvement from baseline with optical LVDs was 26%. Optical LVDs used for near vision were 3X handheld magnifier (89.58% study subjects), 1.5X bar magnifier (2.08% study subjects), base in prism spectacles (6.25% study subjects) and 1 study subject achieved LogMAR 0.3 (N6) vision with refractive correction only.

Table 6: Change of contrast sensitivity with optical LVDs in relation to primary eye diseases (n=48).

Primary eye disease (Frequency)	Contrast sensitivity (Mean±SD, Log CS unit)		Change (percentage)	p value
	Baseline	With low vision device		
Macular dystrophy (13)	1.55±0.14	1.82±0.25	27	<0.001[s]
Retinitis pigmentosa (10)	0.84±0.26	1.07±0.32	23	<0.001[s]
Myopic degeneration (7)	1.95±0.09	2.23±0.06	28	<0.001[s]
Optic atrophy (6)	0.35±0.15	0.45±0.27	10	0.102
Oculocutaneous albinism (5)	1.11±0.35	1.47±0.37	36	<0.001[s]
Retinoschisis (3)	0.85±0.31	1.25±0.35	40	0.015[s]
FEVR (2)	0.53±0.53	0.53±0.53	0	ns
Amblyopia (2)	0.90±0.21	1.13±0.11	23	0.205
Total (48)	**1.15±0.56**	**1.40±0.63**	**25**	**<0.001[s]**

s=significant, p value obtained from paired t test, NA= not applicable as there is no difference

Table 6 shows the relationship between primary eye disease and change of contrast sensitivity with optical LVDs. Patients with Retinoschisis (6.25% study subjects) showed 40% improvement from baseline followed by oculocutaneous albinism (10.42% study subjects) and myopic degeneration (20.83% study subjects) 36% and 28% respectively. The least improvement was shown by study subjects with FEVR (4.2%), 0% and optic atrophy (12.5%), 10%. Overall the average improvement from baseline with optical LVDs was 25%.

Discussion

The study was conducted on 48 low vision patients attending low vision clinic of National Institute of Ophthalmology and Hospital, Dhaka, Bangladesh in order to assess the outcome of specific visual parameters (Distant and near visual acuity, contrast sensitivity and color perception) of study subjects with the use of optical low vision aids.

In the present study the mean age was found to be 25.79±12.14 years and ranged from 10-56 years. Study done by Alotaibi A. (2015) showed that the average age of low vision patients was 29 years with an age range of 5-82 years. Another study done by Li et al. (2002) showed that the mean age of the study subjects were 38.8 years. These differences may reflect the variations in healthcare infrastructure, access, and average lifespan of individuals in the developed and the developing countries. Also hereditary diseases causing low vision usually manifest in early adulthood. Patients with low vision in old age

mostly due to degenerative and chronic ocular diseases (e.g.- ARMD, glaucoma, diabetic retinopathy) usually present with significantly reduced visual acuity in low vision clinic, as this study selected a relatively higher residual visual threshold these cases were not included. Since significant visual impairment is seen in the younger population (72.9% in 10-30 years age group) in the present study, this implies a deleterious impact on the financial aspect of the family, more so because the males who are the chief or sole earners in most of the families are affected during their peak productive period of life.

In this study, among the 48 study participants, 67% were male. This finding is similar to study done by Khan S. A., 2000 where 72% of subjects were male. Percentage of male population affected by visual impairment ranged from 65% to 96% in different studies (Aziz & Kulkarni, 2020; Li, 2002). Yet population based studies (Bourne et al., 2017; Dandona et al., 2002) have reported that about 55% of the people suffering from moderate to severe visual impairment are females. The male preponderance in the present study may be due to a higher health access rate for visual problems among the males compared to females and sociocultural factors where the principal wage earners are males and seek consultation for visual problems more often than females. There is also the factor that the primary diseases responsible for low vision identified in this study were mostly hereditary ocular disorders (e.g.- macular dystrophy, retinitis pigmentosa, hereditary optic atrophy) and they are more common in male population due to genetic factors.

In this study, it was found that the main causes of low vision were between 10-56 years of ages to be macular dystrophy (27.08%), retinitis pigmentosa (20.83%), myopic degeneration (14.58%), optic atrophy (12.5%), oculocutaneous albinism (10.42%) retinoschisis (6.25%), FEVR (4.17%) and amblyopia (4.17%). Study done by Koç et al. (2017) showed that the 3 main causes of low vision are retinal dystrophies (37%), congenital eye anomalies (14%) and myopic degenerations (13%) between ages 18-50 years. Aziz and Kulkarni, 2020 found that retinitis pigmentosa (24%), optic atrophy (18%), ARMD (10%), macular dystrophy (12%), macular scar (10%), and myopic maculopathy (8%) are the main reasons for low vision in adult population. Shah et al. (2011) stated the main causes of visual impairment in children (4-16 years) to be nystagmus (15%), Stargardt's disease (14%), maculopathies (13%), myopic macular degeneration (11%), oculocutaneous albinism (7%) and amblyopia (6%). These findings are very much consistent with the present study findings as the above mentioned diseases are the common diseases that lead to low vision.

In this study, in almost all study subjects there were significant ($p \leq 0.05$) improvement in distant visual acuity with mean value of Log MAR 0.41±0.19 (about 6/15) which was 35% improvement from baseline. 85.42% study subjects had improvement of distant BCVA in 0.2-0.5 Log MAR range (about 2-4 Snellen lines) with optical low vision devices. Study done by Li et al. (2002) showed that 69.4% study subjects benefited from use of monocular or binocular telescopes. Khan (2007) found that almost 85% had a vision of ≥ 6/12 with the prescribed telescopes. These results were similar to the present study in which the increased rate of improvement may be due to the selection of higher baseline visual threshold (better or equal to Log MAR 1) for distant BCVA of the study subjects. Most of the patients with low vision find it difficult even to do their daily routine activity. They become completely dependent on their caretakers for all activities including mobility within or beyond the house, in turn affecting their self-confidence and mental state of mind. Providing appropriate optical low vision aids may help them overcome this hardship and achieve sufficient functional independence to perform essential daily tasks.

In the present study, 68.7% study subjects had improvement of near BCVA in 0.1-0.3 Log MAR range with optical low vision devices. Study done by, Margrain (2000) found that 88% of patients were able to read smaller text with magnifiers whereas only 23% were able to read without low vision aids. Li et al. (2002) also found that 86.8% of the study subjects succeeded in reading newsprint using optical magnifiers. This implies that almost two-third of the patients with low vision can be rehabilitated and the visual

compromise can be reversed to a useful extent, in order to improve their productivity and in turn, their quality of life. Improvement of near vision helps them read essential documents and daily newspaper without needing assistance. This ultimately boost their confidence and self-reliance.

This study found that at presentation the study subjects had contrast sensitivity between Log CS 0.15 and Log CS 2.10. Contrast sensitivity of the study subjects saw an improvement of about 25% from baseline with optical LVDs. Patients with Retinoschisis (6.25% study subjects) showed 40% improvement from baseline followed by oculocutaneous albinism (10.42% study subjects) and myopic degeneration (20.83% study subjects) 36% and 28% respectively. The least improvement was shown by study subjects with FEVR (4.2% study subjects), 0% and optic atrophy (12.5% study subjects), 10%; which were not statistically significant. Aziz and Kulkarni (2020) in their study stated that more than half of the patients who had vision worse than 0.60 Log MAR also had poor contrast sensitivity. Li et al. (2002) showed that with proper illumination (head mounted light) near vision improved along with contrast sensitivity. As contrast sensitivity was tested with adequate illumination in this study, it improved as study subjects' near visual acuity improved with optical LVDs. But even the improved status of contrast sensitivity remained far lower than what is regarded as normal (>Log CS 1.95) (Elliott et al. 1990) except for cases with myopic degeneration.

In the present study, for distant vision study subjects with myopic degeneration showed 50% ($p<0.05$) improvement with optical LVDs followed by oculocutaneous albinism (38%), retinoschisis (34%), retinitis pigmentosa (31%), macular dystrophy (29%) and bilateral optic atrophy (29%). For study subjects suffering from FEVR and bilateral amblyopia the improvement of distance VA was not statistically significant due to lower number of subjects and lower visual acuity improvement with optical LVDs. Improvement of near vision with optical LVDs were noted as bilateral optic atrophy (44%), retinitis pigmentosa (28%), macular dystrophy (19%) and myopic degeneration (19%) ($p<0.05$). For study subjects suffering from oculocutaneous albinism, retinoschisis, FEVR and bilateral amblyopia the improvement of near VA was not statistically significant due to lower number of subjects and lower near visual acuity improvement with optical LVDs. Aziz and Kulkarni (2020) in their study found that the improvement of near vision with LVDs were as follows - macular dystrophy (66%) followed by retinitis pigmentosa (25%) and age-related macular degeneration (25%); The maximum number of lines improved for near was 4 lines. Most of the patients who improved with telescopes for distance also were those with macular dystrophy (33%), followed by macular scar (40%) and retinitis pigmentosa (16.7%). The mentioned study focused on the adult population only. In case of the present study the age range of the subjects was 10-56 years. So, though the etiology of visual impairment differs but the magnitude of improvement was similar.

This study showed that patients with moderate visual impairment improved 25-35% in different visual parameters with optical low vision devices such as monocular and binocular telescopes, handheld and bar magnifier. Use of LVAs would positively impact the day-to-day activities like reading, stitching and mobility thereby improving the overall quality of life.

Despite the need for visual rehabilitation services and the potential for functional vision recovery for the patients greatly suffering from incurable visual impairment, the service delivery is lacking due to poor available resources, lack of trained personnel and facilities as well as government incentive for patients (free of cost LVAs in govt. hospitals) as well as clinicians.

Limitations

This was a single centered study to draw conclusion about the effectivity of the of the optical low vision device. Low vision patients were selected on the basis of specific selection criteria, so the study findings is not applicable to all categories of patients of low vision. Magnitude of low vision and causative diseases among different age groups and genders were not explored as the study did not include complete spectrum of low vision patients. Long term results of low vision device were not assessed.

Only visual parameters were assessed, other parameters of quality of life (daily functions such as general reading, name signing, stitching, road sign visibility, mobility) were not evaluated.

Conclusion

Quantitative analysis of the findings of the study showed that there was significant improvement in distant and near visual acuity as well as contrast sensitivity in low vision with optical low vision device though there was no significant improvement in color perception.

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Conflict of interest

None

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