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Original Article

Impact of Low Vision Aids on Visual Performance and Quality of Life in Individuals with Low Vision

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ABSTRACT

Background: Low vision impairs daily functioning despite medical treatment and corrective lenses, affecting reading, mobility, independence, and overall well-being. Low vision aids (LVAs) may enhance visual performance and quality of life, although local evidence remains limited. This study evaluated the impact of LVAs on visual performance and vision-related quality of life (VR-QoL) among adults with low vision. **Methods & Materials:** This prospective observational study was conducted at the Department of Community Ophthalmology, Bangladesh Medical University (BMU), Dhaka, from September 2023 to December 2024. Adults (≥18 years) with low vision (BCVA <6/18 in the better eye or visual field <10°) were enrolled consecutively. Baseline visual performance (distance and near BCVA, contrast sensitivity by Pelli–Robson, visual field by confrontation) and VR-QoL (National Eye Institute) were assessed, then individualized low vision aids and advice were provided. Outcomes were reassessed at 1, 3, and 6 months. Data were analyzed in IBM SPSS Statistics using the Friedman test, with p ≤0.05. **Results:** Forty participants (mean age 34.1±17.18 years) were included; 55.0% were female. Retinitis pigmentosa (25.0%) was the most common diagnosis. Magnifiers were prescribed to 52.5%, telescopes to 12.5%, and both devices to 35.0%. Significant improvements were observed over 6 months in distance visual acuity (0.90±0.21 to 0.74±0.18), near visual acuity (1.17±0.14 to 0.88±0.18), and contrast sensitivity. Visual fields remained unchanged. VR-QoL improved significantly across all NEI VFQ-25 domains, with overall scores increasing from 36.07±5.53 to 54.76±4.70. **Conclusion:** Low vision aids significantly improved visual performance and vision-related quality of life, supporting their role in enhancing functional independence among adults with low vision.

Keywords: *Low vision, Low vision aids, Visual performance, Vision-related quality of life, and NEI VFQ-25*

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INTRODUCTION

A healthy eye focuses light onto the retina, where photoreceptors convert it into signals sent via the optic nerve to the visual cortex. The fovea enables detailed central vision, while the peripheral retina supports spatial orientation. Disease, injury, or degeneration can impair this pathway, reducing vision quality despite correction; low vision is defined as acuity below legal blindness thresholds after treatment [1]. Globally, public health concerns include low vision and visual impairment. According to WHO, over 2.2 billion people have vision loss that hinders daily activities, mobility, and independent living, limiting useful visual function for everyday tasks [2,3]. Lower-income regions have higher visual impairment rates, which increase with age. Causes include uncorrected refractive errors, cataracts, diabetes, and macular problems, all of which can reduce vision and daily functioning. The number of people with visual impairments will likely continue to increase in Asia as populations age and more people develop chronic conditions such as diabetes, about [4]. Southeast Asia and South Asia carry a significant share of the visual impairment burden, especially since so many people in Southeast Asia have avoidably become visually impaired because of a lack of access to eye care [2,4]. Approximately 12% of people in Bangladesh aged 40 years or older have low vision according to WHO's age standardization, primarily because of cataracts, age-related macular degeneration, and diabetic retinopathy; therefore, substantial numbers of people have low function for their eyesight, and as a result, low quality of life will be experienced [3]. Impacts of low vision extend beyond clinical measures, including reduced ability to read, mobility, social inclusion, ability to work, and psychological well-being. Correlating declining vision with health-related quality of life, even prior to reaching the threshold of being severely impaired, illustrates how critical clinical correction and functional rehabilitation are [5]. Traditional clinical measurement methods often do not fully assess real-world performance and impact on one's life, which is why quality-of-life assessments are so essential in evaluating interventions [6]. Low-vision aids (LVAs) help individuals with low vision using devices like magnifiers, telescopes, electronic systems, augmented reality, and smartphone tools. Research has shown that using LVAs can improve reading speeds, improve visual acuity, and improve quality of life based on self-reported results [7-9]. However, there is a disparity in previous studies regarding study design, sample size, types of devices, and types of outcome measures, and only a few studies have the combination of objective measures and quality of life information for LVAs in South Asia and Bangladesh [2,4]. While the majority of studies about visual impairment have looked at just optical or digital technology for assisting someone who has a limitation when it comes to seeing well, there has not been very much attention given to how their use has an effect on overall psychosocial development [10]. Therefore, this study aims to assess the impact of low vision aids on visual performance and quality of life in individuals with low vision.

METHODS & MATERIALS

This prospective observational study was conducted at the Low Vision Clinic, Department of Community Ophthalmology, Bangladesh Medical University (BMU), Dhaka, Bangladesh, between September 2023 and December 2024. Adults aged 18 years or older of either sex who attended the clinic were enrolled using consecutive sampling. Inclusion criteria comprised best-corrected visual acuity (BCVA) less than 6/18 in the better eye or a visual field less than 10 degrees from the point of fixation. Exclusion criteria were mental handicap, significant media opacity such as cataract or corneal opacity, and visual acuity better than 6/18 or worse than 1/60.

All participants received a baseline clinical evaluation, which included ocular history, comprehensive ocular examinations, and fundus examination. Visual performance outcomes assessed were distance and near BCVA, contrast sensitivity measured with a Pelli-Robson chart, and field of vision evaluated by confrontation testing.

Low vision rehabilitation was administered based on clinical need, utilizing commonly available optical aids such as handheld, bar, and stand magnifiers for near tasks, and telescopes for distance tasks. Non-optical interventions, including reading stands, supplemental lighting, absorptive sunglasses, and environmental modifications to enhance contrast, were also recommended when appropriate.

Vision-related quality of life (VR-QoL) was evaluated using the validated National Eye Institute Visual Function Questionnaire-25 (VFQ-25; Version 2000) [11]. The subscales analyzed included general vision, near activities, distance activities, social functioning, mental health, role difficulties, and dependency. Item responses were converted to 0-100 scales, and subscale means were calculated. The mean of the vision-targeted subscales was used to derive an overall average visual quality score. Assessments were conducted at 1, 3, and 6 months following aid provision. Data analysis was performed using SPSS (version 22). Changes over time were assessed with the Friedman test, with p-values of 0.05 or less considered statistically significant.

RESULTS

Table I summarizes the baseline profile of the 40 participants attending the Low Vision Clinic at Bangabandhu Sheikh Mujib Medical University: mean age was 34.1 ± 17.18 years (range 18–71), females were 55.0%, and the dominant groups were students (42.5%) and housewives (32.5%); retinitis pigmentosa was the most frequent diagnosis (25.0%), followed by macular dystrophy (20.0%) and pathological myopia (15.0%; keratoconus 7.5%), and for aids, 52.5% received magnifiers, 12.5% telescopes, and 35.0% both.

Table I

Baseline socio-demographic and clinical profile of participants (n = 40).

Variable	Category	n (%)
Age group (years)	18–27	21 (52.5)
	28–37	5 (12.5)
	38–47	2 (5.0)
	48–57	6 (15.0)
	58–67	4 (10.0)
	68–77	2 (5.0)
Sex	Female	22 (55.0)
	Male	18 (45.0)
Education	College or technical school	13 (32.5)
	High school	10 (25.0)
	Illiterate	9 (22.5)
	Grade 5 or less	5 (12.5)
	Graduate	3 (7.5)
Occupation	Student	17 (42.5)
	Housewife	13 (32.5)
	Service holder	5 (12.5)
	Retired	3 (7.5)
	Farmer	2 (5.0)
Diagnosis	Retinitis pigmentosa	10 (25.0)
	Macular dystrophy	8 (20.0)
	Pathological myopia	6 (15.0)
	Keratoconus	3 (7.5)
	Other diagnoses	13 (32.5)
Low vision aid used	Magnifier	21 (52.5)
	Telescope	5 (12.5)
	Both magnifier and telescope	14 (35.0)

Table II shows objective visual performance improved progressively across follow-ups: mean distance BCVA changed from 0.90 ± 0.21 at baseline to 0.74 ± 0.18 at 6 months, and mean near BCVA from 1.17 ± 0.14 to 0.88 ± 0.18, both statistically significant by Friedman test (reported as p = 0.001 in the thesis tables); contrast sensitivity also increased, right eye from 1.02 ± 0.27 to 1.11 ± 0.18, left eye from 1.02 ± 0.29 to 1.10 ± 0.19, described as significant over time.

Table II
Visual performance outcomes over follow-up after low vision aid use (*n* = 40).

Outcome	Baseline	1st month	3rd month	6th month	p-value
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	
BCVA (Distance)	0.90 ± 0.21	0.87 ± 0.19	0.77 ± 0.18	0.74 ± 0.18	0.001
BCVA (Near)	1.17 ± 0.14	1.06 ± 0.13	0.93 ± 0.17	0.88 ± 0.18	0.001
Contrast sensitivity (Right eye)	1.02 ± 0.27	1.06 ± 0.26	1.08 ± 0.22	1.11 ± 0.18	<0.05
Contrast sensitivity (Left eye)	1.02 ± 0.29	1.05 ± 0.26	1.07 ± 0.22	1.10 ± 0.19	<0.05

Table III demonstrates that visual field status remained stable during the 6-month follow-up: 72.5% had normal field, and 27.5% had restricted field in each eye at baseline, with the exact same distribution at 1, 3, and 6 months, matching the thesis statement that no field improvement was observed after low vision aid use.

Table III
Visual field status across follow-up (*n* = 40).

Eye	Field status	Baseline	1st month	3rd month	6th month
		n (%)	n (%)	n (%)	n (%)
Right eye	Normal	29 (72.5)	29 (72.5)	29 (72.5)	29 (72.5)
	Restricted	11 (27.5)	11 (27.5)	11 (27.5)	11 (27.5)
Left eye	Normal	29 (72.5)	29 (72.5)	29 (72.5)	29 (72.5)
	Restricted	11 (27.5)	11 (27.5)	11 (27.5)	11 (27.5)

Table IV presents the vision-related quality of life changes measured using National Eye Institute Visual Function Questionnaire-25 domains, all improving over time, with the clearest gains seen in general vision (35.50 ± 10.61 to 69.00 ± 11.94), near activities (29.79 ± 10.65 to 59.38 ± 10.02), and distance activities (33.11 ± 10.92 to 56.25 ± 10.80); mental health rose from 37.50 ± 8.25 to 49.22 ± 7.65, role difficulties from 35.63 ± 10.80 to 53.59 ± 9.48, and dependency from 39.15 ± 12.69 to 49.17 ± 11.61, while social functioning increased more modestly (41.88 ± 10.03 to 47.19 ± 9.17); the overall "average visual quality" score increased from 36.07 ± 5.53 to 54.76 ± 4.70, with significance consistently reported as p = 0.001 in the thesis table.

Table IV
Vision-related quality of life outcomes (NEI-VFQ domain scores) over follow-up (*n* = 40).

Domain	Baseline	1st month	3rd month	6th month	p-value
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	
General vision	35.50 ± 10.61	52.50 ± 10.80	64.00 ± 11.28	69.00 ± 11.94	0.001
Near activity	29.79 ± 10.65	43.12 ± 12.37	51.47 ± 10.66	59.38 ± 10.02	0.001
Distance activity	33.11 ± 10.92	44.16 ± 10.89	50.62 ± 11.07	56.25 ± 10.80	0.001
Social functioning	41.88 ± 10.03	44.06 ± 9.38	46.56 ± 8.95	47.19 ± 9.17	0.001
Mental health	37.50 ± 8.25	40.94 ± 8.49	46.41 ± 8.94	49.22 ± 7.65	0.001
Role difficulties	35.63 ± 10.80	40.78 ± 11.23	50.00 ± 10.78	53.59 ± 9.48	0.001
Dependency	39.15 ± 12.69	41.20 ± 14.21	46.87 ± 12.76	49.17 ± 11.61	0.001
Average visual quality	36.07 ± 5.53	44.37 ± 5.46	51.28 ± 4.56	54.76 ± 4.70	0.001

DISCUSSION

In this prospective observational cohort conducted at the Community Ophthalmology Department of Bangabandhu Sheikh Mujib Medical University, individuals with low vision demonstrated clinically meaningful improvement in visual performance and vision-related quality of life after prescription and continued use of low vision aids, assessed serially at 1, 3, and 6 months.

The participant profile was skewed toward younger adults and students, with females slightly predominating; this pattern is plausible in a tertiary academic setting because younger patients often have higher near-task demands, including reading, writing, and screen-based activities, and therefore may be more motivated to engage with rehabilitation services and assistive devices [12,13]. The female predominance is also consistent with some rehabilitation cohorts where service utilization is higher among women [14]. Educational attainment and employment context are important when interpreting device uptake and functional gain because education can shape health literacy, perceived need, and persistence with training and follow-up; similarly, stigma and workplace concerns can influence disclosure and real-world use of visible assistive devices [15-17].

The diagnostic mix was dominated by degenerative and hereditary retinal disease, particularly retinitis pigmentosa and macular dystrophy, with a smaller contribution from pathological myopia and age-related macular degeneration. This spectrum supports a practical point for manuscript framing; low vision rehabilitation in our context often serves progressive conditions where anatomical reversal is not expected, so outcomes should emphasize functional vision, participation, and psychosocial domains rather than structural change [18-20]. In our cohort, most patients used magnifiers, either alone or combined with telescopes, which fits the high proportion of students and near task demand; the distribution of device types can vary substantially across settings depending on case mix and whether the service is more distance-oriented or near-oriented [21].

Objective measures of visual performance improved over follow-up. Distance and near BCVA showed statistically significant gains by 6 months, suggesting that appropriate optical prescription, training, and continued use can convert residual vision into usable function across common daily tasks [21]. Contrast sensitivity also improved modestly, which is relevant because contrast-mediated difficulties are a major contributor to disability in low vision and can limit performance even when acuity improves; rehabilitation programs that incorporate device optimization, lighting advice, and training may plausibly drive this improvement [21,22]. By contrast, visual field status remained unchanged over follow-up, which is expected for conditions such as retinitis pigmentosa, where field loss reflects underlying photoreceptor degeneration; this contrast between functional improvement and stable field measures should be highlighted clearly to avoid over attribution of effect [19].

Quality of life outcomes measured by NEI VFQ-25 showed consistent, statistically significant improvement across domains, including general vision, near activities, distance activities, mental health, social functioning, role difficulties, dependency, and average visual quality by 6 months. This broad domain response strengthens the interpretation that low vision aids support not only task performance but also autonomy and psychosocial well-being, likely through reduced dependence, greater confidence in mobility and reading, and better participation in family and social roles [23-25]. Improvements in role difficulty and dependency are especially important in Bangladesh, where family support networks are strong but caregiver burden is often unmeasured; demonstrating gain in these domains positions the work as health systems relevant rather than purely clinical [25,26]. Overall, the findings support integrating structured follow-up and training into low vision services, and they justify larger, diagnosis-stratified studies to clarify which device packages yield the greatest benefit for specific etiologies and age groups in our setting [18].

LIMITATIONS

This study was limited by its single-center, small-sample before-and-after design without a control group, which restricts both causal inference and generalizability. Heterogeneous diagnoses, reliance on self-reported NEI-VFQ-25 scores, and inconsistent adherence to assistive aids may have affected the results.

CONCLUSION

The use of low vision aids resulted in significant improvements in visual performance and vision-related quality of life over a six-month period, with notable gains observed in key NEI-VFQ domains and contrast sensitivity. However, visual fields remained unchanged. These results support the integration of structured low vision rehabilitation and follow-up into tertiary eye-care services in Bangladesh to improve functional independence and overall well-being.

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CONFLICT OF INTEREST

None declared

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee

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