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Original article

Low vision aid—A ray of hope for irreversible visual loss in the pediatric age group

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ABSTRACT

Purpose: To analyze visual acuity (VA) improvement, causes of low vision (LV), and quality of life (QOL) following the use of low vision aids (LVAs) in children with LV.
Methods: A prospective analysis was conducted on children with LV aged between 4 years and 18 years between March 2013 and October 2013. Children were recruited from both urban schools and rural schools. LVAs were tried for visual improvement, and improved VA was noted. All children were trained to use the aid and followed up monthly for 3 consecutive months for VA improvement; QOL through a questionnaire was analyzed after the use of LVAs.
Results: A total of 74 children (148 eyes; 50% male; mean age, 11.8 ± 3.2 years) were analyzed, where 34 children were recruited from rural areas and 40 from urban schools. After LVA use, 101 (68.24%) eyes of 59 (79.72%) children improved for distance with telescope and 81 (54.72%) eyes of 51 (68.91%) children improved for near with magnifiers. LV due to retinal problems, optic atrophy, congenital anomalies, and amblyopia drastically reduced after use of LVA. A statistically significantly higher proportion of children had either "excellent" or "good" QOL, and a significantly lower proportion of children had either "not satisfactory" or "poor" QOL after the use of LVA ($p < 0.0001$).
Conclusion: LVA is essential and effective in improving VA and QOL in children with LV.

1. Introduction

The World Health Organization describes a person with low vision (LV) as one who has an impairment of visual function, even after treatment and/or standard refractive correction, and has a visual acuity (VA) of <6/18 to perception of light (PL), or a visual field of <10° 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.[1]

The prevalence of LV in children is > 10 times that of pediatric blindness, with 7 million children worldwide having LV due to ocular disease and 10 million having LV due to uncorrected refractive error.[2] The prevalence of LV in a population-based cross-sectional study in India was reported to be 1.05% in the year 2000, with a burden of 10.6 million people requiring LV services.[3] The magnitude of LV is estimated to be 54.5 million in India (Fig. 1).[4] Many children in schools for the blind often receive formal education using Braille without the need of being actually there, whereas those attending regular schools do so with varying difficulties in coping with their studies and social interaction, and a few others are school dropouts.[5]

LV is characterized by irreversible visual loss, decreased visual field, glare, and contrast, and decreased ability to perform daily activities such as reading or writing, and some people who suffer from this condition may be socially withdrawn. Children with LV can be benefited and have the same quality of life (QOL) as that of normal children if they are provided and guided to use low vision aids (LVAs).[6] The major goals of LV management in children are to increase their functionality (make the most of residual vision), make the children independent, help in their education, and improve their social activities. The most important principle of LVAs (optical) is magnification, which helps in identifying what is being viewed.[7] Prior to dispensing LVAs, one has to collect the following information: ability of the child to visualize, possible viewing distance from the object, duration of activity, whether one or both hands are involved, weight, appearance, ease of handling of

Conflicts of interest: The authors declare that they have no conflicts of interest.

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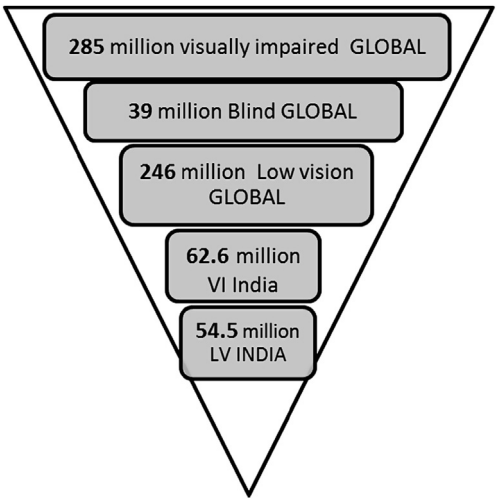

Fig. 1. Magnitude of visual impairment and low vision as per the World Health Organization.

the device, number of devices required for each patient, and most importantly the light factor.

Based on these factors, the present study was designed to analyze VA improvement, causes of LV, and QOL following the use of LVAs in children with LV.

2. Methods

This was a prospective analysis of LV in 74 children (148 eyes) with best corrected visual acuity (BCVA) of <6/18 (20/60) in the better eye using the Snellen chart. Children (aged between 4 years and 18 years) were recruited from urban schools (who attended our outpatient department), rural schools (through our school screening program), and rural camps between March 2013 and October 2013. Oral informed consent was obtained from the parents, and parents were counseled and explained about the use of LVAs (Table 1 and Fig. 2). Children who could not understand and handle the telescope and who could not come for follow-up were excluded from the study. The study adhered to all the principles outlined in the Declaration of Helsinki.

The Snellen chart was used to assess VA for distance and for near vision. For all cases, BCVA was determined after refraction. Color vision, contrast sensitivity, electrophysiological tests, and visual field were done, wherever possible. LVA telescopes (4 × or 2.8 × ; uniocular or binocular) for distance vision and magnifiers (5D spectacles or hand lens 4 × or 10 × or 13 ×) for near vision were tried for VA improvement in each eye separately. Magnification required was determined as "required VA/present VA" for each patient. Children were given aid for "distance and near," "distance only," or "near only," depending on their requirement and improvement.

The improved VA and the eye that showed maximum improvement were noted. All children were trained to use the aid; they were also followed up monthly for 3 consecutive months for VA improvement, child's comfort with use of the LVA, daily activities, and their degree of dependency. QOL for each child was assessed with a short questionnaire (5 questions) given to their parents 3 months after the use of an LVA. Each question was based on the ability to see the blackboard, watch television, read books, their overall school performance, and social behavior. For each activity, a score of +1 was given if the answer was better after using an LVA at the end of 3 months, and 0 if the answer was "no". If the score was 100% (i.e., 5 points), the grade was evaluated as "excellent," 80% (i.e., 4 points) as "good," 60% (3 points) as "better," 40% (2 points) as "not satisfactory," and 20% (1 point) as "poor." The *p* value was calculated using Wilcoxon signed rank test for change in QOL after using LVAs.

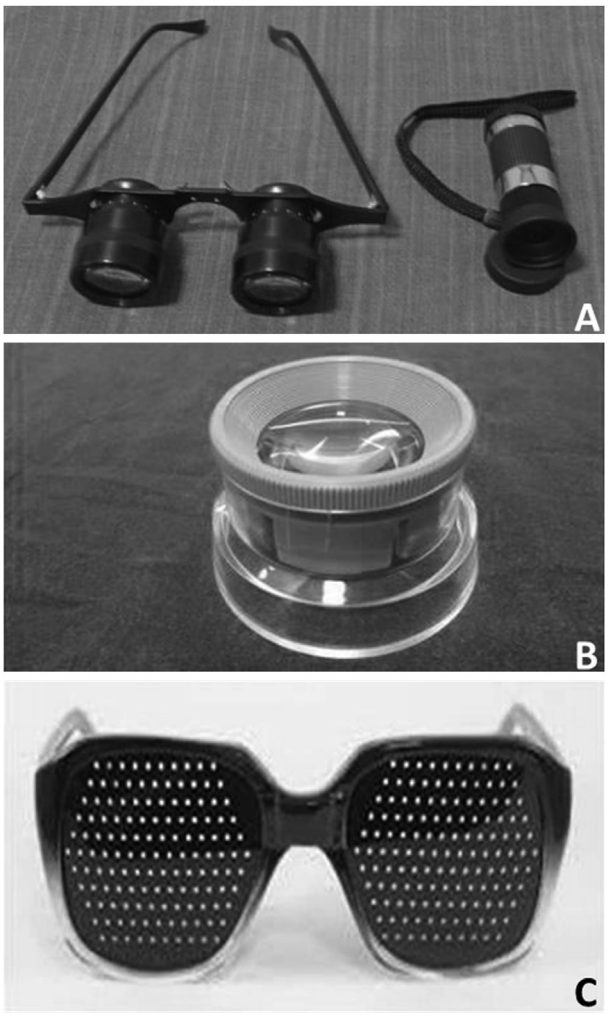

Fig. 2. Low vision aids. Optical devices: (A) telescopes and (B) dome magnifier. Nonoptical device: (C) pinhole spectacles.

Table 1
Low vision aids.

Optical devices
Telescopes (uniocular or binocular 2.8 × , 4 × , 5 ×)—for distance
Spectacle microscope, handheld lenses, pocket and dome magnifiers, and stand magnifiers—for near
VES autofocus—all distances (12 inches to ∞), wide field, and less weight
Nonoptical devices[a]
Filters, pinhole spectacles, accessory devices such as talking watches, clocks, mobiles, reading, and guides
Contact lenses—for albinism and aniridia
X chrome lens—for color blindness
Electronic devices
Mouse magnifier and electronic magnifier
Computer-assisted devices—for higher magnification (both hardware and software are available)
Field enhancement devices

VES = visual enhancing system.
[a] Nonoptical devices have large print reading materials, better illumination, black felt tip pen, typoscope, glare reduction, and contrast enhancement devices.