Original Article

Low Vision Aids: Visual Outcomes and Barriers In Children with Low Vision

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Abstract

Aims: *To study the demographic profile, cause of low vision, visual outcome and the barriers in using low vision aids (LVA).*

Settings and design: *Prospective observational clinical study.*

Methods: *This study was performed on 50 children aged 10-17 years who attended LVA clinic. Unaided, best corrected acuity was assessed using ETDRS chart for distance and Bailey – Lovie chart for near. For distance tasks, telescopes were tried and for near tasks, magnifiers and high plus glasses were tried, improvement in vision was noted. Reasons for not purchasing low vision aids were noted.*

Statistical analysis used: *Chi-square and Fisher Exact test*

Results: *Reading black board was the most common first priority in 31 (62%) children. Reading small and medium prints was the most common second priority in 30 (60%) children. Outdoor games (n=14, 28%) was the most common third priority of low vision children. Macular dystrophy (42%) was the major cause of low vision. With LVA, 64% of children could improve to log MAR 0.5 or better for distance and 44 (88%) children could read N6 to N12. Out of 24 children who did not purchase LVA, cost (n=7) and cosmetic blemish (n=7) were main barriers.*

Conclusion: *There was significant improvement in both near and distance visual acuity with LVA. There is a need for LVA to be made available free of cost for the under privileged and for the devices to be made more cosmetically acceptable. Preventable cause for low vision can be eliminated by creating awareness in public.*

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Keywords: *Low vision, Children, Cost, Cosmetic blemish, Telescope, Magnifiers*

Introduction

The term low vision is almost synonymously used with visual impairment, with the added provision that the residual vision is usable. For low vision services or care, low vision is defined by WHO as a person "who has impairment of visual functioning even after treatment and/or standard refractive correction, and has a visual acuity of less than 6/18 down to and including light perception, or a visual field of 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 task for which vision is essential".[1] In 2010, it was estimated that 285 million people were visually impaired worldwide of which 39 million were blind and 246 million had low vision.[2] The leading causes for low vision in children in India are retinal diseases, amblyopia and optic atrophy.[3] The causes of low vision in children vary from one geographical area to another[3,4] highlighting the importance for an area based epidemiological data pool on low vision. There are various factors that influence the utilization of low vision services. These include access, affordability and presence of other disabilities, over expectation, cosmetic issues, lack of motivation and other barriers. These factors need to be studied in detail in order to meet the growing need for low vision care among children. There are very few studies describing the profile of children attending low visual aids clinic in India.[3,5,6] This study was conducted to study the demographic profile, cause of low vision, visual outcome and the barriers in using low vision aids.

Material and Methods

This prospective observational clinical study was done on 50 children aged 10-17 years who attended the low vision aids clinic between September 2013 to March 2015. Children with low vision as per WHO definition of low vision were included. Written informed consent was taken from parents/guardian of all children willing to participate in the study. A brief overview of the nature of the visual problem and its cause was given to the children and their parents/guardians. They were informed in brief the residual vision the child had and the possibility of utilizing the existing residual vision with low vision aids for their visual needs.

A detailed ocular and systemic history was taken. The child was assessed by a series of questions about mobility, self-care, near and distant visual tasks to know the problems faced and to assess the visual need of the children. Goals were determined. Existing spectacles were assessed and recorded. If the child was already using low visual aids, they were categorized and their usage was noted.

Unaided best corrected acuity was assessed using ETDRS chart for distance (in Log MAR scale) and Bailey - Lovie word reading charts at a distance of 25 cm for near. Cycloplegic refraction was done in all children. Whenever required, colour vision was assessed with Ishihara chart at a distance of 75 cm, contrast sensitivity was assessed with Pelli-Robson

low contrast letter chart and visual field was assessed using Humphrey field analyzer or confrontation test.

If the child had good binocular vision, binocular telescopes were tried first, if not, the eye with better visual acuity or visual field was preferred. Starting with 2.8X, series of telescopes like 4X, 5X, 6X and 8X were tried and visual acuity with each telescope was recorded and a suitable telescope was chosen. For near spectacle aids, approximate dioptric power was calculated using Kestenbaum formula. Various near vision aids like hand held magnifiers, spectacle magnifier, stand magnifier, bar and flat field magnifiers, high add bifocals, half glasses with or without prism were tried and appropriate aids were prescribed. After prescribing the LVA, the child was trained to use the device and advice on the care of the low visual aid was given. Uses and limitations of the devices were clearly explained to children and their parents/guardian as well. Importance of environmental modification was emphasized. If the child required rehabilitation services then he/she was referred to nearest rehabilitation centre. If they were not willing to purchase the LVA even after significant visual improvement, the reason for the same were noted.

Statistical Analysis

Statistical analysis was done using Chi-square/ Fisher Exact test. Statistical software: The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel were used to generate graphs, tables etc.

Results

Fifty children aged 10- 17 years attending low vision aids clinic between September 2013 to March 2015 were included in the study.

Male:Female ratio was 5:3. The mean age of the children was 13.12 ± 4.42 years. Of the 50 children 27 (54%) were from rural area and 27 of the 50 children (54%) were from lower socioeconomic status. 44 (88%) children attended normal school, 3 (6%) attended blind school and 3 (6%) children did not attend any school.

History of consanguinity was present in 20 (40%) children. Majority of the (n=38, 76%) children had problem with reading books and blackboard. Reading black board was the first priority need in 31 (62%), reading small and medium prints was the second priority need in 30 (60%), outdoor games (n=14, 28%) was the third priority need. 16 % of the children had general illnesses of which oculo-cutaneous albinism (n=5) was the most common general illness associated with low vision. Laurence Moon Syndrome (2%), convulsions (2%), delayed milestones (2%) were noted in one child each.

Unaided, 7 (14%) children could not read N24 with the better eye. Another 21 (42%) children could not read N12. The remaining 19 (38%) could read N6- N12 with the better eye. With best correction, 14% of children had less than 1.30 Log MAR (3/60) in the better eye, 86% children had 1.30 to < 0.47 Log MAR (6/18) and none had more than or equal to 0.47 Log MAR (6/18) in the better eye.

Macular dystrophy was the major cause of low vision in 21/50 (42%), followed by amblyopia (14%) and oculo-cutaneous albinism (10%). Eight (amblyopia-7, toxoplasmosis-1) had preventable cause for low vision. Retina (62%) was the most common anatomical site of abnormality (Figure 1).

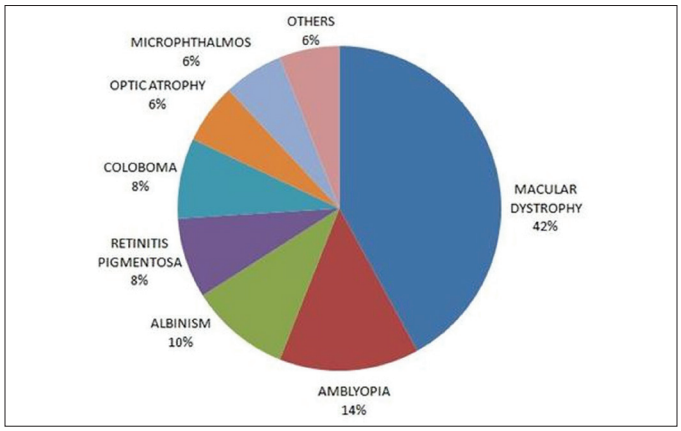

Figure 1: *Pie chart showing causes of low vision in children with low vision.*

With LVA, 64% of children could improve to DVA Log MAR 0.5 or better, 26% to 1.0 to 0.6, and another 4% to 1.30-1.07 (Figure 2). With LVA, 44 (88%) children could read N6 to N12. In 36% of children, LVA could improve near visual acuity to N6 while spectacle correction could improve to this level only in 14% children.

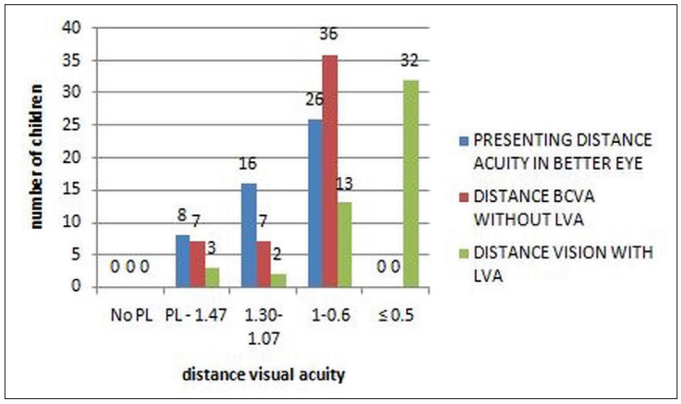

Figure 2: *Bar graph showing comparison of presenting distance visual acuity, best corrected distance visual acuity and distance visual auity with low vision aids. BCVA- best corrected visual acuity, LVA – low vision aids*

Forty five (90%) children expressed reading books as one of the 3 priorities. All the 45 were advised low visual aids, 39 (78%) could read small and medium prints as per their priorities with low visual aids. Six (12%) of them were advised suitable working distance, illumination, big print books and/or large font size on the computer.

All the children had a problem with reading blackboard and expressed it as one of their 3 priorities. 46 (92%) were given LVA. 39 could read black board with LVA. Others were advised to request their teacher to allow them to sit on the front row, improve the illumination and to read the text while writing on blackboard.

For distance task, LVA was advised in 46 (92%) children, of

which, 26 (56.52%) were motivated to use LVA and purchased LVA. Four (8%) children who had no improvement in vision were referred to rehabilitation centre. Of 46 LVA prescribed for distance, 38 (82%) were hand held telescopes and 8 (17.39%) were spectacle mounted telescope. For distance, 4X and 5X hand held telescopes were the most commonly (n=37, 80.44%) prescribed LVA (Table 1).

Table 1: List of low visual aids prescribed to the children for distant task. LVA – low vision aids

Distance Lva Prescribed	Number	Percentage
2.8 X Spectacle Mounted Telescope	8	17.39
4 X Hand Held Telescope	19	41.30
5 X Hand Held Telescope	18	39.14
6 X Hand Held Telescope	1	2.17
Total	**46**	**100**

For near needs, 45 LVA were advised, which included 20 (44.44%) hand held magnifiers, 19 (42.22%) other types of magnifiers (stand magnifier, dome magnifier, bar magnifier) and 6 high plus glasses. Big print books (22%) were the most commonly recommended non optical aid (Table 2).

Table 2: List of low visual aids prescribed to the children for near task

	Number	%
High Plus Glasses		
24 D	1	2.22
20D	1	2.22
16 D	1	2.22
8 D	2	4.44
5 D	1	2.22
Hand Held Magnifiers		
10 X	1	2.22
5 X	7	15.57
4 X	2	4.44
3 X	9	20
1.5 X	1	2.22
Stand Magnifier		
16 D	3	6.66
8 D	2	4.44
Dome Magnifier	10	22.23
Bar Magnifier 1.5 X	4	8.90
Total	**45**	**100**

Out of 24 children who did not purchase LVA, Cost (n=7, 29.17%), cosmetic blemish (n=7, 29.17%) and priorities not met optimally (n=6, 25%) were the three main barriers (Figure 3). Out of 24 children who did not purchase LVA, 9 (37.5%) were from below poverty line and 15 (62.5%) were from above poverty line. In BPL children cost (n=5) was the major factor for not purchasing LVA and in APL children cosmetic blemish (n= 6) was the major factor for not purchasing LVA.

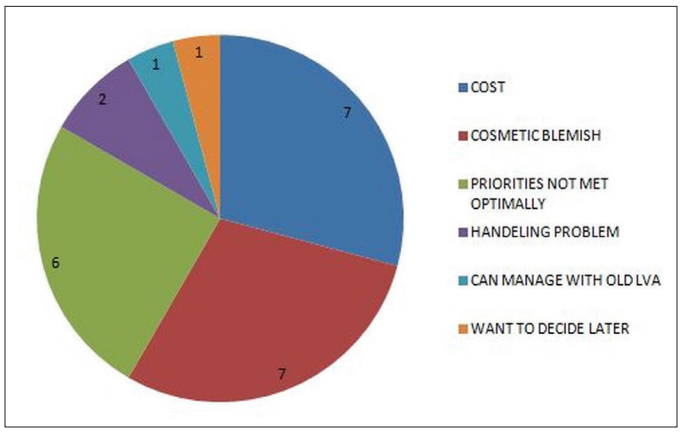

Figure 3: *Pie chart showing factors which influenced patient's decision not to purchase the low visual aid*

Discussion

This prospective observational clinical study was done on 50 children aged 10-17 years who attended low vision aids clinic.

The retina (62%) was the most common anatomical site of abnormality in children with low vision, the most common retinal disease being macular dystrophy (n=21, 42%). Our results correlated with that of Elfadul et al[7] and Kavitha et al[3] who reported that retinal diseases were the most common cause. Sapkota et al studied the profile of low vision children in Nepal. They reported that major cause of visual impairment was nystagmus (58.46%).[4]

In our study, 16% of the children who attend LVA clinic had general illness of which oculo-cutaneous albinism (n= 5) was the major general illness. Delayed milestones and speech disorder was noted in one child (2%). Kavitha et al reported that mild developmental delay was observed in two (2.7%) children.[3]

Reading black board was the most common first priority in 31 (62%) children. Reading small and medium prints was the most common second priority in 30 (60%) children. Outdoor games (n=14, 28%) and watching TV (n= 9, 18%) were the most common third priority of low vision in children. Our children had difficulty similar to that seen by Ganesh et al who reported that the most commonly reported difficulties study were related to their studying lifestyle like copying from the blackboard (80%), reading textbook at arm's length (77.2%).[6]

In our study, there was a significant improvement in both near and distance visual acuity with LVA. In 64% of children, LVA could improve distance visual acuity to log MAR 0.5 or better ($P < 0.01$). In 68% of children LVA could improve near visual acuity to N8 or better ($P<0.01$). Similar improvement in both near and distance visual acuity was reported by Fröhlich et al[8], Sherin et al[9] and Collee et al.[10]

Forty five (90%) children expressed reading books as one of the 3 priorities. All the children had problem with reading blackboard and expressed it as one of their 3 priorities. 46 (92%) were given LVA. 39 could read black board with LVA. Similar improvement in functional vision was reported by Ganesh et al[6] and Fröhlich et al[8].

4X (n=19) and 5X (n=18) hand held telescopes were the most

commonly (n=37, 80.44%) prescribed LVA for distance task. For near tasks, hand held magnifiers (40%) were the most frequently prescribed LVA. Big print books (22%) were the most commonly recommended non optical aid. Similar pattern of LVA prescription was reported in other studies by Kavitha et al[3] and Mao et al[11].

Out of 50 children, 46 were prescribed LVA for near, distance or both. Forty six devices were prescribed for distance task and 45 for near task. Twenty six cases (52%) purchased LVA and 24 (48%) refused to purchase LVA. Cost (n=7), cosmetic blemish (n=7) and priorities not met optimally (n=6) were the three main barriers. This indicates that the socioeconomic factor and cosmetic blemish associated with LVA influence their use. This correlated with Gao et al who observed that out of 243 patients, 185 accepted LVAs and 58 patients refused due to high price, inconvenience, young age (6 years), clumsy appearance and ignorance.[12]

For not purchasing LVA, cost was the major factor in BPL (n=5) children and cosmetic blemish was the major factor in APL children (n=6).

The follow up of children with low vision was challenging as many were from low socio-economic status and rural area. Of the 26 who purchased LVA, 8 patients were found to be using them on follow up.

Limitations of this study were that the quality of life with and without LVA were not assessed, electronic LVA devices were not used and there were limited number of patients.

Conclusion

Retinal pathology was the most common cause of low vision in this study. There was significant improvement in both near and distance visual acuity with low visual aids. Telescopes were the most commonly prescribed LVA for distance task. Hand held magnifiers were the most commonly prescribed LVA for near task. In BPL children, the cost was the major factor for children not purchasing LVA and hence low visual aids must be provided free of cost directly to these children. In APL children, cosmetic blemish was the major factor for children not purchasing LVA so there is a need for LVAs to be made more cosmetically acceptable. 16% of children had preventable cause for low vision in our study. This can be prevented by creating awareness in the public regarding eye diseases and by improving access to eye care facilities.

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