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Original Research Article

# Low vision in school aged children- associated factors and effect of low vision aids on functional status

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ABSTRACT

**Background :** Low vision is defined as significant reduction of vision that cannot be corrected to normal by standard optical correction, medical treatment or surgery. Global prevalence of low vision in paediatric age group is over 10 times that of paediatric blindness. Low vision aids (LVAs) are optical devices which enhance residual vision by magnifying image of object at the retinal level. Early intervention with LVAs can strengthen the vision of children with low vision, by reducing visual stimulus deprivation at an early age, and hence it improves their quality of life. Aim of this study was to identify factors associated with low vision and to assess functional status of children after using LVAs.
**Materials and Methods :** This is a descriptive study conducted among 56 children, between 5 to 15 years age group, attended who visited in a tertiary centre with low vision during a period of 11 years. After taking history, general, systemic and ocular examination, LVAs were prescribed for near and distant vision and were assessed after 2 months. Data analysis was done by using Graphpad quickcalcs internet software.
**Results:** Out of 56 children included in this study, 71% accepted and 29% denied LVAs for distant vision. 58.5% accepted and 12.5% denied LVAs for near vision. 28.5% did not require LVAs for vision. In older children acceptance of LVAs is found to be significantly higher compared to younger age group.
**Conclusions:** Majority of patients are satisfied with LVAs and frequently use them. Adequate LVAs are major factors in improving quality of life. There can be deterioration of vision due to ongoing disease, so regular follow-up examinations are also necessary part of management of low vision patient.



## 1. Introduction

Visual impairment during childhood whether total or partial has a great and negative impact on development, education, future work opportunities and quality of life. Since this effect is experienced throughout the day to day life, it causes serious social and economic consequences to the family and society. Of the Indian population, about 40% are children less than 15 years of age. Based on limited data available, it has been estimated that 0.5 to 1 child per 1000 children are blind in India, but there are no available data for low vision in children. According to WHO low vision is defined as the visual acuity in the better eye is 6/18 or less.[1,2] It is estimated that there are 9-12 million blind people in India, which amounts to about one-fourth of all the blind people worldwide. A survey in 1986 by the WHO and 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 useable residual vision.[3] Given this situation, there is a great need for comprehensive low-vision rehabilitation services in India. In this study, we assess the factors associated

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with low vision among children aged 5 to 15 years also and to assess effectiveness of low vision aids on functional status. We observed visually impaired children benefit from LVAs which facilitate vision enhancement and inclusive education. Thus, LVAs improve the quality of life of visually impaired children.

*WHO- world health organization

†NPPCB – national program on prevention and control of blindness

‡BCVA - Best corrected visual acuity

§LVAs- Low vision aids

## 2. Materials and Methods

56 children between the age group of 5 to 15 years who attended a tertiary centre low vision during a period of one and half years were included in this study after taking consent. A detailed history giving importance to the family history, birth history, consanguinity in their parents, social background, and present mode of education was taken. General and systemic evaluation done. Assessment of best corrected distance and near visual acuity was done after refraction. Distance visual acuity was measured using Snellen's chart and special low vision chart was used at 1m. Near vision is tested using Faculty's Times New Roman chart and logarithmic near visual acuity charts. The study populations were categorized in to four groups according to guidelines of ICD. Thorough anterior segment examination was done by torch light and slit lamp examination. Detailed evaluation of ocular motility was done and fixation pattern and nystagmus were noted. A detailed fundus examination was also done. An LVA trial was done and appropriate Low vision aids were prescribed for near and distant vision to those children who showed improvement in functional vision. The functional improvement in vision was assessed at 2 months using visual acuity examination and questionnaire methods.

### *2.1. Statistics*

A proforma was prepared for data collection and the data collected were entered to the excel work sheet. The data analysis was done using Graphpad quickcalcs internet software (http://www.graphpad.com/quickcalcs). The descriptive statistics was used initially. To find out association between socio demographic and clinical variables to low vision was done using Fischer's exact test. To find out the effectiveness of low vision aids on functional status Fischer's exact test was used.

## 3. Results

Out of 56 children included in the study, 36% were males and 64% were females. In our study population 12% children's parents were third degree relatives.

About the causes of low vision Congenital optic atrophy constitutes 21%, Oculocutaneous albinism 21%, Pathological Myopia 14%, Retinal Dystrophies (Retinitis Pigmentosa (RP), Cone rod dystrophy and atypical RP) 10%, Aniridia 7%, Leber's congenital amaurosis 7%, Coloboma 3.5%, Aphakia 3.50%, and other conditions like Congenital Nystagmus and Coloboma constitutes 10% (Figure 1). Figure 2 shows acceptance of LVAs for distant and near vision in each of the above clinical condition.

The study population is divided into four categories according to WHO definition of low vision. 20/70 to 20/160: is considered moderate visual impairment, or moderate low vision is taken as category 1. 20/200 to 20/400: is considered severe visual impairment, or severe low vision is taken as category 2. 20/500 to 20/1,000: is considered profound visual impairment, or profound low vision is taken as category 3. More than 20/1,000: is considered near-total visual impairment, or near total blindness is taken as category 4. Category-1 constitutes 29%, Category-2 constitutes 46%, Category-3 constitutes 7% and Category-4 constitutes 18% of patients (Table 1). Among these, 71% accepted and 29% denied LVAs for distant vision and 58.5% accepted and 12.5% denied LVAs for near vision. 28.5% did not require LVAs for functional vision. In category 1 and 2 acceptance of low vision aids for distant vision and near vision is found to be significantly higher compared to category 3 and 4 ($p$ value$<0.05$). In category 1 and 2 functional improvements for distant vision and near vision is found to be significantly high compared to category 3 and 4 ($p$ value$<0.05$) but there was no significant difference in functional improvement between the category groups ($p$ value$>0.05$) in case of near vision aids.

In the present study the acceptance of low vision aids for distant vision were Aniridia 0%, Aphakia 50%, Retinitis Pigmentosa 50%, Congenital nystagmus 0%, Congenital optic atrophy 83%, Coloboma 50%, Cone rod dystrophy 100%, Leber congenital amaurosis 25%, Oculocutaneous albinism 83%, Opsoclonus 0%, Pathological myopia 100%. The acceptance of low vision aids for near vision in the present study were Aniridia 100%, Retinitis Pigmentosa 100%, Congenital nystagmus 0%, Congenital optic atrophy 83%, Coloboma 100%, Cone rod dystrophy 100%, Leber's congenital amaurosis 75%, Oculo cutaneous albinism 90%, Opsoclonus 75%.

The patients grouped into two group, according to age group- 5 to 10 years of age as younger children and 11 to 15 years as older children; 36% were 5 to 10 years of age and 64% were 11 to 15 years of age. In older children acceptance of LVAs for distant vision and near vision is found to be significantly high compared to younger ($p$ value 0.0351 and $p$ value 0.0393 respectively). (Figure 3) There was no significant difference in functional improvement with LVAs for distant vision and near vision between older and younger children ($p$ value 0.1486 and $p$ value 0.111 respectively).

**Table 1:** Distribution of children among different categories

| Category | Number | Percentage |
|---|---|---|
| One | 16 | 29% |
| Two | 26 | 46% |
| Three | 4 | 7% |
| Four | 10 | 18% |

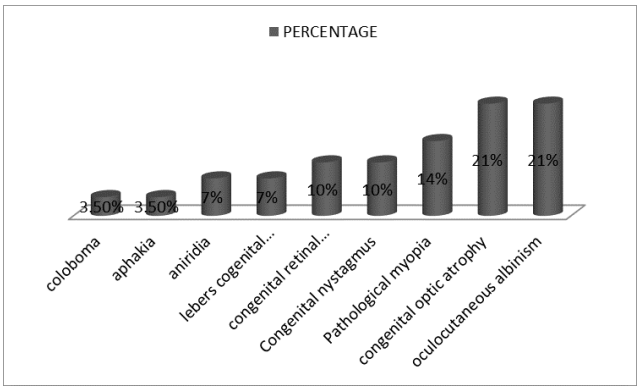


**Fig. 1:** Causes of low vision

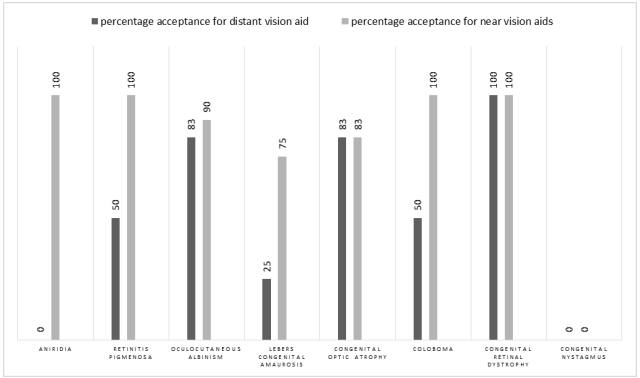


**Fig. 2:** Acceptance for distant and near vision aids in each clinical condition

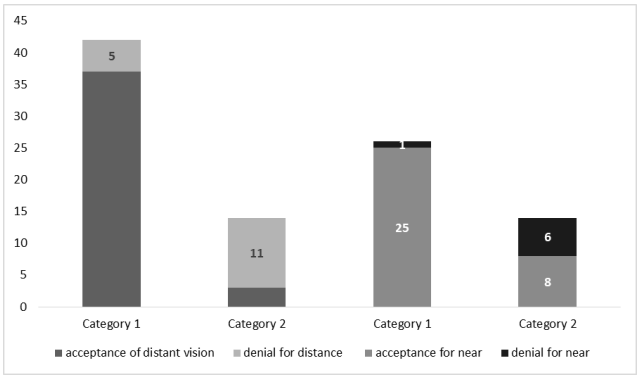


**Fig. 3:** Acceptance vs denial of LVA in category 1 and 2

## 4. Discussion

In our study 71% (n=40) accepted Low vision aids for distant vision and 29% (n=16) denied. In this study 12.5% (n=7) denied Low vision aids for near vision and 58.5% (n=33) accepted, 28.5% (n=16) did not require low vision aids for functional vision. The results of a study by Leat SJ and Karadsheh S indicated that children do use and benefit from low vision aids and that the child's need for near low vision aids can be predicted from their age, unmagnified reading performance, and visual field characteristics.[4] However, many visually impaired children both in mainstream special units and in schools for the blind are not being supplied appropriate low vision aids (LVAs). Many have not had an LVA assessment within 1 year and others are experiencing difficulties with LVAs that could be eliminated or reduced. In a questionnaire study by Rohrschneider K, Kiel R, Pavlovska V and Blankenagel A they reported on high satisfaction with the management and the LVA (> 90%).[5] 57% used their optical LVAs more than 5 times daily mostly for reading and writing (74% and 78% respectively). However, 20 patients were no longer able to read with their LVA due to decrease of function. In a study conducted by Rudduck G et al. a survey of usage of low vision aids (LVAs) by 56 children with visual impairment, who were attending mainstream schools in Wirral a total of 25% of children owned an LVA and 5% were using these on a regular basis. These low levels of ownership and usage led to the development of a low vision service involving the collaboration of education and health care. This paper described the development of that service, its elements and implementation. The results from the new service shown that of the 29 children issued with an LVA, 82.7% were using them on a regular basis. Having an integrated service is shown to significantly improve LVA usage.[6]

## 5. Conclusion

Low vision devices will provide visually impaired children an enriched and more accurate visual information, which in turn will improve their ability to learn and their chances of receiving education in mainstream schools with their sighted peers. In addition, learning to use low vision devices at an early age helps children to become confident with their use; it also allows them to feel less socially awkward as they grow up and continue to use these devices. In this study we observed majority of low vision patients are very satisfied with the prescription of LVAs and frequently uses these aids. The adequate LVA is a major factor improving the quality of life.

The patient's age, diagnosis and visual acuities were related to the compliance rate. It appears that increasing age and decreasing visual acuity may be factors which decrease compliance. However, none of the factors analyzed could be used as a reliable predictor of patient satisfaction or

of eventual benefit. Other health services which provide intensive training in the use of LVAs reportedly achieve a higher level of compliance. Low vision clinic staff needs to be aware of the range of specialist and community based services that could be needed by people with low vision We conclude that our present service could probably be improved by the employment of rehabilitation professionals specifically trained to teach patients how to make the best use of the LVAs provided.

Having an integrated service is shown to significantly improve LVA usage in the group of children seen so far. The service results should be discussed with suggestions for future service development.

Also, due to the possibility of greater deterioration of vision later due to the ongoing disease process follow-up examinations on a regular basis appear to be necessary.

## 6. Source of Funding

None.

## 7. Conflict of Interest

None.

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