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# Need of optical aids for schools for blind students in Pune and Nasik districts and compliance of their use

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**Purpose:** To assess the need for spectacles and low-vision aids (LVA) in students attending schools for the blind and study their compliance with use. **Methods:** Comprehensive ocular evaluation was performed using a hand-held slit lamp and ophthalmoscope. Vision acuity was measured using a logarithm of the minimum angle of resolution (logMAR) chart for distance, as well as for near. Spectacles and LVAs were dispensed after refraction and LVA trial. Follow-up was performed to assess the vision using the LV Prasad Functional Vision Questionnaire (LVP-FVQ) along with compliance with use after 6 months. **Results:** Of the 456 students examined from six schools, 188 (41.2%) were female; 147 (32.2%) were <10 years of age. In all, 362 (79.4%) were blind since birth. The students dispensed only LVAs were 25 (5.5%), only spectacles were 55 (12.1%), and both spectacle and LVAs were 10 (2.2%). The vision improved using LVAs in 26 (5.7%) and using spectacles in 64 (9.6%). There was a significant improvement in LVP-FVQ scores ( $P < 0.001$ ). Also, 68/90 students were available for follow-up, of whom 43 (63.2%) were compliant to use. Causes of not wearing spectacles or LVA in 25 were left somewhere or lost 13 (52%), broken 3 (12%), uncomfortable to use 6 (24%), not interested to use 2 (8%), and got operated 1 (4%). **Conclusion:** Although the dispensing of LVA and spectacles improved the visual acuity and vision function of 90/456 (19.7%) students, nearly a third were not using them after 6 months. Efforts need to be taken to improve the compliance of use.

**Key words:** Childhood blindness, congenital anomalies, low vision aids, schools for the blind

Studies from schools for blind students from Andhra Pradesh, Delhi, Maharashtra, North Eastern states (Assam, Meghalaya, Manipur, and Tripura), Karnataka, Gujarat, Uttar Pradesh, Tamil Nadu, and Telangana have shown that a significant number of students have some residual vision that can be put to use and can improve with low-vision aids (LVA).<sup>[1-13]</sup> Some studies have documented the improvement in their functional vision after dispensing optical devices.<sup>[6,11]</sup>

Children with visual impairment and blindness are looked at with sympathy, deserving help and support. These children need help to study and learn skills, so that they become socially and economically independent, gain self-esteem and are able to contribute to the community as differently-abled citizens. Studies from East Africa, the United Kingdom (UK), and Nepal have shown that many students in schools for the blind can be helped by improving their vision.<sup>[14-16]</sup>

Previous studies from schools for the blind in Maharashtra had looked at the causes of blindness in children, those who

could be helped using LVA.<sup>[3,6,11,13]</sup> Some studies quantified their improvement.<sup>[11]</sup> However, there were no studies documenting how much children/students actually used the devices, and the difference the dispensed optical aids made in their lives.

This study looked at all these objectives: To ascertain the causes of blindness and visual impairment in students attending schools for the blind, assess the need for optical aids (spectacles and LVA) in these special children, dispense optical aids to students whose vision can be improved, and also study the compliance to use of spectacles and LVA by students. It also looks at the temporal trend in the causes of blindness in these special school children from 2002 to 2020.<sup>[3,6,11,13]</sup>

## Methods

This was a cross-sectional, prospective study conducted from 2019 to 2020. Permission was sought and obtained from the Ethics Committee of Institute for Technology and Management, Navi Mumbai, Maharashtra and also from each of the school authorities. The instruments were part of a mobile eye clinic and included a logarithm of the minimum angle of resolution (logMAR) distance acuity chart, logMAR

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near acuity chart, a hand-held slit lamp, I-kare tonometer, a direct ophthalmoscope (Heine), a retinoscope (Heine), auto refractometer, trial box and trial frames and its accessories, occluder, and pen-torch.

Children attending six special schools for blind children in Nashik and Pune districts were examined from June to September 2019. They were the Government school for Blind, Nashik, National Association for Blind, Nashik, Trivenidevi Tulshiramji Patodiya Blind School, Malegaon, Poona School and Home for Blind Boys, Koregaon Park, Pune, Poona School, and Home for Blind Girls, Kothrud, Pune, and the Smt. Patashibai Lunkad Blind School, Bhosari, Pune.

The required permission was granted through emails and written applications. The required permission for screening of the children was obtained from the principal/headmaster of each school. The students were examined, and findings were recorded as per the "World Health Organization (WHO)/(PBL) Prevention of Blindness Eye Examination Record for Children with Blindness and Low Vision".<sup>[17]</sup> Relevant information was collected from class teachers and children. A brief history of the family, place of residence, and whether the parent's marriage was consanguineous were recorded. Information on additional disabilities (e.g., learning disability, physical handicap, epilepsy, or deafness) was obtained from children's records.

A detailed eye examination was performed. Distance visual acuity was measured using a logMar chart and near vision using a near logMar chart. Each eye was tested separately and then both together. The functional vision and intraocular pressure were measured using an I-Kare tonometer. The functional vision was determined using the four grades as made in the WHO protocol: the ability to walk around independently, the ability to recognize faces, the ability to see prints (two lines of N10 letter size), and the students who could use the residual vision.<sup>[17]</sup>

Anterior segments were examined using a hand-held slit lamp and posterior segments were examined using direct and indirect ophthalmoscopy after dilating the pupils. The need for optical, surgical, or medical intervention was recorded, and the visual prognosis was assessed. The classification system was based on the anatomical site of the abnormality (cornea, lens, uvea, retina, optic nerve, and globe) and underlying etiology (genetic, prenatal, perinatal, and childhood).

Cycloplegic refraction was attempted and a low-vision trial (telescope, hand magnifiers) was performed, if needed.

Assessment of LVAs for a distance was done by the following formula:

Magnification Required = Required visual acuity/Present visual acuity

The LVA commonly prescribed for distance included a monocular telescope; whereas for near, spectacles with higher plus and hand-held and stand magnifiers were dispensed. The spectacles and LVA were dispensed in October 2019.

Children with low vision were given good assessment and training to use LVA with a follow-up to ensure good compliance. An important part of the evaluation included counseling the children as well as teachers apart from just dispensing the aids.

**Table 1: Schools for the blind and their students**

Names of Blind Schools	Frequency	Percentage
Government School for Blind, Nashik	34	7.5
National Association for Blind, Nashik	63	13.8
Poona School and Home for Blind Boys, Koregaon Park, Pune	142	31.1
Poona School and Home for Blind Girls, Kothrud, Pune	115	25.2
Smt Patashibai Lunkad Blind School, Bhosari, Pune	57	12.5
Trivenidevi Tulshiramji Patodiya Blind School, Malegaon, Nasik district	45	9.9
Total	456	100

**Table 2: Causes of blindness**

Causes of blindness	Frequency	Percentage
Cornea	147	32.2
Retina	57	11.5
Congenital anomaly	103	22.5
Lens	47	12.5
Nystagmus	19	4.2
Strabismus	1	0.2
Optic nerve	44	9.7
Albinism	11	2.4
Amblyopia	5	1.1
Uvea	4	0.8
Glaucoma	3	0.7
Enucleation	3	0.7
Cortical blindness	2	0.4

The L.V. Prasad Functional Vision Questionnaire was used to assess change in the quality of life.<sup>[18]</sup> The score was given as –

0 = No problem; 1 = Little; 2 = Moderate amount; 3 = Great deal; 4 = Unable to do the activity.

Follow-up was performed after 6 months, and the compliance and change in the quality of life were assessed. The pre- and post-interventions were noted individually. Also, the status of using spectacles and LVAs was noted; and if not using the optical aid, the reason was asked and mentioned to assess compliance.

A report of the findings and recommendations was given to the principal of each school. Children requiring further investigations and treatment were referred to the tertiary care center. An Excel sheet was used for data entry and data were analyzed using the Statistical Package for Social Sciences (SSPS) version 16 software.

## Results

A total of 456 students were examined from six schools of the blind, of which 268 (58.8%) were male. Table 1 shows the names of the six special schools and the number of students examined in each. The age group <10 years old was 147 (32.2%), the 11–15 age group 251 (55%) were 11–15 years old, whereas 58 (12.7%) were >15 years of age.

**Table 3: Comparison of pre and post LVFVQ scores in children who were given LVDs**

		Pre-intervention			Post-intervention			
		Min	Max	Median	Min	Max	Median	
Q1	Do you have any difficulty in making out whether the person you are seeing across the road is a boy or a girl, during the day?	0	4	2	0	4	2	<i>P</i> <0.001
Q2	Do you have any difficulty in seeing whether somebody is calling you by waving his or her hand from across the road?	1	4	2.5	0	4	2	<i>P</i> <0.001
Q3	Do you have difficulty in walking alone in the corridor at school without bumping into objects or people?	0	4	2	0	4	1	<i>P</i> <0.001
Q4	Do you have any difficulty walking home at night (from tuition or a friend's house) without assistance when there are streetlights?	1	4	3	0	4	2	<i>P</i> <0.001
Q5	Do you have any difficulty copying from the blackboard while sitting on the first bench in your class?	1	4	2	0	4	2	<i>P</i> <0.001
Q6	Do you have difficulty reading the bus numbers?	1	4	3	0	4	2	
Q7	Do you have any difficulty reading the other details on the bus (such as its destination)?	1	4	3	0	4	2	<i>P</i> <0.001
Q8	Do you have any difficulty reading your textbooks at arm's length?	1	4	3	0	4	1	<i>P</i> <0.001
Q9	Do you have any difficulty writing along a straight line?	0	4	3	0	3	2	<i>P</i> <0.001
Q10	Do you have any difficulty finding the next line while reading when you take a break and then resume reading?	0	4	2	0	3	2	<i>P</i> <0.001
Q11	Do you have any difficulty locating dropped objects (pen, pencil, and eraser) within the classroom?	0	4	2	0	4	1	<i>P</i> <0.001
Q12	Do you have any difficulty threading a needle?	0	4	3	0	4	2	<i>P</i> <0.001
Q13	How much difficulty do you have in distinguishing between 1 rupee and 2 rupee coins (without touching)?	0	4	1	0	2	0	<i>P</i> <0.001
Q14	Do you have difficulty climbing up or down stairs?	0	3	1	0	2	0	<i>P</i> <0.001
Q15	Do you have difficulty lacing your shoes?	0	3	0	0	2	0	<i>P</i> <0.001
Q16	Do you have difficulty locating a ball while playing in the daylight?	0	4	4	0	4	3	<i>P</i> <0.001
Q17	Do you have difficulty applying the paste to your toothbrush?	0	2	0	0	1	0	<i>P</i> <0.001
Q18	Do you have difficulty locating food on your plate while eating?	0	2	0	0	0	0	<i>P</i> <0.001
Q19	Do you have difficulty identifying colors (e.g., while coloring)?	0	3	0	0	3	0	<i>P</i> <0.001
Q20	Do you have difficulty watching television properly	1	4	2	0	4	1.5	<i>P</i> <0.001
Q21	How do you think your vision is compared with that of your normal-sighted friend?	2	4	3	0	4	2	<i>P</i> <0.001

**Table 4: Comparison of the results demonstrating causes of blindness amongst schools examined across past 15 years**

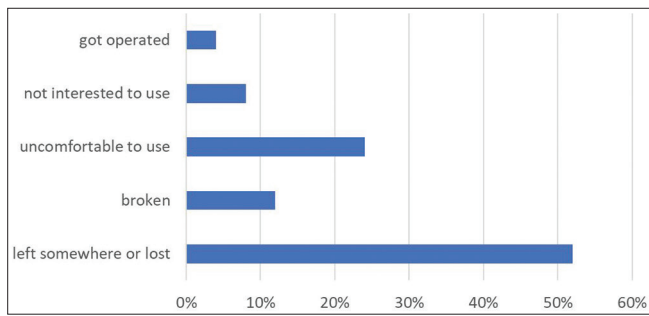
Common causes of blindness	2002-2005 <sup>3</sup>	2010-2012 <sup>6</sup>	2015-2016 <sup>9</sup>	2019-20 <sup>#</sup>	2018-19 <sup>13</sup>
Microphthalmos, anophthalmos	41.3%	30.9%	31.6%	22.5%	34.2%
Corneal conditions	22.2%	13.0%	16.2%	32.2%	16.7%
Lens (cataract, aphakia)	6%	16.9%	9.5%	12.5%	9.1%
Retinal disorders	11.2%	9.3%	11.5%	11.5%	18.4%

<sup>#</sup>This study. The data for reference 3 (BJO 2007) and reference 13 (IJO 2022) are for the West Maharashtra region only. The 2010-12 and 2015-16 series were only of the Pune region

Visual acuity of each eye was recorded individually of which, vision with no perception of light in the right eye was 155 (34%) and left eye was 144 (31.6%), vision with the perception of light positive in the right eye was 103 (22.6%) and left eye was 103 (22.6%). If the better eye vision was considered, 41 (9%) had 3/60, 27 (5.9%) had 2/60, 40 (8.8%) had 1/60, 22 (4.8%) had counting fingers at 50 cm, 22 (4.8%) had counting fingers near the face, 31 (6.8%) had hand movements, 34 (7.5%) had the perception of light but no projection, 73 (16%) had PLPR+, and 139 had no perception of light. For three children, vision could not be assessed as they were

uncooperative. Six students had a vision of logMAR 0.9 (6/48), one had logMAR 0.8 (6/38), six had logMAR 0.7 (6/30), five had logMAR 0.6 (6/24), one had logMAR 0.5 (6/19), two had logMAR 1.0 (6/60), two had logMAR 0.3 (6/12), whereas one student had logMAR 0.2 (6/9.5).

As for the age of onset of blindness, 362 (79.4%) were blind since birth, 73 (16%) were blind since the first year of life, and the age of onset was unknown for 21 (4.6%). One hundred two (22.4%) had another blind member in their family. Table 2 demonstrates the causes of blindness amongst the students examined.



**Figure 1: Reason for not wearing spectacles and LVA**

The students given only LVAs were 25 (5.5%), only spectacles were 55 (12.1%), and both spectacles and LVAs were 10 (2.2%), 90 in all.

The vision improved using LVAs was 26 (5.7%) and that of spectacles was 64 (9.6%). Also, 366 (80.3%) students did not improve with prescription. Table 3 shows the vision functional vision questionnaire scores for each question before and after dispensing the optical aids.

Of the 90 students who were dispensed optical aids, 68 students were available for the follow-up to check compliance. On ensuring compliance for use, 43/68 (63%) were using the optical aids, whereas 25 (37%) were not using them. Amongst those dispensed spectacles, at the 6 months follow-up, 24 students were using spectacles, whereas 21 students were not using them. Amongst those dispensed LVAs, 13 students were using them, whereas 3 students were not using them. Amongst those who dispensed both, six students were using both spectacle and LVA, whereas one student was not using them. Fig 1 shows the causes for not wearing the spectacles and/ or low vision aids that were dispensed free of cost.

The cause of not wearing spectacles or LVA were left somewhere or lost 13 (52%), broken 3 (12%), uncomfortable to use 6 (24%), not interested to use 2 (8%), got operated 1 (4%). Table 4 shows the comparison across time for the causes of blindness amongst schools for the blind students from 2002 to 2019 in the same/similar schools.

## Discussion

The redefinition of low vision has resulted in more people with severe and profound low vision can be rehabilitated with appropriate intervention. Low-vision patients can improve their residual vision and possibly relearn to use lost functional vision, which often restores the ability to perform daily tasks such as reading.<sup>[11,14,15]</sup> Various studies have found low-vision devices (LVD) as an effective means of providing visual rehabilitation.<sup>[11,14,15,19]</sup> Sloan *et al.* showed that children, compared to adults, have a very high rate of successful LVD use when aids are properly prescribed.<sup>[20]</sup> The LVD was not available in schools, and again emphasizes the need to improve awareness of LVD among parents and teachers involved in educating the blind as nearly 90/456 students had their vision function improved in this series. However, in spite of this, more than one-third of children were not using the spectacles and LVA that had been dispensed to them free of cost with attendant counseling. The burden of childhood blindness in terms of blind person years is second only to cataracts.<sup>[21]</sup> Much

more needs to be performed to ensure that these children are able to make use of their residual vision.

The overall visual function of a child has four major components: communication, mobility, daily living activities, and sustained near vision tasks such as reading and writing, including color vision and contrast sensitivity assessment.<sup>[22]</sup> A more detailed evaluation of these parameters, including psychological assessment, can aid in planning special education programs for visually impaired children. Substantial changes in the environment, which are not very costly, should be an integral part of the low-vision care of these children.

Depending on the educational need to use Braille, or the ability to use print as an educational medium, additional wings of low-vision care need to be set up within available rehabilitation services in schools for the blind schools. Some of these children with low vision, studying in schools for the blind, after being trained, can possibly be integrated into regular schools and thus the schools for the blind can be reclassified as schools for the visually impaired. This would also do away with the issue of inappropriate enrollment.<sup>[23]</sup>

For low-vision services to become widely available to children with severe visual impairment, there is a need to develop simple guidelines for identifying such children, develop simplified methods of assessing children with low vision, which can be used by “non-experts,” as well as guidelines on prescribing, using, and maintaining LVDs, which should ideally be locally produced. The compliance was not 100%. The spectacles and LVA had been dispensed completely free of cost. A study of spectacle compliance amongst secondary school children, who had been dispensed spectacles free of cost through “sarva siksha abhiyaan,” after 6 months of use in the Pune district was found to be 29.5%. The reasons for not using were similar, “forgot to wear,” “lost,” “broken,” and “teased about it.” One common factor in that study and the present one was that the devices had been given free of cost to children.<sup>[24]</sup>

To provide sustainable, low-cost, low-vision services close cooperation between optometrists, optical technicians, ophthalmologists, teachers, and parents will be essential.<sup>[25]</sup>

Limitations: For evaluation, only three schools in Pune were examined. The school for the blind in Alandi, Pune, was not examined as it was examined recently in 2019. The follow-up for compliance was performed using telephone conversation, due to COVID-19.

## Conclusion

In conclusion, ophthalmologists must be made aware of the potential value of spectacles and LVDs in “incurably blind children.” The present study demonstrates the need for ophthalmic evaluation, refraction, and assessment for low-vision devices and spectacles before admission to schools and the periodic review thereafter. In addition, training for the use LVDs with print education should be introduced in the schools for the blind, along with teaching Braille, keeping in mind both the short-term visual outcome and the long-term visual prognosis. A joint effort on part of optometrists, ophthalmologists, and schools for the blind could reduce the number of students in these schools.

Regular low-vision assessment could result in many students being enabled to read and learn print; getting into integrated education and having more choices of vocation and recreation in the future, which will allow them to develop their potential to its truest extent.

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### Conflicts of interest

There are no conflicts of interest.

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