A Survey of Visual Impairment in Children Attending a Blind School in South India

Sir,

Childhood blindness is a huge social burden because of the large number of "blind years" it generates. The current global estimates of children with moderate to severe visual impairment and blindness are approximately 17.52 million and 1.42 million, respectively.[1]

Population-based studies on childhood blindness are difficult because they entail evaluation of large samples. A blind school survey is an easier way to obtain a cross-section of childhood blindness for a region, but it has an inherent Berksonian bias. Nevertheless, it can provide a valuable insight into the causes of childhood visual impairment and may help local authorities plan interventions accordingly.

We surveyed a blind school in an urban locality of a tier III city on a single day (December 4, 2016). Prior permission for examination was obtained from the principal and an ethical clearance was obtained from the Institutional Ethics Committee. The survey adhered to the tenets of the Declaration of Helsinki.

The students were examined by an ophthalmologist and two mid-level ophthalmic personnel trained in refraction and low vision assessment. Distance visual acuity was assessed by Aurochart© (Aurolab, Madurai, India), a self-illuminated electronic Snellen's acuity chart, placed at a distance of three meters from the child, in a make-shift dark room. Distance refraction was done by loose-lens retinoscopy. The objective values obtained were refined subjectively. The spherical component was refined by a bracketing method using ±2.0 D, ±1.0 D and ±0.5 D lenses. The astigmatic component was refined using a Jackson's cross cylinder (±1.0 D for those with vision worse than 6/36 and ± 0.5 D for the others). The axis was bracketed to within 10º steps and the amount to within ± 1.0 D.

If the child failed the distance vision test but appeared to have some useful vision left, tests for functional vision (independent mobility, social contact, and near vision) were performed with both the eyes open.[2] "Independent mobility" was assessed by asking the child to navigate unassisted between two chairs kept two meters apart in a well-lit room. "Social contact" was defined by the child's ability to identify known faces from two meters. "Near vision" was assessed by asking the child to describe or identify three, two-centimeter symbols from any near distance. Children with no functional vision were referred to the base hospital for cane training.

Anterior segment evaluation was carried out with a torchlight. Fundus evaluation, if indicated, was performed using an indirect ophthalmoscope after full mydriasis. The ophthalmologist recorded the major site of abnormality responsible for visual impairment using the classification system advocated by the World Health Organization.[3] When the major anatomical site of abnormality was different in the two eyes, the eye with the preventable or treatable cause was selected. If neither eye had a treatable or a preventable abnormality, the eye with the better vision was selected.

Continuous variables were summarized as mean and standard deviation. Categorical variables were summarized as frequency and percentage. The data were analyzed using OpenOffice Calc for Windows v4.14 (The Apache Software Foundation, Wilmington, North Carolina, USA).

A total of 149 children were examined in the blind school out of which 91 students (61.1%) were males. The mean age of the students was 12.13 ± 3.16 years (range = 6–16 years). Overall, 133 children (89.3%) were visually impaired (42.86% [n = 57] had low vision and 57.14% [n = 76] were blind) while 16 children (10.7%) had no visual impairment (according to the WHO definition). Among these 16 children, two had post traumatic phthisis in one eye, one had an enucleated globe and three had ametropic amblyopia. All these six children had mild mental retardation for which they had not been accepted in a normal school. In the remaining ten, there was a visual impairment not severe enough to be classified as Category I but this was associated with a physical impairment (six children had hearing difficulties and the rest had limb abnormalities). They had been unable to adjust in regular schools and so they had been allowed to stay back.

The major anatomical site and etiology of visual impairment in these 133 children are summarized in Table 1. The term "others" included disorders in which the primary anatomical site of abnormality was dubious while the term "undetermined" encompassed cases where the appropriate underlying etiology was uncertain. In the surveyed blind school, we found that developmental anomalies accounted for vision loss in a majority of the cases (n = 39; 29.32%) while the proportion of corneal blindness was low (5.3%; n = 7). A recent systematic review has documented similar findings from other contemporary blind school surveys as well.[4] However, surveys conducted between 1990 and 2007 commonly reported the cornea as the most common anatomical site of blindness. This paradigm shift has perhaps been due to an increased incidence of genetic abnormalities and increased exposure to teratogens during pregnancy.[4]

Overall, the etiologies of blindness were mixed with a predominance of hereditary and undetermined causes. A major limitation of our study was that we could neither interview nor examine the parents.

Table 1: The distribution of visual impairment (n=133)

	n (%)
Anatomical site	
Whole globe	42 (31.6)
Cornea	7 (5.3)
Lens-related	27 (20.3)
Uvea	2 (1.5)
Retina	23 (17.3)
Optic nerve	10 (7.5)
Others*	22 (16.5)
Etiologies	
Hereditary	21 (15.8)
Intrauterine factor	2 (1.5)
Perinatal/neonatal factor	4 (3.0)
Post-natal/childhood/infancy	6 (4.5)
Undetermined**	100 (75.2)

*Others: Ametropic amblyopia, idiopathic nystagmus and cortical visual impairment, **Undetermined: Cataract or glaucoma (family history unavailable), abnormalities since birth, nystagmus, phthisis bulbi, ametropic amblyopia, retinal diseases of unknown etiology such as coat's disease and optic atrophy

This was crucial for classifying the children with glaucoma and cataract into the appropriate inheritance categories.

In our survey, 47 (35.3%) cases had an avoidable blindness. The preventable causes (n = 15; 11.3%) included ametropic amblyopia (n = 5; 3.8%), stimulus-deprivation amblyopia (n = 3; 2.3%), congenital rubella syndrome (n = 2; 1.5%), and trauma (n = 5; 3.8%) while the treatable causes (n = 32; 24.1%) included glaucoma (n = 7; 5.3%), cataract (n = 7; 5.3%), pseudophakia with amblyopia (n = 17; 12.8%) and retinopathy of prematurity (ROP) (n = 1; 0.8%). Out of the seven children with unoperated cataract, only one was operable and was sent to the base hospital for further management. In the rest, the cataract was either partly absorbed or there was no perception of light. The presence of pseudophakia with amblyopia as a cause for avoidable vision loss indicates a lack of knowledge among the care-providers regarding the timing of surgery and the need for follow-up. Dense amblyopia might have already set in by the time the surgery had been done. Moreover, surgery for a pediatric cataract is only a part of its management and stringent follow-up with anti-amblyopia measures is essential for a good final visual outcome. Thus, educating and counseling the primary care-providers of children with congenital cataracts should be a major area of focus.

Although the proportion of congenital glaucoma was much higher than that reported in the general population (5.3% vs. 1 in 10,000–20,000),[5] it is difficult to state whether this is a definite trend or a manifestation of Berksonian bias. Ametropic amblyopia as a cause of avoidable blindness simply indicates a lack of awareness regarding the need for routine ophthalmological evaluation of children. Cicatricial ROP was seen in only one case (0.8%). This may be attributed to a high infant mortality rate where ROP is rarely seen due to the scarcity of neonatal care facilities.

In conclusion, the pattern of childhood blindness seen in this survey is similar to that in other contemporary studies. The prevalence of preventable blindness can be reduced by strengthening the primary eye-care services. But reduction in the prevalence of treatable blindness would require improvement in pediatric ophthalmology facilities with provisions for early referral and rehabilitation. Parental education through social health activists and paramedical personnel may also help in drastically reducing the incidence of treatable vision loss in children.

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Conflicts of interest

There are no conflicts of interest.

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