WORLD VIEW

Childhood blindness in India: a population based perspective

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Aim: To estimate the prevalence and causes of blindness in children in the southern Indian state of Andhra Pradesh.

Methods: These data were obtained as part of two population based studies in which 6935 children ≤15 years of age participated. Blindness was defined as presenting distance visual acuity <6/60 in the better eye.

Results: The prevalence of childhood blindness was 0.17% (95% confidence interval 0.09 to 0.30). Treatable refractive error caused 33.3% of the blindness, followed by 16.6% due to preventable causes (8.3% each due to vitamin A deficiency and amblyopia after cataract surgery). The major causes of the remaining blindness included congenital eye anomalies (16.7%) and retinal degeneration (16.7%).

Conclusion: In the context of Vision 2020, the priorities for action to reduce childhood blindness in India are refractive error, cataract related amblyopia, and corneal diseases.

Childhood blindness is one of the priorities in Vision 2020: the right to sight.[1] It is estimated that there are 1.4 million blind children in the world, two thirds of whom live in the developing countries,[2] and that the causes of blindness in children vary according to region and socioeconomic development.[2 3]

Population based data on the prevalence of childhood blindness, which are needed to set priorities and plan strategies to reduce childhood blindness, are limited worldwide including from India.[3 4] Population based data on childhood blindness obtained as part of a community based comprehensive eye care programme were previously reported from the state of Andhra Pradesh in India.[5] The blindness data from this programme were reported for only very poor vision, visual acuity of <3/60 in the better eye, because only those children who were suspected of having poor vision or eye problems were examined and not all the children in the target population.

We now report data on blindness in children, defined as presenting visual acuity of <6/60 in the better eye, the definition of blindness used in India,[6] obtained as part of two population based studies in the Indian state of Andhra Pradesh, in which the majority of the eligible children in the sample received complete eye examination.

METHODS

Blindness was defined as presenting visual acuity of <6/60 in the better eye. The data on childhood blindness were obtained as part of the Andhra Pradesh Eye Disease Study (APEDS) and the Refractive Error Study in Children (RESC).[6–8] The methodology of these two studies has been described in detail elsewhere.[6–8] A brief description follows.

APEDS was a population based cross sectional study of all ages representative of the urban-rural and socioeconomic distribution of the population of the Indian state of Andhra Pradesh.[6 7] A total of 11 786 people were sampled from 94 clusters in one urban and three rural districts using stratified random sampling.[6 7] Of all the sampled people, 10 293 (87.3%) were examined, including 2861 children ≤15 years of age. The age of each subject at the time of examination was considered for reporting the results. Written informed consent was obtained from the parent or guardian of the children before examination. The eye examination in APEDS has been described in detail previously.[6 7] In brief, this included measurement of presenting and best corrected distance and near visual acuities under standardised conditions with logMAR charts,[9] external eye examination, assessment of pupillary reaction, anterior segment examination using slit lamp biomicroscope, measurement of intraocular pressure using Goldmann applanation tonometer, gonioscopy, and lens, vitreous, and posterior segment examination after dilatation unless contraindicated because of risk of angle closure. Photographic documentation was done for any anterior or posterior segment pathology which was used to confirm diagnoses.[6 7] The cause of blindness was assigned as described previously.[6 7] This study was approved by the ethics committee of the LV Prasad Eye Institute, Hyderabad, India. APEDS was conducted from October 1996 to February 2000.

RESC was a population based study of school aged children between 7 and 15 years of age in the Mahabubnagar district, a poor rural district, of the Indian state of Andhra Pradesh to study epidemiology of refractive errors.[8] Random selection of 25 village based clusters was used to identify a sample of 4414 children 7–15 years of age. From April 2000 to February 2001, of those sampled, 4074 (92.3%) were examined after obtaining written informed consent from the parent/guardian. The examination included standardised visual acuity measurements using logMAR charts, ocular motility evaluation, retinoscopy and autorefraction under cycloplegia, and examination of anterior segment, media, and fundus. The survey was approved by the ethics committee of the LV Prasad Eye Institute, Hyderabad, India. Human subject research approval for the study protocol was obtained from the World Health Organization secretariat committee on research involving human subjects.

RESULTS

Five of the 2861 children (15 years of age or less) examined in APEDS were blind, a prevalence of 0.17% (95% confidence interval (CI) 0.06 to 0.41). The age range of these blind children was 3–9 years and three (60%) were female. Of the four districts included in APEDS, all blind children were

Table 1 Causes of blindness in children. Blindness defined as presenting visual acuity <6/60 in the better eye

Cause of blindness	No (%) of blind children		
	APEDS	RESC	All
Refractive error	2 (40)	2 (28.6)	4 (33.3)
Retinal	0	2 (28.6)	2 (16.7)
Corneal opacity	1 (20)	1 (14.3)	2 (16.7)
Congenital eye anomaly	1 (20)	1 (14.3)	2 (16.7)
Amblyopia	1 (20)	1 (14.3)	2 (16.7)
Total	5 (100)	7 (100)	12 (100)

APEDS = Andhra Pradesh Eye Disease Study; RESC = Refractive Error Study in Children; and All = both the studies combined.

residing in the two poor rural districts. In two of these five children, visual acuity could not be measured. These two children, both aged 3 years, were thought to have very poor vision, as they could not fixate and follow light. Table 1 shows the causes of blindness in children from APEDS. Refractive error included a case each of high myopia and hyperopia. Corneal opacity in one child was present since birth, the cause of which could not determined. One child with congenital eye anomaly had retinochoroidal coloboma involving optic disc and macula. The cause of amblyopia in one child was stimulus deprivation because of congenital cataract (both eyes had been operated upon).

Seven of the 4074 children (7–15 years of age) examined in RESC were blind, a prevalence of 0.17% (95% CI 0.07 to 0.35). The age range of these blind children was 7–14 years, and six (85.7%) were female. The causes of blindness are shown in Table 1. Refractive error included a case each of high myopia and hyperopia. The retinal disorders included a case each of heredomacular degeneration and myopic degeneration. Corneal opacity in one child was following fever in early childhood that was thought to be related to precipitation of vitamin A deficiency based on the history given by the mother, and one child had stimulus deprivation amblyopia due to nystagmus.

Considering the two studies together, the prevalence of childhood blindness was 0.17% (95% CI 0.09 to 0.30). The prevalence of presenting visual acuity of <3/60 in the better eye was 0.10% (95% CI 0.04 to 0.21).

DISCUSSION

As the prevalence of blindness in children is much lower than in adults, a larger sample size of children is needed to provide accurate data on the prevalence and causes of childhood blindness. Hence, the majority of the population based data on childhood blindness are generally obtained from either surveys done to assess blindness for all ages or from surveys done to assess a particular disease of interest in children—for example, vitamin A deficiency or refractive error.[3] These data on childhood blindness reported by us are also from two such studies, one from a study of visual impairment in all ages (APEDS) and the other from a study of refractive errors in school aged children (RESC). In the absence of other recent population based data on childhood blindness from India that include complete eye examination of all the study participants, these data could serve as an estimate of childhood blindness with presenting visual acuity of <6/60 in the better eye. Though every attempt was made by the field team to recruit blind children or children with multiple handicaps from the sample households who were away at special schools, it is possible that some of these children could have been missed if information about them was not given to the field team by their families for some reason. Hence, this could have resulted in lower estimates for childhood blindness.

A complete dilated eye examination was performed for children in both the studies. The causes of childhood blindness were generally similar in both the studies, except for the retinal causes that were found only in RESC. These data on causes of blindness should be interpreted in the background of the relatively small number of blind children. Considering both the studies together, refractive error, which can be easily treated with spectacles, was responsible for one third of the blindness. Congenital eye anomalies, retinal degeneration, and amblyopia due to congenital cataract and nystagmus made up 50% of the total blindness. Corneal disease was responsible for 17% of the blindness, half of which could be attributed to vitamin A deficiency.

The majority of the children with blindness were female in both the studies. The relatively small sample size has to be kept in mind while interpreting this finding. We have also previously reported that blindness is higher in females of all ages considered together in the Indian state of Andhra Pradesh.[6] It is possible that families are less likely to enrol a female blind child in the blind school than males, and hence, we found more female blind children in this population. This is also suggested from the study on children living in blind schools in nine states of India, which reported that 60% of the children in these schools were males.[10]

From an eye care service delivery and planning perspective, one third of the blindness was due to refractive error which is relatively easily treatable. Another 16.6% of the blindness was due to preventable causes (8.3% each due to vitamin A deficiency and amblyopia after cataract surgery). The remaining 50% of the blindness was due to causes that are currently not treatable or preventable, which included congenital eye anomalies (25%), retinal degeneration (16.7%), and nystagmus related amblyopia (8.3%).

Extrapolation of these data suggest that of the approximately 400 million children in India,[11] 680 000 (95% CI 360 000 to 1 200 000) may be blind, including 226 440 with easily treatable refractive error. The majority of the blind children are likely to be in the poor segment of the population. In the context of Vision 2020, these data suggest that the priorities for action to reduce childhood blindness in India appear to be refractive error, cataract related amblyopia, and corneal diseases.

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