WORLD VIEW

Causes of severe visual impairment and blindness in Bangladesh: a study of 1935 children

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Objective: To identify the anatomical site and underlying aetiology of severe visual impairment and blindness (SVI/BL) in children in Bangladesh.
Design: A national case series.
Methods: Children were recruited from all 64 districts in Bangladesh through multiple sources. Causes were determined and categorised using standard World Health Organization methods.
Results: 1935 SVI/BL children were recruited. The median age was 132 months, and boys accounted for 63.1% of the sample. The main site of abnormality was lens (32.5%), mainly unoperated cataract, followed by corneal pathology (26.6%) and disorders of the whole eye (13.1%). Lens-related blindness was the leading cause in boys (37.0%) compared with corneal blindness in girls (29.8%). In 593 children, visual loss was due to childhood factors, over 75% being attributed to vitamin A deficiency. Overall 1338 children (69.2%) had avoidable causes. Only 2% of the country's estimated SVI/BL children have access to education and rehabilitation services.
Conclusions: This is the first large-scale study of SVI/BL children in Bangladesh over two-thirds of whom had avoidable causes. Strategies for control are discussed.

With an estimated 1.4 million blind children worldwide, the World Health Organization's (WHO) global initiative for the elimination of avoidable blindness (VISION 2020: The Right to Sight) has prioritised the control of blindness in children.[1 2] The available data suggest that the prevalence and causes of blindness in children vary widely from country to country, reflecting differences in socio-economic development and health care provision.[3] Accurate information on the prevalence and causes of blindness in children is difficult to obtain due to low prevalence—for example, only seven blind children were identified in a study of >10 000 children in India.[4] Reliable data are needed, as strategies for the control of blindness in children are significantly different from those for adults: specific training, expertise and equipment, and a more comprehensive, multidisciplinary team approach are required. Early detection and prompt treatment are also essential to prevent irreversible amblyopia.

Bangladesh is one of the most densely populated countries in the world and is the seventh most populous nation, with 41% being children below the age of 16 years.[5] The country is ranked 139th according to the United Nation's Human Development Index. A recent survey provided data for adults,[6] but to date no reliable data exist for children.

The purpose of this study of severely visually impaired or blind (SVI/BL) children was to identify the main anatomical site and underlying aetiology of blindness; to identify all preventable and treatable causes (i.e. avoidable causes); and to explore variation by socio-demographic variables.

SUBJECTS AND METHODS

Recruitment of SVI/BL children

The details of systematic attempts in each of the 64 districts of Bangladesh to identify SVI/BL children are described in another publication,[7] but in brief the following sources were used:

- Schools (SpEdu): all eight special schools for the blind and 69 integrated schools.[8]
- Community-based rehabilitation (CBR) programmes: all 21 active CBR programmes for SVI/BL children.
- Key informants (KIs): KIs were community volunteers who were trained by the study team to ascertain as many SVI/BL children as possible in their own locality.

Data collection

The team comprised an ophthalmologist (MM), three project officers and a project administrator. The project officers were responsible for contacting, visiting, networking, identifying and recruiting SVI/BL children in each district and for making arrangements for the visit by the mobile eye examination unit. The project administrator coordinated the team and maintained the data collection forms and equipment. Data on each child were recorded by the ophthalmologist on the WHO/PBL Eye Examination Record for Children with Blindness and Low Vision[9] which has been widely used in other studies.[10–16]

Method of eye examination

Examinations were conducted in the schools for the blind, or in suitable locations close to where the children lived. Each child was seen with his or her parent, class teacher, CBR coordinator or KI. Socio-demographic data, and relevant ophthalmic, medical, obstetric and family histories were elicited by the ophthalmologist. Presenting distance visual acuities (ie, with optical correction if usually worn) were measured in each eye separately and then in both eyes together using a reduced logarithm of minimum angle of resolution (logMAR) E chart, at 6 or 3 m.[17] Cardiff acuity cards were used for pre-school children, employing the standard staircase method.[18] Near vision was tested with an E chart with N5–30 font sizes with

Abbreviations: BL, blindness; CBR, community-based rehabilitation ICU, intensive care unit; IQR, interquartile range; KI, key informant; ROP, retinopathy of prematurity; SpEdu, special schools for the blind and integrated schools; SVI, severe visual impairment; WHO, World Health Organization

both eyes open. Visual fields were assessed by confrontation. Anterior segment examination was carried out using a magnifying loupe and torch. Cycloplegic refraction was performed unless it was considered clinically inappropriate (eg, dense cataract), using retinoscopy and trial lenses. Posterior segments were examined by direct and indirect ophthalmoscopy. Intraocular pressure measurements were not made. Interobserver agreement studies conducted in the pilot study prior to the main study (between MM and CG) on the anatomical and aetiological causes of visual loss had good levels of agreement. All children needing surgical, medical or optical treatment were referred to one of four collaborating eye hospitals.

Inclusion criteria

Children aged <16 years. The WHO categories of visual impairment[19] were used: SVI was defined as a presenting visual acuity (ie, with glasses if normally worn) of <6/60 to 3/60 in the better eye. BL was defined as <3/60 in the better eye. As a result, children with unilateral blindness or impairment were not included in the study.

Classification of causes

Three classification systems were used, the first two being those developed by the WHO.[9]

Anatomical site of abnormality

All structural abnormalities were recorded for each eye, and one site selected for each eye, using the detailed definitions and criteria in the WHO Coding Instructions. Cataract, for example, is defined as central lens opacity sufficient to reduce visual acuity. One site, either that in the right eye or that in the left eye, was selected to represent the major site for the child, again following WHO guidelines. If the main sites differed between eyes, priority was given to treatable then to preventable causes.

Underlying aetiology

Based on family history, ocular history, clinical findings and diagnosis, attempts were made to determine the time of onset of the insult leading to visual loss. The following categories were used: hereditary, intrauterine, perinatal and childhood factors, again following WHO guidelines.

Preventable/treatable/unavoidable

Preventable causes (eg, vitamin A deficiency, measles) were diagnoses/conditions which could have potentially been prevented through simple health promotion, prevention and education at community and household levels by non-specialist, primary level health workers, volunteers or community members. Treatable causes were conditions where surgical, medical or optical interventions could have preserved or restored sight (eg, cataract and glaucoma surgery). Preventable, treatable and unavoidable categories were mutually exclusive for each diagnosis and subsequent analysis. Avoidable blindness was the sum of treatable and preventable causes, and unavoidable causes were all other causes.

Ethical approval

Permission to visit schools was granted by the Ministry of Social Welfare. Ethical approval was obtained from the ethics review committee of the BNSB Eye Hospital in Bangladesh.

Data management

Data were entered by a dedicated data entry officer into a database created in Microsoft Access (2000). All data entries were double checked by the project administrator. A random selection of the data set revealed an error rate of <0.1%. The data were exported to STATA 9.0 (Statcorp. Release 9.0., Stata Corporation, College Station, Texas) for statistical analysis. All tests are two sided, and CI are quoted at the 95% level.

RESULTS

All identified participants (n = 2625) were asked to be present on the day of eye examination. All those who were present (n = 2322) on the day were examined by the ophthalmologist. After examination, 387 participants were excluded from the study as they were either too old or had visual acuity ≥6/60 in at least one eye. A total of 1935 children were included in this study.

Demographic details of study children

More boys were recruited than girls (63.1% vs 36.9%) (table 1). Over half the study children were aged 11–15 years (1027, 53.1%) but there was no gender differences in age (p = 0.49). Children were largely ascertained from rural locations (1847, 95.4%), with no rural/urban gender differences (p = 0.74). The median age of rural children was 11 years (interquartile range (IQR 7–14)) compared with 13 years in urban children (IQR 9–15) (p<0.001).

Table 1 Demographic characteristics of the study population, by gender

	Boys	Girls	Total
Division*			
Barisal	56 (4.6)	38 (5.3)	94 (4.9)
Khulna	240 (19.7)	124 (17.3)	397 (20.5)
Chittagong	423 (34.7)	259 (36.2)	364 (18.8)
Dhaka	237 (19.4)	160 (22.4)	682 (35.2)
Rajshahi	230 (18.9)	120 (16.8)	350 (18.1)
Sylhet	34 (2.8)	14 (2.0)	48 (2.5)
Level of VI†			
Blind	1100 (91.0)	661 (92.5)	1771 (91.5)
SVI	110 (9.0)	54 (7.5)	164 (8.5)
Near acuity			
≥N10	82 (6.7)	39 (5.5)	121 (6.3)
≥N30	138 (11.3)	66 (9.2)	204 (10.5)
<N30	824 (67.5)	493 (68.9)	1317 (68.1)
Unable	176 (14.4)	117 (16.4)	293 (15.1)
Age (years)			
0–5	185 (15.2)	112 (15.7)	297 (15.4)
6–10	404 (33.1)	207 (29.0)	611 (31.6)
11–15	631 (51.7)	396 (55.4)	1027 (53.1)
Place of dwelling			
Rural	1166 (95.6)	681 (95.2)	1847 (95.5)
Urban	54 (4.4)	34 (4.8)	88 (4.55)
Other disability			
Yes	64 (5.3)	32 (4.5)	96 (5.0)
No	1156 (94.7)	683 (95.5)	1839 (95.0)
Family history‡			
Yes	255 (20.9)	171 (23.9)	426 (22.0)
No	963 (78.9)	541 (75.7)	1504 (77.7)
Unknown	2 (0.2)	3 (0.4)	5 (0.3)
History of consanguinity§			
Yes	208 (17.0)	132 (18.4)	340 (17.6)
No	983 (80.6)	564 (78.9)	1547 (80.0)
Unknown	29 (2.4)	19 (2.7)	48 (2.4)
Age of onset			
Congenital	373 (30.5)	239 (33.4)	612 (31.6)
Infantile¶	290 (23.8)	124 (17.3)	414 (21.4)
≥1 to <5 years	361 (29.6)	231 (32.3)	592 (30.6)
≥5 to <16 years	195 (16.0)	122 (17.1)	317 (16.4)
Total	1220 (100%)	715 (100%)	1935 (100%)

*Arranged by adult population literacy, in descending order: Barisal (66.2%); Khulna (54.9%); Chittagong (52.0%); Dhaka (48.3%); Rajshahi (47.4%); and Sylhet (39.3%).
†VI, visual impairment. Blindness was defined as a presenting visual acuity (ie, with glasses if normally worn) of <3/60 in the better eye. Severe visual impairment (SVI) was defined as presenting <6/60 to 3/60 in the better eye.
‡The family history was unknown in five children.
§History of consanguinity was unknown in 48 children.
¶Postnatal to <1 year.

Table 2 Main anatomical site of abnormality, and underlying aetiology in 1935 severely visually impaired and blind children, by gender and age

		Boys	Girls	0–5 years	6–10 years	11–15 years	Total
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Anatomical	Whole globe	155 (12.7)	98 (13.7)	48 (16.2)	85 (13.9)	120 (11.7)	253 (13.1)
p<0.001*	Cornea	301 (24.7)	213 (29.8)	39 (13.1)	140 (22.9)	335 (32.6)	514 (26.6)
p<0.001†	Lens	451 (37.0)	178 (24.9)	129 (43.4)	230 (37.6)	270 (26.3)	629 (32.5)
	Uvea	21 (1.7)	17 (2.4)	1 (0.3)	10 (1.6)	27 (2.6)	38 (2.0)
	Retina	148 (12.1)	97 (13.6)	36 (12.1)	71 (11.6)	138 (13.4)	245 (12.7)
	Optic nerve	88 (7.2)	66 (9.2)	21 (7.1)	45 (7.4)	88 (8.6)	154 (8.0)
	Glaucoma	47 (3.9)	36 (5.0)	19 (6.4)	26 (4.3)	38 (3.7)	83 (4.3)
	Other‡	9 (0.7)	10 (1.4)	4 (1.35)	4 (0.7)	11 (1.1)	19 (1.0)
Aetiology	Hereditary	176 (14.4)	115 (16.1)	55 (18.5)	98 (16.0)	138 (13.4)	291 (15.0)
p=0.06	Childhood factor	353 (28.9)	240 (33.6)	35 (11.8)	163 (26.7)	395 (38.5)	593 (30.7)
p<0.001†	Other§	10 (0.8)	7 (1.0)	2 (0.7)	4 (0.7)	11 (1.1)	17 (0.9)
	Unknown	681 (55.8)	353 (49.4)	205 (69.0)	346 (56.6)	483 (47.0)	1034 (53.4)
Type of	Preventable	315 (25.8)	222 (31.1)	34 (11.5)	146 (23.9)	357 (34.8)	537 (27.8)
blindness	Treatable	549 (45.0)	252 (35.2)	157 (52.9)	272 (44.5)	372 (36.2)	801 (41.4)
p<0.001*	Unavoidable	356 (29.2)	241 (33.7)	106 (35.7)	193 (31.6)	298 (29.0)	597 (30.8)
p<0.001†	Total	1220 (100)	715 (100)	297 (100)	611 (100)	1027 (100)	1935 (100)

*χ^2, showing significant differences between genders in anatomical site and type of blindness.
†χ^2, showing significant differences between age groups in anatomical site, aetiology and type of blindness.
‡Includes children that had either no anatomical abnormality (n=14) or no anterior segment abnormality, but the posterior segment was not examined (n=5) because the child was too young and/or uncooperative and/or had multiple disabilities.
§Perinatal, intrauterine.

The vast majority of children (n = 1839, 95%) had isolated visual loss. A positive family history of blindness was reported by 426 children (22%), and parental consanguinity by 340 children (17.6%). The odds of a positive family history was 3.2 (CI 2.4 to 4.1, p<0.001) times higher in children whose parents had a consanguineous marriage. The vast majority of children recruited suffered from BL (91.5%) rather than SVI. A total of 325 children (16.8%) had a near acuity of N30 or better.

Anatomical site of abnormality leading to SVI/BL

The main anatomical site of SVI/BL was lens abnormalities (629 children, 32.5%); 528 of these children (27.3%) had unoperated cataract, and 101 (5.2%) remained SVI/BL after cataract surgery (table 2). In these pseudo/aphakic children, visual loss was attributed to ambylopia in 46 (45.5%) and surgical complications or posterior capsule opacification in 55 (54.5%). Among aphakic/pseudophakic children, only two were aged <5 years compared with 38 (37.6%) aged 6–10 years and 61 (60.4%) aged 11–15 years.

Corneal disorders (514, 26.6%), principally corneal scarring, was the second most common cause, followed by lesions of the whole globe (253, 13.1%), mainly microphthalmos (161 children) and anophthalmos (43 children). A further 245 children (12.7%) had retinal conditions, principally retinal dystrophies (223 children). Lesions of the optic nerve affected 154 children (8.0%), 21 of whom had optic nerve hypoplasia. A total of 130 children had optic atrophy, 30 following meningitis and 20 from raised intracranial pressure/intracranial tumours. Glaucoma was diagnosed in 83 children (4.3%) and uveal lesions in 38 (2.0%).

Disorders of the lens were diagnosed more often in boys than girls (37.0% vs 24.9%, respectively, p<0.001), whereas corneal pathology was more common in girls (29.8% vs 24.7%, p<0.001). The main site of abnormality in children aged 0–5 years and 5–10 years was lens related (43.4% and 37.6%, respectively), whereas in children aged 11–15 years, corneal disorders were the most common (32.6%) (table 2). Blind children were more likely to have corneal pathology (27.6% vs 15.9%, p = 0.001) and disorders of the whole globe (13.8% vs 5.5%, p = 0.003), whereas those with SVI were more likely to have disorders of the lens (42.1% vs 31.6%, p = 0.006) and uvea (4.3% vs 1.8%, p = 0.026).

Underlying aetiology of SVI/BL

In just over half of the cases, an underlying aetiology could not be determined (n = 1034, 53.4%) (table 2). The main sites of abnormality in these children were lens related (437, 42.3%)

Table 3 Avoidable (preventable and treatable) and unavoidable causes of blindness and severe visual impairment in children

	n (%)
Preventable	
Vitamin A deficiency plus other*	224 (11.6)
Vitamin A deficiency	118 (6.1)
Measles	118 (6.1)
Meningitis	30 (1.6)
Trauma	15 (0.8)
Ophthalmia neonatorum	14 (0.7)
Harmful traditional practice	7 (0.4)
Other (eg, toxoplasmosis, infectious keratitis)	11 (0.6)
Subtotal	537 (27.8)
Treatable	
Cataract	528 (27.3)
Pseudo/aphakia	101 (5.2)
Glaucoma	83 (4.3)
Others (eg, ROP, raised ICP, tumours, epilepsy)	25 (1.3)
Uveitis	22 (1.1)
Keratoconus/dystrophy	21 (1.1)
Refractive error	11 (0.6)
Retinal detachment	10 (0.5)
Subtotal	801 (41.4)
Unavoidable	
CEA (microphthalmos, anophthalmos, coloboma)	223 (11.5)
Retinal dystrophies	223 (11.5)
Optic nerve disease (atrophy, hypoplasia)	102 (5.3)
Other†	33 (1.7)
Removed, phthisical, or disorganised	16 (0.8)
Subtotal	597 (30.8)
Grand total	1935 (100)

*Strong history of severe febrile illness with or without diarrhoea
†Albinism, cortical blindness, congenital nystagmus, corneal opacity with other eye anomalies (eg anterior segment dysgenesis, microphthalmos, congenital cataract, sclerocornea).
ROP, retinopathy of prematurity; ICP, intracranial pressure; CEA, congenital eye anomaly.

Table 4 Main anatomical site of abnormality, and underlying aetiology in 1935 severely visually impaired and blind children, by age of onset of disorder

	Congenital	Infantile*	⩾1 to <5 years	⩾5 to <16 years
	n (%)	n (%)	n (%)	n (%)
Anatomical p<0.001†				
Whole globe	199 (78.7)	14 (5.5)	26 (10.3)	14(5.5)
Cornea	38 (7.4)	82 (16.0)	281 (54.7)	113 (22.0)
Lens	189 (30.1)	230 (36.6)	152 (24.2)	58 (9.2)
Uvea	15 (39.5)	2 (5.3)	5 (13.2)	16 (42.1)
Retina	105 (42.9)	39 (15.9)	59 (24.1)	42 (17.1)
Optic nerve	23 (14.9)	25 (16.2)	51 (33.1)	55 (35.7)
Glaucoma	37 (44.6)	19 (22.9)	14 (16.9)	13 (15.7)
Other‡	6 (31.6)	3 (15.8)	4 (21.1)	6 (31.6)
Aetiology p<0.001†				
Hereditary	156 (53.6)	52 (17.9)	55 (18.9)	28 (9.6)
Childhood factor	20 (3.4)	103 (17.4)	319 (53.8)	151 (25.5)
Other§	12 (70.6)	2 (11.8)	2 (11.8)	1 (5.9)
Unknown	424 (41.0)	257 (24.9)	216 (20.9)	137 (13.3)
Type of blindness p<0.001†				
Preventable	14 (2.6)	84 (15.6)	305 (56.8)	134 (25.0)
Treatable	246 (30.7)	259 (32.3)	183 (22.9)	113 (14.1)
Unavoidable	352 (59.0)	71 (11.9)	104 (17.4)	70 (11.7)
Total	612 (31.6)	414 (21.4)	592 (30.6)	317 (16.4)

*Postnatal to <1 year.
†χ^2, showing significant differences in anatomical, aetiological and type of blindness by age of onset of disorder.
‡Includes children that had either no anatomical abnormality (n = 14) or no anterior segment abnormality, but the posterior segment was not examined (n = 5) because the child was too young and/or uncooperative and/or had multiple disabilities.
§Perinatal, intrauterine.

followed by whole globe (215, 20.8%) and retinal conditions (128, 12.4%).

Among the known aetiologies, childhood factors predominated (593 children, 30.7%), the vast majority being diagnosed with corneal scarring (456, 76.9%) attributed principally to vitamin A deficiency, often precipitated by fever, diarrhoea or measles infection.

Two-hundred and ninety-one (15.0%) children had genetic disorders, mainly lens related (140, 48.1%) and retinal conditions (112, 38.5%). Modes of inheritance were as follows: autosomal dominant, 26 children (10.9%); autosomal recessive, 26 (10.9%), and could not be determined, 239 (82.1%). A history of parental consanguinity was found in 40.9% of children with a hereditary aetiology, and consanguinity increased the odds of a hereditary aetiology by 4.5 (95% CI 3.4–6.0, p<0.001). Nearly half (55, 46.2%) of the children with parental consanguinity and a hereditary aetiology had retinal dystrophies. Intrauterine and perinatal causes were both uncommon (17, 0.9%): two children had toxoplasmosis. Perinatal factors included corneal scarring attributed to ophthalmia neonatorum (14 children), and only one child was blind from retinopathy of prematurity.

Avoidable causes of BL/SVI

Overall, 1338 children (69.2%) had avoidable causes of SVI/BL: 537 children had preventable causes (27.8%) and a further 801 children (41.4%) had treatable conditions. Boys were significantly more likely to have an avoidable cause than girls (70.8% vs 66.3%, p = 0.037). Girls were more likely to have a preventable cause (31.1% vs 25.8%, p = 0.013), whereas boys were more likely to have treatable causes (45.0% vs 35.2%, p<0.001) (table 2). No significant age differences were apparent between children with and without avoidable causes (χ^2, p = 0.08). However, there was a trend, with older children being more likely to have avoidable causes than younger children (ie, age 0–5 years 64.3% avoidable; 6–10 years 68.4% avoidable; 11–15 years 70.2% avoidable). Preventable conditions were more likely in older children, whereas treatable conditions were more likely in younger children.

Approximately two-thirds of preventable causes were attributed to vitamin A deficiency either alone or following a febrile illness and/or diarrhoea (342, 63.7%) (table 3). Vitamin A deficiency was slightly more common in girls than in boys (19.3% vs 16.7%, p = 0.151). Measles was the next most common preventable cause, again being more common in girls (7.8% vs 5.1%, p = 0.015). Overall, 85% (460 children) of preventable causes of SVI/BL were attributed to vitamin A deficiency, measles, diarrhoeal diseases and febrile illness.

Over three-quarters of treatable causes were due to lens disorders (629, 78.5%) and 1 in 10 (4.3%) were SVI/BL from glaucoma. A total of 597 children (30.8%) had unavoidable causes of SVI/BL, 11.5% being due to congenital eye anomalies and 11.5% to retinal dystrophies (223 children in each group).

Causes in relation to the age at onset of visual loss

Nearly a third of the children reported being blind since birth, and 84% were SVI/BL before their fifth birthday (table 4). Two-thirds of lens-related SVI/BL occurred before the age of 1 year, whereas 92.7% of corneal conditions occurred after the child was 1 year old. Seventy-five per cent of preventable causes and 86% of treatable conditions led to SVI/BL before the age of 5 years.

DISCUSSION

This is the first large-scale study of SVI/BL children in Bangladesh and one of the largest case series of blind children reported from anywhere in the world. As in previous studies of blind children,[20–24] boys outnumbered girls. There are several explanations: boys may be at greater risk of blinding conditions than girls, blind girls may have a higher mortality rate than blind boys, or parents of blind boys may be more willing to seek eye care (and education) than parents of blind girls. The last two reasons seem the more likely in this setting where parents are more willing to invest their limited resources in the welfare of sons.

In our study, disorders of the lens (mainly unoperated cataract) were the single most common cause of SVI/BL, particularly among younger children. This finding is similar to that of a large population-based survey of vitamin A deficiency undertaken in 1982–1985 in Bangladesh involving >22 000 children aged 3 months to 6 years, in which 5/11 blind children (45.5%) identified had cataracts.[25]

Our results are similar to those of a population-based study in India where 8/12 (66.7%) SVI/BL children had avoidable causes.[26] However, our findings differ from those of most other studies in developing countries where disorders of the lens usually account for 10–20%.[2] One explanation is that most previous studies have been of children in SpEdu, where children with cataract may have been identified and operated on, leaving these special schools after regaining their sight. Parents of children in SpEdu may also be more health care seeking than parents of children not attending school. Other reasons for the high proportion of lens-related SVI/BL are first, the incidence of cataract may be higher than in other countries, and, secondly, qualitative research undertaken at the time of the study suggests that parents delay taking their child for an ophthalmic opinion or are often given inappropriate advice, being told to delay surgery (unpublished data). The low rates of aphakia in young children in this study also suggest that young children are not receiving cataract surgery. Perhaps the most likely explanation lies in the lack of eye care services for children. A national situational analysis of paediatric eye care services in 2001–2002 identified only one fully trained paediatric

ophthalmologist and three other ophthalmologists who operate on older children with cataract.[27] Paediatric ophthalmic services, were, therefore, totally inadequate, and likely to be inaccessible and too expensive for poor rural families.

Corneal pathology, mainly scarring, was the second most common cause of SVI/BL, and this is consistent with other studies from developing countries.[11 15 28 29] Other studies also suggest that scarring may be declining in importance as younger children are less affected than older children.[22 30]

The apparent decline noted in our study probably reflects the falling prevalence of vitamin A deficiency in Bangladesh in response to concerted control initiatives (from 3.6% in 1982–83, to 1.78% in 1989, and to 0.6% in 1996[31]). Control includes intermittent vitamin A supplementation as part of the Expanded Programme of Immunization (EPI), home gardening and nutrition education. However, children who are borderline deficient can be precipitated into keratomalacia by episodes of febrile illness, diarrhoea or measles, all of which are highly prevalent in Bangladesh. In our study, a history of measles preceding blindness was reported by 6.1% of children. In Bangladesh, measles remains the fifth most common cause of childhood deaths (ie, 20 000 deaths annually). In response to this, the Measles Initiative, Bangladesh Campaign has been recently announced.[32] This will be the largest ever measles immunisation campaign which will target approximately 33.5 million children aged 9 months to 10 years.

Retinopathy of prematurity (ROP) was not found to be a major cause of SVI/BL in Bangladesh. As the majority of communities are without access to paediatric intensive care units (ICUs) highly premature babies may not be surviving to develop ROP. However, particularly in the larger cities, as there is development of neonatal ICUs, more children are likely to develop ROP.

In contrast to studies in developed countries,[33] we found a much lower proportion of children with multiple disabilities. Possible reasons include lower survival rates of children with complex disabilities in developing countries, compounded by the fact that in more developed nations, as sight-restoring eye conditions are managed, only the more complex (typically those with multiple disabilities) remain. Furthermore, difficulty in case ascertainment due to the social stigma of disability in communities in developing countries makes this difference in proportions appear greater.

If one assumes the prevalence of blindness in children in Bangladesh to be approximately 0.7–0.8/1000,[2] there are approximately 36 000–40 000 blind children in the country, two-thirds being of school age. Our study suggests that <2% of SVI/BL children have access to SpEdu and that coverage with CBR programmes is also inadequate.

The study findings led to the launch of the Bangladesh Childhood Cataract Campaign. Key elements include training paediatric ophthalmologists and clinical teams, developing a health education strategy, and community-based approaches for active case finding. There are now eight centres providing paediatric services, but eight more are needed to reach the VISION 2020 target of one Child Eye Care centre for every 10 million population by the year 2020.[2]

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