

A survey of visual impairment and blindness in children attending eight schools for the blind in Myanmar: An update

Sonia Huang¹, Michelle T Sun^{1,2}, Ashwin Mallipatna^{2,3}, Cesar Carrillo^{1,2}, Yi Fan Tang¹, Khine Nweni⁴, Tin Win⁴, Than Htun Aung⁴, Naing Lin⁴, Ye Win², Andy Griffiths², Martin Holmes², Naw Marina Thapaw⁴, Soe Hlaing⁴, Robert Casson^{1,2}, James Muecke^{1,2}

Purpose: To determine the causes of visual impairment (VI) and blindness among children in schools for the blind in Myanmar; to identify the avoidable causes of VI and blindness; to provide spectacles, low-vision aids, and ophthalmic treatment where indicated; to provide an update of the 2007 survey performed and identify any major epidemiological changes. **Methods:** Two hundred and ninety children under 16 years of age from all eight schools for the blind in Myanmar were examined and the data entered into the World Health Organization Prevention of Blindness Examination Record for Childhood Blindness. **Results:** In total, 271 children (93.4%) were blind (visual acuity [VA] <3/60 in the better eye) and 15 (5.17%) had severe visual impairment (SVI = VA <6/60 to 3/60 in the better eye). Most children had whole globe as the major anatomical site of SVI or blindness (105, 36.6%). The cause was unknown in the majority of these (155, 54.0%). One hundred and twelve children had avoidable causes of blindness and SVI (39.0%). Forty children (13.9%) required an optical device and 10.1% required surgical or medical attention, with a potential for visual improvement through intervention in 3.48%. **Conclusion:** In all, 39.0% of children had potentially avoidable causes of SVI and blindness with cataracts and measles being the commonest causes. This follow-up survey performed after the first one completed in Myanmar in 2007 demonstrates a change in the major site of abnormality from the cornea to whole globe and a reduction in avoidable blindness but highlights the ongoing burden of measles.

Key words: Blind schools, blindness, childhood blindness, Myanmar, visual impairment

Myanmar is a country in mainland South-East Asia with a population of approximately 53 million people, of which 70% live in rural areas.^[1] An estimated 19 million of the world's children are visually impaired, with 1.4 million of these children irreversibly blind.^[2,3] Over a decade ago, the first survey of childhood blindness in Myanmar performed by our research team found that nearly half of all children in schools for the blind had potentially avoidable visual impairment (VI) and blindness, including refractive error and congenital cataract. In addition, corneal opacification secondary to measles and vitamin A deficiency (VAD) was identified as the leading cause.^[4] This study prompted several strategies aimed at addressing the lack of specialized pediatric eye services. In particular, the nongovernment organization Sight For All trained the country's first pediatric ophthalmologist and established pediatric eye units at the three major ophthalmic teaching institutes in the country. These measures combined with Myanmar's measles immunization program initiated in 2007^[5] were expected to significantly reduce the burden of childhood blindness in

Myanmar. We conducted a school-based survey to determine if there have been any significant changes in patterns of childhood VI and blindness in Myanmar over the last decade.

Methods

Over a 2-week period in 2018, all eight schools for the blind in Myanmar were visited by a team of Australian ophthalmologists and optometrists from Sight For All together with a local team of Myanmar ophthalmologists and optometrists. Each team member undertook the same component of the assessment at each school to ensure consistency of examination and reliability of data collection. Approval to undertake the survey in Myanmar was given by the Department of Public Health of Myanmar, the Myanmar Ministry of Social Welfare and the Myanmar Ophthalmological Society. Ethics approval was obtained in both Myanmar and Australia. The study was conducted in accordance with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Each school provided written consent from the respective

¹South Australian Institute of Ophthalmology, The University of Adelaide and Royal Adelaide Hospital, Adelaide, South Australia, ²Sight for All, Adelaide, Australia, ³Department of Ophthalmology, Women's and Children's Hospital, Adelaide, South Australia, Australia, ⁴Department of Ophthalmology, Yangon Eye Hospital, Yangon, Myanmar

Correspondence to: Dr. Sonia Huang, South Australian Institute of Ophthalmology, Royal Adelaide Hospital, Adelaide, SA 5000, Australia. E-mail: soniahuang24@gmail.com

Received: 25-Nov-2020

Revision: 21-Mar-2021

Accepted: 22-Jun-2021

Published: 26-Jul-2021

Access this article online

Website:

www.ijo.in

DOI:

10.4103/ijo.IJO_3534_20

Quick Response Code:



This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

Cite this article as: Huang S, Sun MT, Mallipatna A, Carrillo C, Tang YF, Nweni K, et al. A survey of visual impairment and blindness in children attending eight schools for the blind in Myanmar: An update. Indian J Ophthalmol 2021;69:2034-9.

principal. If parents were able to attend the survey, they were asked to provide written consent for their child; otherwise, it was obtained from the school principal. All children gave verbal consent.

Demographic details were obtained, and distance visual acuity (VA) was assessed binocularly and for each eye using a logMAR LEA chart. Children with VA $<3/60$ were recorded as count fingers, hand movements, perception of light, or no perception of light (NPL), accordingly. The standard World Health Organization (WHO) definitions of VI were used.^[6] Functional vision was assessed by asking each child to navigate assisted around two chairs placed 1 m apart. Visual fields were assessed by confrontation as perimetry testing was not available.

Any child who had distance vision of better than NPL or were believed to have useful residual vision (when formal testing of VA was not possible but the child was believed to have sufficient vision for independent mobility, for making social contacts or for near vision)^[6] underwent refractive testing and low-vision assessment. Pinhole acuity was tested using a multiple pinhole occluder and tumbling E chart at 3 m, illuminated by natural sunlight or ambient room lighting. Care was taken to ensure that background glare was minimized. Pinhole acuity was not assessed in cases where it would obviously not improve vision (e.g., complete central corneal opacification, macular, or optic nerve pathology). Pinhole acuity merely served as a gauge for potential VA improvement with refraction. A lack of improvement with pinhole testing did not preclude assessing refraction, given the nature and severity of visual reduction and possible use of eccentric fixation. Where refraction improved the acuity, distance spectacles were ordered and dispensed locally.

Near vision was tested binocularly using 5 mm shapes (square, circle, triangle) and a series of large (50 mm), high contrast, matching shapes. Working distance was not specified in the near vision measurement, encouraging children to adopt their usual posture when attempting to read. When large matching shapes were discernible, low-vision assessment was conducted. Low-vision aids (LVAs) were trialled in order of ease of use and magnification strength: (1) high plus spectacles, (2) stand magnifiers, (3) spectacle-mounted loupe magnifiers, and (4) block/visualite bright-field magnifiers. Trialled magnification was selected based upon each child's relative ease of identifying the 5 mm shapes.

A logMAR near chart of Arabic numerals, with a matching chart, was used to assess near acuity with the LVA, for both the right and left eyes (if applicable). Each child was offered at least two LVA options, and their use demonstrated. The selection of an LVA was determined primarily by the near vision outcome, but also according to the child's demonstrated ease and preference for a particular aid.

Each child's anterior segment was examined using slit-lamp biomicroscopy. Each fundus was also examined by indirect ophthalmoscopy following dilatation, when possible. The ophthalmologists recorded the primary cause of VI for each eye and for the child using the WHO classification system.^[6] When the primary cause was different for the two eyes, the most preventable or treatable abnormality was selected as the child-specific cause. Data were recorded by the research team and on the World Health

Organization Prevention of Blindness Examination Record for Childhood Blindness (WHO/PBL ERCB).

At the time of ocular examination, any child with a confirmed or suspected inherited genetic disorder such as congenital glaucoma, congenital cataracts, or anterior segment dysgeneses had a sample taken for genetic testing. Saliva samples were taken from each child in the DNA saliva collection kit (Oragene DNA saliva collection kit). Where possible, and after gaining consent, a saliva sample was also taken from family members of the affected child for genetic testing.

After the initial data collection was completed, any children who had bilateral phthisis, staphyloma, or adherent leukoma without a clear history were reinterviewed via a caregiver by a local ophthalmologist to further elicit the possible etiology of their blindness. The questions asked included: (1) How did the child go blind? (2) When did the child go blind? (3) Did the child have a normal looking eye for some time before she/he went blind? (4) Was any traditional medicine used in the eyes of the child? (5) Did the child have fever and rash before she/he went blind? and (6) Was the child malnourished before she/he went blind? If the history provided a clear etiology for their presentation, then the etiology was altered accordingly on the WHO/PBL ERCB.

Results

A total of 290 children, 15 years old or younger, were examined at the eight schools. Of those, 156 (53.8%) were male, 126 (43.4%) were female, and 8 (2.76%) did not have their gender recorded. The ages of the children ranged from 5 to 15 (mean age 12.4, median age 13). In total, 271 children (93.4%) were blind, 15 (5.17%) had severe visual impairment (SVI), 2 (0.690%) had VI, and 1 child (0.345%) had a VA better than 6/18. One child (0.345%) could not have their vision formally tested due to intellectual impairment but were believed to be blind [Table 1].

Among the two children with VI, one had bilateral retinal dystrophy and one had bilateral cataracts. The latter child underwent cataract surgery in both eyes at the age of 1 and had a repeat operation on the right eye at 3 years of age. The child with VA better than 6/18 in the better eye had bilateral congenital glaucoma. The right eye demonstrated severe optic atrophy and the left eye a cup disc ratio of 0.8. All subsequent analyses are for the 287 children (99%) with VA $<6/60$ in the better eye.

A large proportion of children were of Myanmar ethnic group (99, 34.5%); however, a significant number of children did not have their ethnic group recorded (120, 41.8%). The majority of children (266, 92.7%) did not have any associated physical or mental disabilities and had visual loss from birth (194, 67.6%) [see Table 2 for demographic data]. Sixty-four children (22.3%) had a family history of eye disease with the main abnormalities in their eyes being retinal dystrophy (25, 39.1%) and amblyopia (13, 20.3%).

The majority of children had no history of previous eye surgery (216, 75.3%). In total, 29 had cataract surgery, 22 had unknown surgery, 7 had either evisceration or enucleation, 6 had glaucoma surgery, 2 had iridectomies, 2 had corneal grafts, and 3 had other types of surgeries. Of the three children who had other types of surgery, one had upper and lower lid surgery for a likely entropion and two had retinal surgery.

Table 1: Visual acuity in all 290 children

WHO category of visual acuity	Vision in better eye	Number	%
Blind	<3/60-NLP	271	93.45
Severe visual impairment	<6/60-3/60	15	5.17
Visual impairment	<6/18-6/60	2	0.690
	6/6-6/18	1	0.345
Could not have vision formally tested - believed sighted		0	0
Could not have vision formally tested - believed blind		1	0.345
TOTAL		290	100

WHO=World Health Organization, NLP=No light perception

Anatomical site of abnormality

Whole globe abnormalities were the most common major site of abnormality (105, 36.6%) followed by corneal abnormalities (86, 30.0%). Microphthalmos was the commonest abnormality (55, 19.2%) followed by staphyloma (48, 16.7%) [Table 3]. In total, 12 children had lens abnormalities (4.18%), 54 with retinal abnormalities (18.8%), 7 with optic nerve abnormalities (2.44%), and 21 with a normal appearing globe but other abnormality i.e., amblyopia (7.32%).

Etiological categories of visual loss

In the majority of children, the main etiology of visual loss was unknown (155, 54.0%), with 92 of these having abnormalities since birth (32.1%), 24 with cataract (8.36%), 8 with glaucoma (2.79%), 2 with retinoblastoma but no family history (0.697%), and 29 with other abnormalities of unknown etiology that cannot be classified (6.97%) [Table 4]. The condition occurred in childhood in 78 children (27.2%), with 17 of these suffering measles keratitis (5.92%) and 36 children suspected of having suffered measles (12.5%). There were 5 cases of VAD (1.74%), 1 suspected case (0.348%), and 12 cases of harmful traditional medicine use (4.18%). In 50 children, the condition was hereditary (17.4%), 3 suspected to have occurred in utero (1.05%) and 1 case suspected to have occurred in the perinatal period (0.348%).

Avoidable causes of visual loss

One-hundred and twelve children had avoidable causes of SVI and blindness (39.0%) [Table 5]. The commonest preventable cause was measles (18.5%), and the most common treatable cause was cataracts (8.36%).

Outcomes of questionnaires

A total of 88 (30.7%) children's caregivers completed the questionnaire. As a result, 10 cases of harmful traditional medicine use, 2 cases of trauma, and 3 cases of VAD were further identified, and 8 suspected cases of measles were confirmed.

Action needed in children

One child had a pair of glasses and no children had LVAs at presentation. Visual field testing was unable to be performed in 251 right eyes and 245 left eyes; however, 60 children were believed to have useful residual vision (20.9%). Pinhole testing was performed in 19 children (6.62%), with vision improving in two children (0.697%).

The majority of children required no further medical or surgical (259, 90.2%) attention. In total, 10 children required medication (3.48%), 13 required surgical treatment (4.53%),

and 3 children required both (1.05%). The vision could be improved in 10 children (3.48%) and was likely to deteriorate in 28 children (9.76%). These children were all referred to the local ophthalmologist. The prognosis for vision was likely to remain stable in 247 children (86.4%).

Two-hundred and eight-five children (99.3%) attended only their respective school for the blind. One (0.348%) child attended an integrated school and one child did not have their education information recorded (0.348%). A change in schooling was recommended for four children: one of whom was able to have their vision further improved and three children with cognitive impairment who were more likely to benefit from care at another school.

Discussion

There are approximately 15 million children under the age of 16 in Myanmar, from a total population of approximately 53 million.^[1] There is still no formal blindness register for children in Myanmar; however, the number of blind may be as high as 25,000.^[4] Although there is an increased number of total students attending schools for the blind and an additional school for the blind since the last survey performed in 2007, there is still a large number of students not receiving appropriate ophthalmic treatment and education. A blind child is more likely to suffer socioeconomic deprivation, to be more frequently hospitalized, have poorer quality of life, and to die in childhood than a child who is not blind.^[2] Although only 3% of the world's blind population are made up of children,^[7] these children will have a lifetime of blindness ahead of them making childhood blindness second only to cataracts in terms of number of "blind person years."^[8]

There are several notable changes when comparing the results of this survey with our study one decade ago. In the previous survey, there was a preponderance of males over females (62.0% vs. 38.0%). While this still remains true, the percentage of females has increased (53.7% vs. 43.6%) hopefully reflecting a change in social bias over the last decade. Of the 290 children in this study, 98.6% were SVI/blind, with the whole globe as the commonest major site of abnormality (36.6%), in contrast with our 2007 survey which found the cornea to be the commonest major site of abnormality (49.5%). Although a large proportion of the children surveyed still had corneal pathology (30.0%), it is possible that the reduced number reflects the implementation of the measles immunization program in Myanmar in 2007. In addition, UNICEF supported the measles-rubella vaccination for approximately 550,000 children in response to the Yangon measles outbreak. Other

Table 2: Demographic details of children with visual acuity <6/60

	Number of children	%
Ethnic group		
Myanmar	99	34.5
Chin	8	2.79
Chinese	2	0.697
Dawei	3	1.05
Hindu	1	0.348
Kayan	2	0.697
Kachin	2	0.697
Kayar	2	0.697
Kayin	31	10.8
La Hu	2	0.697
Lee Sue	2	0.697
Mon	3	1.05
Nar Ga	1	0.348
Pa Laung	1	0.348
Rakhine	5	1.74
Shan	3	1.05
Not recorded	120	41.8
Total	287	100
Schools for the blind		
Kyimyindie School for the blind	105	36.6
Kha Wei Chan School for the blind	85	29.6
Pyin U Lwin School for the needy blind	29	10.1
Sagaing School for the blind	24	8.36
Myitkina School for the blind	17	5.92
Meiktila School for the blind	19	6.62
Monywa School for the needy blind	8	2.79
TOTAL	287	100
Age of onset of visual loss		
Since birth	194	67.6
First year of life	25	8.71
Aged 1-15 years	60	20.9
Unknown	8	2.79
TOTAL	287	100
Consanguinity		
Yes	9	3.14
No	160	55.75
Unknown	118	41.1
TOTAL	287	100
Family history of eye disease		
Yes	64	22.3
No	218	75.96
Unknown	5	1.74
TOTAL	287	100

recent childhood blindness studies performed in Asia have also found whole globe anomalies to be the main cause of blindness including India (25%),^[9] Lao (30.4%),^[10] and Bhutan (20%).^[10] Corneal opacities, however, still remains the most common site of abnormality in sub-Saharan Africa and areas of extreme deprivation.^[2,11-13]

Table 3: Anatomical site of abnormality of children with visual acuity <6/60

Site of abnormality	Number of children	%
Whole globe	105	36.6
Phthisis	24	8.36
Anophthalmos	11	3.83
Microphthalmos	55	19.2
Buphthalmos	4	1.39
Glaucoma	4	1.39
Removed	4	1.39
Disorganized	2	0.70
Other	1	0.35
Cornea	86	30.0
Staphyloma	48	16.7
Scar	17	5.92
Keratoconus	1	0.35
Dystrophy	1	0.35
Other opacity	19	6.62
Lens	12	4.18
Cataract	8	2.79
Aphakia	1	0.348
Other	3	1.05
Uvea	1	0.348
Aniridia	0	0
Coloboma	0	0
Uveitis	0	0
Other	1	0.348
Retina	54	18.8
Dystrophy	45	15.68
Albinism	2	0.697
Retinopathy of prematurity	0	0
Retinoblastoma	0	0
Other	7	2.44
Optic nerve	7	2.44
Atrophy	2	0.697
Hypoplasia	4	1.39
Other	1	0.348
Other, not listed	1	0.348
Other + Globe appears normal	21	7.32
Refractive error	0	0
Amblyopia	20	6.97
Cortical blindness	1	0.348
TOTAL	287	100

The causes of SVI/blindness in this survey were similar to the 2007 study. The cause of SVI/blindness was unknown in the majority (54.0%), with most of these children having an abnormality since birth in comparison to having cataract and glaucoma in the last survey. This was likely due to the difficulty in obtaining reliable history for each child as most parents were not available on the day and medical records were often inadequate. The follow-up questionnaires provided valuable additional information to the data collected from the initial survey, helping to identify likely cases of traditional medicine practice, VAD, trauma, and measles that may have otherwise been unrecognized.

Table 4: Aetiological categories of vision loss of children with visual acuity <6/60

Aetiological category	Number of children	%
Hereditary disease	50	17.4
Autosomal dominant - definite	0	0
Autosomal dominant - suspected	1	0.348
Autosomal recessive	2	0.697
Cannot specify	47	16.4
Intrauterine factor	3	1.05
Rubella - suspected	3	1.05
Toxoplasmosis	0	0
Perinatal/Neonatal factor	1	0.348
ROP	0	0
Ophthalmia neonatorum - suspected	1	0.348
Postnatal/infancy/childhood factor	78	27.1
Vitamin A deficiency - definite	5	1.74
Vitamin A deficiency - suspected	1	0.348
Measles - definite	17	5.92
Measles - suspected	36	12.5
Trauma - definite	4	1.39
Trauma - suspected	1	0.348
Harmful traditional practices	12	4.18
Other	2	0.697
Unknown etiology	155	54.0
Cataract	24	8.36
Glaucoma/buphthalmos	8	2.79
Retinoblastoma, no FH	2	0.697
Abnormality since birth	92	32.1
Other	29	10.1
TOTAL	287	100

Table 5: Avoidable causes of visual loss

	Number of children	%
Preventable causes		
Measles	53	18.5
Ophthalmia neonatorum	1	0.348
Trauma	5	1.74
Rubella	3	1.05
Toxoplasmosis	0	0
Harmful traditional practices	12	4.18
Vitamin A deficiency	6	2.09
Treatable causes		
Cataract	24	8.36
Glaucoma/buphthalmos	8	2.79

Suspected and definite cases included

Unknown causes also predominated in studies from other schools for the blind in the past (India, Sri Lanka, Indonesia, Thailand)^[4] and still appears to be the case in other recent studies in Nepal,^[11] Mongolia,^[14] and Indonesia.^[15]

Like the 2007 survey, conditions occurring in childhood were the second commonest cause of SVI/blindness (27.2%). Of these

78 children, 17 had suffered measles and 36 were suspected to have suffered measles based on their clinical findings. If all suspected cases are included, then 18.5% of all surveyed children suffered measles keratitis in comparison to 17.4% in 2007. In the previous study, there were no confirmed cases of VAD; however, there was five definite cases and one suspected case in this study. A number of these cases were confirmed after performing the follow-up questionnaire so the increase from the last survey may not necessarily reflect an increased prevalence of VAD or measles over the last decade. It also still remains possible that childhood conditions are responsible for a proportion of the cases where there was an unknown cause of corneal blindness. Harmful traditional practice was identified in 12 cases and reflects an ongoing need to provide education to families about the potential harm of their use and to seek medical attention for any health concerns first.

Hereditary disease was the third commonest etiological category and accounted for 17.4% of SVI/blindness with the majority of these children having retinal dystrophy. The hereditary pattern could not be identified in 47 of the 50 children, 2 were autosomal recessive and 1 was suspected to be autosomal dominant. Hereditary diseases were more common in the studies from Mongolia (27%),^[14] Cambodia (45.2%),^[16] and Nepal (27.9%).^[11] There were no confirmed perinatal or intrauterine conditions in this survey. One child was suspected to have ophthalmia neonatorum and three suspected to have intrauterine rubella infection.

The majority of children (67.6%) had visual loss from birth. This may mean that the prevalence of hereditary, perinatal, and intrauterine conditions may have been underestimated as 59.4% of children who had an unknown etiology also had an abnormality since birth. Congenital ocular anomalies including anophthalmos, microphthalmos, and optic nerve hypoplasia occurred in 24.4% of children.

Overall, 39.0% of children had avoidable causes of visual loss. This percentage is lower than that in 2007 (43.6%) and hopefully reflects the implementation of pediatric ophthalmological services within Myanmar. The most common preventable and treatable causes remain the same: measles (18.5%, definite and suspected cases included) and cataracts (8.36%) respectively. With Myanmar's national measles immunization strategy launched in January 2007, there should hopefully be a continued decrease in the proportion of measles keratitis resulting in corneal blindness.

Childhood blindness is a priority of Vision 2020 – The Right to Sight, which recommends that one pediatric eye care center (led by a pediatric ophthalmologist) be established for every 10 million population within a country by the year 2020.^[17] There are now three pediatric eye care centers in Myanmar, one at Yangon Eye Hospital, one at North Okkalapa General Hospital in Yangon, and one at Mandalay Eye, Ear, Nose, and Throat Hospital, all established by Sight For All in response to our initial survey with the support of the Myanmar Government.^[18] Despite attending specific schools for the blind, there were still 40 students who could benefit from optical management, 10 children requiring medical attention, and 13 requiring surgical attention. This further reiterates the need for more established optometric and low-vision services in Myanmar and the need to raise awareness among staff of schools about the importance of regular ophthalmic assessment.

Although a larger number of students were surveyed in this study, the causes of SVI/blindness in Myanmar are still likely to be somewhat biased. This is due to the fact that not all visually impaired children attend schools for the blind and those who do are likely to reflect families of more privileged socio-economic or ethnic backgrounds. With 70% of the population living in rural areas, healthcare is more difficult to access and the poorer population may not be so well represented. It is possible that in these populations there is a higher prevalence of avoidable causes. Despite this, the data collected and trends seen by performing surveys utilizing the same method a number of years apart are a useful tool in determining what areas require more focus and whether implemented interventions are effective.

Conclusion

In conclusion, a significant proportion of children in schools for the blind in Myanmar (39.0%) had potentially avoidable causes of SVI and blindness with measles and cataract being the commonest irreversible and treatable causes, respectively. This follow-up survey performed a decade after the initial study in 2007 demonstrated a significant reduction in avoidable blindness but highlights the ongoing burden of measles.

Acknowledgements

The authors thank all eight schools for the blind in Myanmar and each child who participated in the survey.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Myanmar Statistical Yearbook. Nay Pyi Taw, Myanmar: Central Statistical Organisation; 2017.
2. Solebo AL, Teoh L, Rahi J. Epidemiology of blindness in children. *Arch Dis Child* 2017;102:853-7.
3. du Toit R, Courtright P, Lewallen S. The use of key informant method for identifying children with blindness and severe visual impairment in developing countries. *Ophthalmic Epidemiol* 2017;24:153-67.
4. Muecke J, Hammerton M, Aung YY, Warrier S, Kong A, Morse A, *et al.* A survey of visual impairment and blindness in children attending seven schools for the blind in Myanmar. *Ophthalmic Epidemiol* 2009;16:370-7.
5. Mass Measles Immunisation Campaign. Vol. 2019. World Health Organisation; 2019
6. Gilbert C, Foster A, Negrel AD, Thylefors B. Childhood blindness: A new form for recording causes of visual loss in children. *Bull World Health Organ* 1993;71:485-9.
7. Parikshit G, Clare G. Blindness in children: A worldwide perspective. *Community Eye Health* 2007;20:32-3.
8. Rahi JS, Gilbert CE, Foster A, Minassian D. Measuring the burden of childhood blindness. *Br J Ophthalmol* 1999;83:387-8.
9. Kemmanu V, Giliyar SK, Shetty BK, Singh AK, Kumaramanickavel G, McCarty CA. Emerging trends in childhood blindness and ocular morbidity in India: The Pavagada Pediatric Eye Disease Study 2. *Eye (Lond)* 2018;32:1590-8.
10. Farmer LD, Ng SK, Rudkin A, Craig J, Wangmo D, Tsang H, *et al.* Causes of severe visual impairment and blindness: Comparative data from bhutanese and laotian schools for the blind. *Asia Pac J Ophthalmol (Phila)* 2015;4:350-6.
11. Shrestha JB, Gnyawali S, Upadhyay MP. Causes of blindness and visual impairment among students in integrated schools for the blind in Nepal. *Ophthalmic Epidemiol* 2012;19:401-6.
12. Njuguna M, Msukwa G, Shilio B, Tumwesigye C, Courtright P, Lewallen S. Causes of severe visual impairment and blindness in children in schools for the blind in eastern Africa: Changes in the last 14 years. *Ophthalmic Epidemiol* 2009;16:151-5.
13. Stevens GA, Bennett JE, Hennocq Q, Lu Y, De-Regil LM, Rogers L, *et al.* Trends and mortality effects of vitamin A deficiency in children in 138 low-income and middle-income countries between 1991 and 2013: A pooled analysis of population-based surveys. *Lancet Glob Health* 2015;3:e528-36.
14. Bulgan T, Gilbert CE. Prevalence and causes of severe visual impairment and blindness in children in Mongolia. *Ophthalmic Epidemiol* 2002;9:271-81.
15. Muhit M, Karim T, Islam J, Hardianto D, Muhiddin HS, Purwanta SA, *et al.* The epidemiology of childhood blindness and severe visual impairment in Indonesia. *Br J Ophthalmol* 2018;102:1543-9.
16. Sia DI, Muecke J, Hammerton M, Ngy M, Kong A, Morse A, *et al.* A survey of visual impairment and blindness in children attending four schools for the blind in Cambodia. *Ophthalmic Epidemiol* 2010;17:225-33.
17. Preventing Blindness in Children. Geneva: World Health Organisation; 1999.
18. Our Current Projects: Paediatric Ophthalmology. Sight For All v 2019 [Available from: <https://sightforall.org/projects/>].