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Causes of severe visual impairment and blindness in children in the Republic of Suriname

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ABSTRACT

Aims To determine the causes of severe visual impairment and blindness (SVI/BL) in children in Suriname (Dutch Guyana) and to identify preventable and treatable causes.

Methods 4643 children under 16 years of age were recruited from two locations: 33 children attending the only school for the blind were examined and 4610 medical records were analysed at an eye clinic. Data have been collected using the WHO Prevention of Blindness Programme eye examination record for children.

Results 65 children were identified with SVI/BL, 58.5% were blind and 41.5% were severely visually impaired (SVI). The major anatomical site of SVI/BL was the retina in 33.8%, lens in 15.4% and normal appearing globe in 15.4%. The major underlying aetiology of SVI/BL was undetermined in 56.9% (mainly cataract and abnormality since birth) and perinatal factors 21.5% (mainly retinopathy of prematurity (ROP)). Avoidable causes of SVI/BL accounted for 40% of cases; 7.7% were preventable and 32.3% were treatable with cataracts and ROP the most common causes (15.4% and 12.3%, respectively).

Conclusions More than a third of the SVI/BL causes are potentially avoidable, with childhood cataract and ROP the leading causes. Corneal scarring from vitamin A deficiency does not seem to be a continuing issue in Suriname.

INTRODUCTION

The control of childhood blindness (BL) is considered a high priority of the WHO's 'VISION 2020—The Right to Sight' programme.[1] The main target of this global initiative is to eliminate avoidable BL by the year 2020. Although BL in children is relatively uncommon, it is a priority of VISION 2020 for several reasons: children who are born blind or who become blind and survive have a lifetime of BL ahead of them with all the associated emotional, social and economic costs to the child, family and society; many of the causes of BL in children are either preventable or treatable (ie, avoidable); and control of BL is closely linked to child survival, as many of the conditions associated with childhood BL also cause child mortality (eg, premature birth, measles, vitamin A deficiency (VAD)).[2]

The prevalence of BL in children ranges from approximately 0.3/1000 children in developed countries to 1.5/1000 in developing countries.[3] Globally there are estimated to be 1.4 million blind children, almost three quarters of whom live in the poorest regions of Africa and Asia.[2] Population-based data on the prevalence and major causes of childhood BL are essential for every country, in order to set priorities for control programmes and to monitor the changing patterns over time.

The causes of childhood BL differ between regions, related to socioeconomic status.[4] In low-income regions corneal scarring secondary to VAD and measles keratitis are the main causes of childhood BL. In middle-income countries cataract and retinopathy of prematurity (ROP) are important causes. ROP, a potentially avoidable cause of BL, can account for up to 60% of BL in these countries.[4]

The Republic of Suriname is a middle-income country situated on the north coast of South America, bordered by Guyana, French Guiana and Brazil. It has a population of 520 000 of which 150 800 (29%) are under 15 years of age.[5] The northern, coastal zone inhabits over 90% of the total population, the southern part consists of dense tropical rainforest. Almost half of the population lives in the capital Paramaribo (49.9%). Suriname is a multiracial country consisting of Hindustani (37%), Creole (31%), Javanese (15%), Maroons (10%) and various other minorities (7%). The country has a high literacy rate (95%).[6]

Population-based data on causes of BL in children are difficult to obtain, as very large samples are needed for a reliable outcome. A common way in developing countries is by examining children in schools for the blind or by accessing records from patients at low-vision clinics or screening programmes.[4 7] Suriname has only one school for the blind, the Louis Braille School (LBS). To enlarge study population, data were also obtained from another location: the Suriname Eye Centre (SEC), part of the Academic Hospital Paramaribo. Medical missions to rural districts in the north and to the poorly accessible interior in the south are frequently coordinated from here. Therefore, it is likely that a large amount of Surinamese children with visual loss have been diagnosed and registered.

No study has yet been reported on the prevalence and causes of visual impairment (VI) and BL in children in Suriname. The purpose of this study was to identify the causes of severe visual impairment SVI and BL in children attending the school for the blind and children visiting the SEC; and to identify all preventable and treatable causes.

MATERIALS AND METHODS

Over a 3-month period of time between February 2011 and May 2011 a total number of 4643

children under 16 years of age were recruited from two locations: 33 children attending the LBS were examined and 4610 medical records were analysed at the SEC. The study was performed according to the World Association's Declaration of Helsinki. The research protocol was approved by the Medical Ethical Commission of the Ministry of Public Health of Suriname (no: 1326-VG028-2012) and informed consent was obtained from examined students (or their guardians).

The team comprised three ophthalmologists and two project administrators. At the LBS children were examined and 33 children under 16 years of age included. Relevant information was collected form the children and their parents and medical records. The ophthalmologists took demographic details and a brief history of each child and performed a detailed eye examination to assess visual acuity (VA). Distance VA was measured for each eye using a LogMar LEA chart. All children were refracted where possible, and the VA repeated with correction. Visual loss was classified to the WHO categories of VI.[8] BL is defined as presenting VA <3/60 in the better eye, SVI as VA <6/60 to 3/60 in the better eye, and VI as VA <6/18 to 6/60 in the better eye. Functional vision was assessed by simple tests, such as the ability to navigate unaided around furniture, the ability to recognise faces and to see printed shapes. Visual fields were not tested. Anterior segment examination was performed using a slit lamp biomicroscopy. The posterior segment was evaluated after dilating of the pupil, using a direct and/or indirect ophthalmoscope. Intraocular pressures were not routinely measured.

At the SEC 4610 medical records were analysed representing all children aged between 8 years and 16 years who had ever visited the clinic. There were no cases excluded. For logistic reasons it was not possible to analyse medical records of all age groups. For 23 children aged 8–16 years and attending the LBS (out of a total of 28) a medical record was found at the SEC. No children were double counted.

The ophthalmologists recorded all data on standard Eye examination Records for Children with Blindness and Low Vision which had been developed by the WHO's Programme for the Prevention of Blindness.[9] The form includes sections for recording demographic data, and causes of visual loss using a descriptive anatomical and aetiological classification. The examination record is complemented by coding instructions, which give guidelines for use, definitions and methods of classification. The major site of abnormality leading to visual loss for each eye and for the child was recorded using criteria given in the coding instructions. Aetiology was also determined for each eye and for the child as an individual. The project administrators instructed and coordinated the team and maintained the data collection forms and equipment. Data were analysed using SPSS V.18.0 statistical software (SPSS Inc., Chicago, Illinois, USA). Results of ophthalmological examinations were also given to the LBS to enable patient-tailored care.

RESULTS

Of 4643 children, 107 were identified with visual loss (VA of <6/18 in the better eye). Of these, 33 were examined LBS students and 74 were analysed medical records. A total of 53 children (49.5%) were male and 54 (50.5%) female. The majority of children (95.3%) were between 8 years and 16 years old. Median age was 13 years (range 4–15 years). The youngest child attending the LBS was 4 years of age. The total number of children with SVI/BL was 65 (65/107, 60.7%); 35.5% (38 children) were blind and 25.2% (27 children) were severely visually impaired (table 1). Data presented in this paper are for children with SVI/BL (n=65). The 42 children with moderate VI were not further analysed as they do not contribute to study aims of identifying preventable and treatable causes of childhood BL.

Table 1 Visual acuity in all 107 children

WHO category	Visual acuity (better eye)	N	Per cent	LBS	Per cent	SEC database	Per cent
Total SVI/BL		65	60.7	23	69.7	42	56.7
Blind (BL)	NPL	10	9.3	6	18.2	4	5.4
Blind (BL)	<3/60-PL	28	26.2	14	42.4	14	18.9
Severe visual impairment (SVI)	<6/60–3/60	27	25.2	3	9.1	24	32.4
Visual impairment (VI)	<6/18–6/60	42	39.3	10	30.3	32	43.3
Total VI/SVI/BL		107	100	33	100	74	100

LBS, Louis Braille School; NPL, no perception of light; PL, perception of light; SEC, Suriname Eye Centre.

ANATOMICAL CAUSES OF BLINDNESS

The anatomical classification of causes of SVI/BL is presented in table 2. The major anatomical sites of abnormality were the retina in 33.8%, lens in 15.4% and normal appearing globe 15.4%. ROP (8, 12.3%) was the most common abnormality of the retina, followed by retinal dystrophies (6, 9.2%). Cataract (10, 15.4%) was the single cause of lens disease. SVI/BL due to disease with normal appearing globe was caused by either idiopathic nystagmus or cortical BL in five children (7.7%). Seven children (10.8%) had an incomplete medical record. They had a VA <6/60 in the better eye, but the underlying cause of their SVI/BL could not be determined.

AETIOLOGY OF BLINDNESS

The aetiological classification of SVI/BL is presented in table 3. The aetiology could not be determined in 37 children (56.9%). The majority had abnormalities which have been present since birth, such as anophthalmos, buphthalmos and cataract, which could not be attributed to hereditary disease or specific factors occurring during the intrauterine period. Perinatal factors accounted for 21.5%, including ROP and cerebral hypoxia. The condition occurred during childhood in 6.2%, including VAD, trauma and harmful traditional practices. Congenitally acquired rubella was the single intrauterine factor and was responsible for 1.5% of SVI/BL.

AVOIDABLE CAUSES OF BLINDNESS

Overall, 40% (95% CI 28.1 to 51.9) of SVI/BL were potentially avoidable: 7.7% (95% CI 1.2 to 14.2) were preventable and 32.3% (95%CI 20.9 to 43.7) were treatable (table 4). Corneal scarring from VAD was found in two children (14 years and 15 years of age) accounting for 3.1% of preventable causes. Most common treatable causes were cataract (15.4%) and ROP (12.3%).

DISCUSSION

This is the first study of SVI/BL in Suriname. There is no formal BL register for children in this country. Given the estimated prevalence of childhood BL of 0.6/1000 children, approximately 90 blind children will be found in Suriname.[4 5] The present study identified 38 blind children aged below 16 years, representing 42% of the estimated prevalence of blind children in Suriname. Comparative studies in schools for blind children

Table 2 Anatomical classification in 65 children with SVI/BL attending the school for the blind and derived from the SEC

Site of abnormality	N	Per cent
Whole globe	6	9.2
Anophthalmos	3	4.6
Buphthalmos	1	1.5
Glaucoma	2	3.1
Cornea	4	6.2
Scar (VAD)	2	3.1
Dystrophy	1	1.5
Other opacity	1	1.5
Lens	10	15.4
Cataract	10	15.4
Uvea	1	1.5
Coloboma	1	1.5
Retina	22	33.8
Dystrophy	6	9.2
Albinism	4	6.2
ROP	8	12.3
Retinoblastoma	1	1.5
Other (scar)	3	4.6
Optic nerve	5	7.7
Atrophy	2	3.1
Hypoplasia	1	1.5
Other	2	3.1
Globe appears normal	10	15.4
Idiopathic nystagmus	5	7.7
Cortical blindness	5	7.7
Unclear diagnosis	7	10.8
Total	65	100

BL, blindness, ROP, retinopathy of prematurity; SEC, Suriname Eye Centre; SVI, severe visual impairment; VAD, vitamin A deficiency.

often represent less than 1% of the estimated prevalence of blind children.[10–12]

Studies on children in schools for the blind can provide an indication of the major causes of childhood BL in a particular area. However, data from these studies may not be representative for the total childhood population as not all children are admitted to blind schools and children from poor rural communities are likely to be under-represented.[13]

The LBS does not accept students with multiple handicaps, children aged below 4 years and those who are still very dependent on their parents in daily life. Priority is given to those with severe visual loss. Of all children with visual loss 30.8% (33/107) were attending the LBS. Similarly this was 35.4% (23/65) of children with SVI/BL demonstrating

Table 3 Aetiological classification of SVI/BL in 65 children attending the school for the blind and derived from the SEC

Aetiological category	N	Per cent
Hereditary	9	13.8
Intrauterine	1	1.5
Perinatal	14	21.5
Childhood	4	6.2
Unclassified	37	56.9
Total	65	100

BL, blindness; SEC, Suriname Eye Centre; SVI, severe visual impairment.

Table 4 Avoidable causes of SVI/BL in 65 children with SVI/BL attending the school for the blind and derived from the SEC

Causes	N	Per cent
Avoidable	26	40.0
Preventable	5	7.7
Corneal scar from VAD	2	3.1
Congenital rubella	1	1.5
Trauma	1	1.5
Harmful traditional practices	1	1.5
Treatable	21	32.3
Cataract	10	15.4
ROP	8	12.3
Glaucoma/buphthalmos	3	4.6
Unavoidable	39	60.0

BL, blindness; ROP, retinopathy of prematurity; SEC, Suriname Eye Centre; SVI, severe visual impairment; VAD, vitamin A deficiency.

shortcomings of just using data from a school for the blind. The remaining visually impaired children are in the integrated education programme or are not educated. These children cannot enrol due to shortage of places, little financial possibilities and lack of parental awareness. The sample of students examined in this study must therefore be viewed as a selected group having a bias towards older children, probably from more affluent households and in whom visual loss is likely to be more severe.

In the present study, data was also obtained from medical records at an eye clinic. This method has the advantage of identifying a larger group of children with visual loss than by community surveys where the proportion of blind children is generally very small. For comparison, only seven blind children were identified in a population-based survey of >10 000 children in India.[14] However, this method is subject to certain inherent biases as children from poor rural communities may be under-represented and medical records contain retrospective information which can be out of date or unclear. In our study, this occurred only a few times due to fairly good medical recording.

Congenital cataract was found in 15.4% of cases. A study in Brazil found 12.7% of SVI/BL in children due to cataract.[15] Cataract is becoming an increasingly important cause of childhood BL in developing countries where there are programmes in place for the control of VAD and measles. In these countries cataract can account for 5– 20% of cases.[16]

ROP was observed in 12.3% of the cases, and is considered a frequent cause of VI in developing countries.[3 15 17] ROP seems to have a correlation with infant mortality, suggesting that countries with infant mortality rates in the range of 8–60/1000 live births are most likely to have ROP as an important cause of BL.[4] Suriname has an infant mortality rate of 24/1000 live births and confirms this suggestion.[6] In the more developed countries of Latin America such as Argentina, Cuba and Paraguay, ROP accounts for a third to a half of cases of BL or profound low vision and its appearance ironically may be an indicator of improved healthcare.[17]

In many low-income countries corneal scarring from VAD is the predominant cause of preventable SVI/BL.[4] In this study only 3.1% (two children) of preventable SVI/BL was attributed to VAD. Both children were near the upper age limit suggesting VAD is not a continuing issue in Suriname. Another important cause of childhood BL in poor countries is measles keratitis which can account for up to two-thirds of preventable causes.[10]

In our study there were no cases of measles keratitis. The coverage of measles immunisation has increased dramatically over the years in many countries, with an associated drop in the number of cases of measles and measles related deaths.[4] According to WHO/Unicef estimates, Suriname had measles immunisation coverage of 88% in 2009. This is lower than in neighbouring regions: Brazil 99% coverage, Guyana 97% coverage and Colombia 95% coverage (2009 WHO/Unicef estimates of immunisation coverage).

A number of countries in Latin America have already started implanting VISION 2020 action plans. One of the programme's targets is establishing one paediatric eye centre for every 10 million people within a country in 2020. Suriname already meets this target with a professional eye care centre with several ophthalmologists with subspecialties.

CONCLUSIONS

Potentially avoidable causes of SVI/BL in Suriname were seen in 40% of the evaluated population, with childhood cataracts and ROP the leading causes. Improvement can be made on screening for ROP. Data suggest corneal scarring form VAD appears to have been eradicated from Suriname. There were no cases of measles keratitis; but the data support the need of increased coverage of measles immunisation to prevent an increase of cases in the future. BL usually gets low attention in public healthcare, although preventive programmes and treatment have significant impacts on the quality of and success in life of such children. Hopefully this study can help in planning and implementing appropriate activities for children with SVI/BL in Suriname.

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Competing interests None.

Patient consent Obtained.

Ethics approval Medical Ethical Commission of the Ministry of Public Health of Suriname (no: 1326-VG028-2012).

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