

Pattern of childhood blindness at a referral center in Saudi Arabia

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BACKGROUND: An understanding of the causes of blindness and the magnitude of the problem is crucial in designing effective intervention and prevention programs. We undertook this retrospective review to determine the causes of childhood blindness at an eye referral center.

PATIENTS AND METHODS: We reviewed charts of children who presented between August 1997 and August 2003. All children had a complete ophthalmologic examination. Blindness was defined as a visual acuity <20/400, visual impairment as visual acuity between 20/400 and 20/60, and visual loss as a visual acuity <20/60.

RESULTS: A total of 5217 children included 220 (59%) males and 152 (41%) females (age range 2 to 18 years, mean age, 10 years). One hundred twelve (2%) were blind and 260 (5%) had visual impairment. The most common causes of bilateral blindness included optic nerve diseases, retinal disorders, and cataract. The most common causes of unilateral blindness included trauma, retinal diseases, refractive errors, and optic nerve diseases. The most common causes of bilateral visual impairment included refractive errors, corneal diseases, retinal disorders, cataract, and congenital nystagmus. Genetically determined disorders were observed in 37 (70%) of 53 patients with bilateral blindness, and in 52 (56%) of 93 patients with bilateral visual impairment. The incidence of consanguinity among parents of children with acquired causes was 2 (3%) of 59 patients compared to 34 (38%) of 89 among genetically determined causes ($P<0.001$).

CONCLUSION: Genetically determined disorders continue to play an important role in the causation of childhood blindness among patients attending our referral center in Saudi Arabia. Genetic counseling, early eye screening of children and public education may help in the prevention of visual disorders in children.

Blindness is a major health problem that adversely affects the individual, his family and the community. Blindness seriously interferes with the quality of life of the affected individual, especially in developing countries where public facilities are not equipped for the physically handicapped members of society. The prevalence and distribution of blind people have been determined in many countries, and it has been shown that the prevalence of blindness in developing countries is 10 to 40 times higher than that in developed nations.¹ The majority of blind people of the world live in the developing countries of Asia, Africa and Latin America. The causes of blindness in the Eastern Mediterranean countries are different from the western world.

Blindness in childhood may interfere with the normal development and education of the child. This places a burden on the individual and his society. The causes of childhood blindness in developing countries have not been widely elucidated. To design effective intervention and prevention programs, an understanding of the causes of blindness and the magnitude of the problem is crucial. The main purpose of this study was to evaluate the prevalence and causes of blindness among Saudi children presenting to The Eye Center, Riyadh, Saudi Arabia.

Patients and Methods

We conducted a retrospective review of the medical records of all patients who presented to The Eye Center, Riyadh, Saudi Arabia, during the period of August 1997 to August 2003. They constituted 5217 patients aged 2 to 18 years of age. The medical history, family history and ophthalmologic evaluations were reviewed and recorded. Consanguinity among parents was defined as first-degree cousins. Visual acuity was measured using the Snellen charts, and vision was classified according to World Health Organization (WHO) criteria.²⁻⁵ Blindness was defined as visual acuity of less than 20/400, and visual impairment was defined as visual acuity of less than 20/60 but better than 20/400.⁶ Visual loss was defined as the sum of blindness plus visual impairment referring to any child with a visual acuity of less than 20/60. Eye examinations included biomicroscopy, tonometry, ophthalmoscopy and retinoscopy. The Student's *t* test and chi-square test were used in the statistical analysis.

Results

A total of 372 (7%) out of 5217 patients had visual loss. The age range in the 372 patients was 2 to 18 years with a mean age of 10 years; there were 152 (41%) females and 220 (59%) males (Table 1). Forty (11%) patients were under the age of 4 years, 128 (34%) were between 5 and 9 years of age, and 204 (55%) were between the age of 10 and 18 years. There were 112 cases of blindness (visual acuity less than 20/400) and 260 cases of visual impairment (Table 2 and 3). The most common causes of bilateral blindness among the 5217 patients were optic nerve diseases in 21 (40%) cases, and retinal disorders in 17 (32%) cases, and cataract in 4 (7%) cases. The most common causes of unilateral blindness included trauma in 23 (39%) cases, retinal diseases in 10 (17%) cases, and refractive errors in 9 (15%) cases, and optic nerve disease cases. The most common causes of bilateral visual impairment were refractive errors in 15 (16%) cases, corneal diseases in 15 (16%) cases, retinal disorders in 11 (12%) cases, cataract in 10 (11%) cases, and congenital nystagmus in 10 (11%) cases. The most common causes of unilateral visual impairment included refractive errors in 78 (47%) cases and amblyopia secondary to strabismus or anisometropia 29 (17%) cases. Consanguinity among parents of children with blindness was present in 11 (21%) cases, and among children with visual impairment in 25 (27%) cases.

Table 1. Age and sex distribution of 372 children with visual loss and visual impairment.

Age group	Male	Female	Total
2-4 years	25	15	40
5-9 years	69	59	128
10-18 years	126	78	204
Total	220 (59%)	152 (41%)	372 (100%)

Table 2. Causes of childhood blindness among 112 children.

Cause	Bilateral blindness		Unilateral blindness		Total	
	No.	(%)	No.	(%)	No.	(%)
Optic nerve diseases	21	(40)	5	(8)	26	(23)
Retinal disorders	17	(32)	10	(17)	27	(24)
Cataract	4	(7.5)	4	(7)	8	(7)
Uveitis	4	(7.5)	0	(0)	4	(4)
Trauma	0	(0)	23	(39)	23	(20)
Refractive errors	0	(0)	9	(15)	9	(8)
Corneal opacities	0	(0)	4	(7)	4	(4)
Other	7	(13)	4	(7)	11	(10)
Total	53	(100)	59	(100)	112	(100)

Genetically-determined disorders occurred in 53 (47%) of 112 patients with blindness compared to 67 (26%) of 260 patients with visual impairment. Furthermore, genetically determined disorders occurred in 37 (70%) of 53 patients with bilateral blindness compared to 16 (27%) of 59 patients with unilateral blindness. These genetically determined disorders also occurred in 89 (61%) of 146 patients with bilateral visual loss compared to 31 (14%) of 226 patients with unilateral visual loss.

The incidence of parents' consanguinity among patients with genetically determined causes of blindness was 10 (27%) of 37 patients compared to only 1 (6%) of 16 acquired causes. On the other hand, 24 (46%) of 52 cases of visual impairment due to genetically determined causes had positive consanguinity compared to only 1 (2%) of 41 due to an acquired cause. Furthermore, 34 (38%) of the 89 patients with visual loss due to genetically determined disorders were the product of consanguineous marriages compared to only 2 (3%) of the 57 patients with visual loss due to acquired causes ($P < 0.0001$) (Table 4).

Table 3. Causes of childhood visual impairment among 260 children.

Cause	Bilateral impairment		Unilateral impairment	
	No.	(%)	No.	(%)
Refractive errors	15	(16)	78	(47)
Corneal diseases	15	(16)	11	(7)
Retinal disorders	11	(12)	8	(4)
Nystagmus	10	(11)	10	(6)
Cataract	10	(11)	6	(3)
Albinism	7	(8)	0	(0)
Strabismus	6	(7)	29	(17)
Ectopia lentis	5	(5)	0	(0)
Uveitis	5	(5)	12	(7)
Glaucoma	4	(4)	0	(0)
Trauma	0	(0)	10	(6)
Other	5	(5)	3	(3)
Total	93	(100)	167	(100)

Table 4. Causes of visual loss and parent consanguinity.

Parent consanguinity*	Genetically determined causes		Acquired causes		
	No.	(%)	No.	(%)	Total
Yes	34	(38)	2	(3)	36
No	55	(62)	55	(97)	110
Total†	89	(100)	57	(100)	146

*First degree cousins

† $P < 0.0001$ genetically determined vs. acquired causes

Table 5. Recommendations for the prevention of childhood blindness in Saudi Arabia.^{1,2}

Public education programs
– Prevention of trauma: use of safety belts, care in use of hazardous toys, stones, fireworks, etc.
– Discouragement of consanguinous marriages
– Avoidance of misuse of topical medications and folk remedies
– Genetic counseling
– Early management of red eyes
Medical programs
– Eye examination at birth
– Eye screening of pre-school and school children
– Early management of congenital cataracts
– Continuing medical education
– Vaccination for infectious diseases in children

Discussion

Several reports on childhood blindness in Eastern Mediterranean countries have appeared in the literature over the past two decades.⁶⁻¹⁰ The major causes of blindness in children include retinal degeneration, congenital glaucoma, corneal scars, trauma, optic atrophy and vitamin A deficiency.⁶⁻¹⁰ The loss of productivity of the visually-impaired person constitutes a major socio-economic handicap. Blinding eye diseases remain a major public health problem in many developing countries including Saudi Arabia. The prevention of such diseases is less expensive than taking care of those who are blind.

The prevalence of blindness in Saudi Arabia was determined by a community-based survey by Tabbara and a co-worker in 1983.¹¹ The authors found that 1.5% of the population were blind and 7.8% were visually impaired.¹¹ Among the general population of Saudi Arabia, the most frequently encountered causes of blindness included cataract, trachoma, corneal opacities and refractive errors.¹⁰ In this study, the causes of visual loss among Saudi children presenting to The Eye Center are errors of refraction, retinal disorders, trauma, strabismus, corneal diseases, optic nerve diseases, cataract and uveitis.

It was previously shown that the pattern of childhood blindness in Saudi Arabia changed after 1962. Prior to 1962, most causes of the childhood blindness were acquired (infection or trauma), and after 1962 the major causes of blindness were found to be genetically determined.⁶ Subsequent studies in other Eastern Mediterranean countries like Lebanon and Jordan showed a similar trend in childhood blindness.⁸⁻¹⁰ Similarly, the present study has shown in general that genetically-determined diseases play an important role as a cause of visual loss among children in Saudi Arabia, and constitute the most important cause of blindness, especially in bilateral blindness. Currently, infectious and nutritional diseases appear to play a minor role in the etiology of childhood blindness in Saudi Arabia.

Prevention of childhood blindness at the present time should be directed towards the early detection of genetically determined disorders and genetic counseling. Currently, several disorders may be diagnosed by genetic studies, but the prevention of genetically determined blindness is an evolving long-term problem. Genetic counseling is essential in many blinding genetically determined diseases. Proposed guidelines for the prevention of visual loss among children in Saudi Arabia are outlined in Table 5.

Preservation and restoration of vision can be promoted in two major areas—public education and medical programs. Trauma (39%) is a leading cause of unilateral blindness and can be prevented by public education programs to draw the attention of the public to the dangers of playing with hazardous toys, stones, fireworks and sharp instruments. The importance of using safety belts and children seats during driving should also be emphasized. Discouraging consanguineous marriages should be systematically undertaken with participation of religious authorities in public educational programs. The use of topical medications without ophthalmic surveillance and the use of folk and homemade remedies should also be discouraged by public education.

Medical programs should include eye examinations shortly after birth and within the first year of life. This examination is crucial in the early detection of curable eye disorders and may prevent many cases of blindness among children. Eye screening of pre-school and school children should be initiated by the appropriate authorities in the primary health care centers and by school health programs. It is important to organize continuing medical education programs for the general practitioner and for other health personnel. These will eventually help in early detection and management of congenital cataracts and other congenital anomalies.

Vaccination for measles and rubella would help in the prevention of acute keratitis and cataracts,

respectively. Mass treatment for trachoma should be initiated in communities where the disease is highly endemic. Trachoma may lead to blindness in adults, but may be prevented by detection and treatment in childhood. Training of personnel in ophthalmology for the early referral of congenital cataract, glaucoma and amblyopia, may prevent loss of vision. Improving the existing surgical facilities and continuing medical education will help in the control of preventable causes of visual loss in childhood.

We do acknowledge the fact that this study is not a community-based survey. It is a biased sample from a referral facility and does not determine the magnitude or the true prevalence of childhood blindness in Saudi Arabia. It involves a selected patients population and underscores the urgent need for a community-based blindness survey among the Saudi children. However, this study may help in formulating guidelines for the restoration and preservation of vision, prevention of blindness, and visual impairment in Saudi children.

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