

Causes of Blindness and Severe Visual Impairment in Children in Schools for the Blind in East Azerbaijan State

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Abstract

Purpose: To determine the anatomical site and underlying causes of blindness and severe visual impairment (BL/SVI), in schools for the blind in East Azerbaijan state with determining potentially preventable and treatable causes.

Methods: Between October 2003 and November 2004 a total of 124 students attending three schools for the blind in East Azerbaijan state were examined clinically and data reported using the WHO/PBL childhood blindness assessment form.

Results: Most of the students (91.9%) were blind. The major causes of BL/SVI in our study were: Retinal dystrophy (mainly early onset retinitis pigmentosa) in 34.7% of participants; cataract and aphakia in 14.5%; corneal scar/haze in 15.4% and microphthalmus in 13.7%. The retina was the major anatomical site of visual loss (41.1%) followed by the whole globe (23.4%), lens (14.5%), cornea (15.3%) and optic nerve (5.6%).

Conclusion: A relatively high proportion of childhood blindness in East Azerbaijan state has avoidable causes. Most cases of corneal scars and phthisis can be prevented, and cataract is potentially treatable condition.

Keywords: Childhood Blindness, Avoidable Blindness

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Introduction

Childhood blindness has been identified as a priority in the areas of the world health organization's Vision 2020 - The right to sight program.¹ Currently it is estimated that there are 1.5 million blind children in the world, of whom 1.0 million live in Asia, of them 80% is preventable or curable.¹ Blindness in children has been studied

in different parts of the world, and there are geographical variations in the major causes of childhood blindness.² This reflects different levels of socioeconomic development and provision of health care service. The major causes of blindness also vary with the passage of time.³

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Studies have revealed that in general, malnutrition and infections are most frequent causes of childhood blindness in many undeveloped and developing countries,⁴⁻⁶ but in developed countries the major causes of blindness are central nervous system diseases, congenital anomalies and retinal disorders.⁷⁻⁹

According to the last censuses of population that have been conducted 1996 by the National Statistical Center, Iran has a population of 60 million, who are spread over 30 provinces.¹⁰ 27.51% of the population is children (age 14 or less) and 20.54% are in the range between 15-24 years old.¹⁰ According to our best knowledge there is no statistically valid data of blindness in north-west Iran, and the major causes of childhood blindness has not been studied before. The aim of this study was to determine most frequent causes of blindness among children in East Azerbaijan state.

Methods

There are three blind schools available in East Azerbaijan state, the Tabriz Blind School is exclusively for the blind and caters for both residential (mostly) and day students that mainly come from all cities of the East Azerbaijan state. The two other schools in the state are for blind, deaf and mentally disabled children. Between October 2003 and November 2004, all the blind students in all the blind schools were examined by an optometrist and an ophthalmologist. Informed consent was obtained from each school's headmaster as well as each student at the time of examination whenever possible. Among the total 147 students in the blind schools the students aged 16 years or less and those older than 16 years but who became blind before the age 16, totally 124 blind or severely visual impaired children were included in this study. Information was gathered using interviews with students, parents (if possible) and school staff. A history of the age at onset of visual loss, family history, history of consanguinity and information about hereditary diseases, intrauterine or childhood factors was taken. Unilateral and binocular visual acuity was measured for each student using the Snellen's illiterate E chart. If VA was less than $20/400$, each eye was tested to perceive hand motion or light. Anterior segment examination was performed using a flashlight and a simple

magnifier, a hand held slit lamp was used if it was needed. Posterior segment examination was performed using direct and/or indirect ophthalmoscope. The WHO/PEL eye examination record for children with blindness and low vision form was used to collect and to analyze the data.¹¹ The cause of visual loss was recorded using the anatomical and etiological classification in the form.¹¹ Any required therapeutic intervention was recorded. Data collected were entered into a computer from where frequency charts and distributions were generated, using SPSS software. We considered significant relationship if the P was found less than 0.05 in Pearson Chi-square test.

Results

In all 124 students who participated in the study, 66.9% (83) were boys and 33.1% (41) were girls. 54% (67) of them were aged 15 years or over, 37.1% (46) were aged 7-14 years and 5.6% (7) was less than 7 years old. Mostly (76.6%) were blind congenitally, with relatively high rate (41.19%) of consanguinity. General information including the age, sex, age of onset of blindness and consanguinity were summarized in table 1. The age range was 1 to 26 years. The distribution of visual acuity is given in table 2. 91.9% (114) of the students were blind, mostly with vision of light perception or hand motion and 8.1% (10) were severely visual impaired.

Table 1. The sex, age distribution, age of onset of blindness and history of consanguinity among the students

General information	No	%
Sex		
Male	83	66.9
Female	41	33.1
Age distribution (1-26)		
1-6	11	8.8
7-14	46	37.1
15-26	67	54
Age of onset of blindness		
Congenital	95	76.6
Pre-school	17	13.7
School age	7	5.6
Unknown	5	4
History of consanguinity		
Yes	52	41.9
No	43	34.7
Unknown	29	23.4
Total	124	100

Table 2. WHO categories of visual impairment among the students

WHO category	level of visual acuity (better eye)	NO	%
Blind	NPL	21	16.9
Blind	<3/60 to PL	93	75
Severe visual impairment	<6/60 to 3/60	10	8.1
Visual impairment	<6/18 to 6/60	0	0
No impairment	6/18 or better	0	0
Total		124	100

PL: Perception of light, NPL: No perception of light

Anatomical causes of visual loss

The anatomical site of abnormality leading to severe visual impairment or blindness is shown in table 3. Retina was the main site of pathology in 41.1% followed by the whole globe in 23.4% and the lens in 14.5% of the blind students.

Table 3. Anatomical classification of the causes of visual impairment (better eye)

Anatomical site	No	%
Whole globe	29	23.4
Cornea	19	15.3
Lens	18	14.5
Uvea	0	0
Retina	51	41.1
Optic nerve / central nervous system	7	5.6
Total	124	100

The main causes of visual impairments and the main causes leading to blindness or severe visual impairment among the students provided for the better eye, are shown in table 4. The major causes were retinal dystrophy in 34.7%, cataract/Aphakia in 14.5% and corneal scar/haze in 15.4%. Retinitis pigmentosa was the leading disorder among the retinal dystrophy group. Vitamin A and/or other nutritional deficiencies and also infectious disorders of the eye were mainly attributed to the corneal scars.

Table 4. The main causes of visual impairments among the students (better eye)

Anatomical site	Main cause	No	%
Whole globe	Microphthalmia	17	13.7
	Phthisis	4	3.2
	Buphthalmus/glaucoma	5	4
	Nonophthalmia	3	2.4
Cornea	Corneal scar	10	8.1
	Corneal dystrophy/haziness	9	7.3
Lens	Cataract and aphakia	18	14.5
Retina	Retinal dystrophy	43	34.7
	Albinism	5	4
	Retinopathy of prematurity	3	2.4
Optic nerve	Optic nerve atrophy	7	5.6
Total	Total	124	100

Etiology of visual impairment

The etiology of visual impairment is shown in table 5. The major etiological factor was hereditary diseases in 60.5%, mainly including retinal dystrophies, congenital cataract, glaucoma, anophthalmos and microphthalmos, but the childhood factors such as nutritional deficiency, trauma, and infectious disease of the cornea leading to scar contributes for 13.8% of blindness among the students and in 25.7% it was unknown.

Table 5. Causes of visual impairment by etiologic category among the students

Etiological category	No	%
Hereditary disease	75	60.5
Intrauterine factors	9	7.3
Childhood factors	8	6.5
Unknown	32	25.7
Total	124	100

Discussion

Data from surveys from schools for the blinds, though subject to the selection bias, have the major advantage that many children can be examined for causes of blindness by one or two examiners using standard method. Marked differences in the causes of childhood blindness have been reported in the past for different

countries worldwide, apparently based on socioeconomic factors. In high income countries, lesion of the optic nerve, CNS and ROP predominates as the causes of blindness,^{1,3,8,14,23} while corneal scarring and ophthalmia neonatorum are the major cause in low income countries.^{1,4,6,17} Other significant causes in all countries are cataract and retinal dystrophy.^{4,5,7,12} In our study almost all students (91.9%) were blind with vision mostly between hand movement and no perception of light. These findings were much poorer compared to some studies^{8,14,16} and were similar to other reported studies.^{4,5,9,12,15,18}

In our study there were fewer females (⁴¹/₁₂₄) than males (⁸³/₁₂₄) in all of the three blind schools, as the male to female ratio being 2:1, slightly higher than some reported studies; India⁶ 1.7:1, and Ethiopia¹⁵ 1.8:1. This is probably because the boys and not the girls are generally sent to school especially in rural population. Hereditary and genetic diseases (retinal dystrophy, cataract, glaucoma) were the major causes of childhood blindness in our study, accounting for 60.5% which is similar to some reported studies.^{4,12,17,18} Forty eight percent of the blind children had positive history of consanguinity marriage in their parents and there was a statistically significant correlation between consanguinity and blindness (Pearson Chi-square, $P=0.046$). In comparison, studies in other Asian countries found genetic/hereditary eye disease to be responsible for 35.5% in Bangladesh,¹⁹ 16.8% in Thailand,²⁰ 30.7% in China,¹³ 23% in India,¹⁷ and 29.5% in Malaysia,¹⁸ 13.4% in north India.¹⁶ Although a high level of consanguineous marriage were found in other countries such as India (32%),¹⁷ and Hong Kong (12.5%)¹⁴ but there is a great tendency among our population toward the consanguineous marriage, and it is not common indeed a genetic consulting before a high risk marriage even if available. Postnatal/childhood infectious eye diseases (13.8%), similar to studies reported from Nigeria,⁵ Ethiopia,¹⁵ and India.^{6,16} This result is in contrast with studies reported from developed countries such as United Kingdom,⁸ United States¹⁰ and Poland,⁷ and also some other Asian countries such as Malaysia,¹⁸ Hong Kong,¹⁴ and China,^{12,13} where the ROP, cortical impairment and optic nerve disorders are the major causes of blindness. Of the 75 hereditary cases retinal

dystrophies were the prominent causes in 45 (34.7%) followed by cataract in 18 (14.5%) and Corneal scar/haze in 18 (14.6%). Congenital ocular anomalies such as microphthalmos and nophthalmos accounted for 13.7% and 2.4% respectively of SVI/BL. These findings however were in accordance with those from blind school surveys done in Japan 11.2%,²¹ Congo 18.7%²² and Indonesia 10.9%.⁴

Corneal scar/haze and phthisis bulbi were responsible for 18.6 of SVI/BL cases. Those conditions were most likely attributed to infections and malnutrition in the postnatal/infancy or childhood period, that is they are potentially preventable causes of blindness. As known for more than 100 years, a drop of an appropriate antimicrobial agent delivered to the eye within 1 hour of birth can effectively reduce the incidence of ophthalmia neonatorum.²³ Vitamin A deficiency could also be related to the cause of visual morbidity. Vitamin A supplements should be administered and immunization against rubella should be given to mothers and children.

Cataract which was responsible for 14.5% of SVI/BL in our study is also a potentially treatable disease, early detection followed by appropriate surgical technique and postoperative rehabilitation should prevent this kind of morbidity. The buphthalmos and primary congenital glaucoma cases found in this study 4% is less than that found by Sitorus study⁴ 8.2%, but like the same study were in the late stage of the disease. Glaucoma and, cataract should be recognized and treated as soon as possible, optional care including the option of appropriate surgery unfortunately are not available mostly. In our study, perinatally related diseases, such as ROP, were identified in only three (2.4%) cases. Gilbert et al declared that in developing countries, the frequency of ROP approaches zero because few low-birth weight neonates survives²⁴ as countries become more developed the prevalence of ROP increases because the tendency to save the live of low-birth weight premature infants become more available.²⁴ We believe that this low incidence of ROP is probably the result of the much higher mortality rate of premature children in our state. Although Behcet disease and IRA are not infrequent in our country, as our study

population did not include adult blinds we could not find any blind children due to uveal tract involvement.

Conclusion

Hereditary disease, cataract and corneal scar as the prominent causes of blindness, is a mixed pattern which lies between the pattern seen in developing countries and those seen in developed countries. By decreasing the rate of consanguineous marriage and performing a regular genetic consultation before marriage, we can prevent the genetic/hereditary eye

diseases. Most cases of corneal scars are most likely attributed to infections and nutritional deficiencies in infancy and are preventable conditions. On the other hand cataract which was the second major cause of BL/SVI in our study is potentially a treatable condition.

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