Original Article

AN UPDATE OF CAUSES OF CHILDHOOD BLINDNESS AND SEVERE VISUAL IMPAIRMENT IN CHILDREN ATTENDING SCHOOLS FOR THE BLIND IN BENIN CITY, NIGERIA.

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ABSTRACT

Aim: To determine the current causes of visual impairment and blindness amongst students in schools for the blind in Benin City, Nigeria.

Methods: A cross sectional survey of students attending all three schools for blind education in Benin City, Nigeria, was carried out in 2016. All consenting students comprised of two groups of students; those below 16 years and those 16 years and above, but who became blind before the age of 16 years were surveyed. Age, sex, educational status, cause, onset, and severity of visual impairment were assessed and the data collected was analyzed using the World Health Organization Prevention of Blindness Examination Record for Childhood Blindness (WHO/PBL ERCB).

Results: 13 students (44.8%) were less than 16 years and 16 (55.2%) were 16 years or older. Twenty –six children (89.7%) were blind and 3 (10.3%) had severe visual impairment. The major anatomical sites of blindness/ SVI were lens (9, 31.0%), whole globe (8, 27.6%) and cornea (5, 17.3%). At a disaggregated level, the causes of blindness/SVI were similar in both groups but corneal lesions occurred at a higher proportion in the older age group (13.8%) than the younger group (3.4%). The aetiology of blindness/ SVI was unknown in 18 (62.0%) cases. Measles keratopathy, ophthalmia neonatorium and harmful traditional practices were identified in a few students (5, 17.3% respectively). Majority of the cases of blindness/SVI were avoidable (22, 75.9%) and mostly treatable by surgery. Five (55.6 %) out of 9 students with lens- related causes had operated cataracts but 4 (80%) had poor outcome, mostly due to amblyopia from late surgery in addition to other post-operative complications.

Conclusion: Cataracts and glaucoma were the major causes of blindness and visual impairment in this study. Consequently, there is a need for increasing awareness about childhood blindness and early therapeutic interventions in susceptible child populations.

Key words: Childhood blindness, severe visual impairment, causes, blind schools, Benin City.

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Introduction

Blindness in children remain a significant public health problem globally, not just because of the large numbers of children affected but because of the more fastidious disability and economic impoverishment it

confers on affected children, families, communities and economies. This is especially so in low income and developing countries where over three-quarters of blind children live.[1] Childhood blindness vary widely regionally based on socio-economic indices and under-five mortality rates. It ranges from 0.3 per 1000 in high income countries with low under-five mortality rates to about 1.5 per 1000 in low-income countries with the highest under-five mortality rates.[2] Over 80% of the causes of childhood blindness are either preventable or treatable in these developing countries.

Reports[3-8] from some low and middle income developing countries show that blindness from congenital causes such as cataract, glaucoma and acquired causes such as retinopathy of prematurity (ROP) have become the commonest causes of blindness in children, whereas in high income/ developed countries, diseases of the central nervous system predominate.[1,7] Population based survey methods are best in collecting data on blindness but they are too difficult to use in children in whom blindness is relatively rare. Although key-informant methods [9]are increasingly popular and effective, studies of schools for the blind are also useful as they provide quick and key information about prevalent causes and help to assess progress or otherwise of blindness prevention efforts in specific regions. This is particularly useful when comparison needs to be made with previous data utilizing similar methods.

The World Health Organization (WHO)/ Prevention of blindness Examination Record[10] is a veritable and standard instrument of data collection used for most childhood blindness surveys. It was developed in 1990 by the International Centre for Eye Health (ICEH), London, in collaboration with the WHO to facilitate the recording of causes of blindness and low vision in children 0-15 years. It is also useful to overcome the difficulties encountered in comparing data on causes of severe visual impairment and blindness from different places.

In an earlier report from Benin City in 2001,[11] the most common causes of blindness were corneal opacities (42.8%), Pthisis bulbi (24.6%), micro-cornea (24.6%) and lens related causes such as cataract (14.3%) and aphakia (14.3%). The common causes of corneal blindness in the region were measles associated keratopathy, Vitamin A deficiency, harmful traditional eye medications and ophthalmia neonatorium.[11,12] At that time, child care services were relatively poor with measles immunization coverage ranging from 40% in 1998 to as low as 25.3% in 2003[13] with no specialist paediatric ophthalmology facilities available in the region. The situation has changed considerably in recent times; countrywide measles immunization coverage has increased to 51% by 2016 with the highest peak in 2010 (63%),[14] paediatric ophthalmology units now exists in the tertiary hospital in the city and another teaching hospital in the state. The purpose of this study is to highlight the temporal trends in the causes of blindness/ SVI in Benin City by studying students in schools for the blind and compare the results with previous studies in the region. This will enable assessments of efforts at reduction of childhood blindness with a view to making recommendations for reducing childhood blindness in the state.

Methods

The study was a descriptive cross-sectional study conducted between May and June 2016 in all three government schools providing special education for blind students in Benin City, Edo State, Nigeria. They comprise of two integrated secondary schools (a girls only school and a mixed school) and one primary

special school for blind children. All students under the age of 16 years at the time of the study and aged 16 years and above, but who became visually impaired before the age of 16 years were included. Students who were older than 16 years and who became blind or visually impaired after the age of 16 years were excluded.

A team comprising a consultant ophthalmologist, two ophthalmic senior residents and one optometrist from the University of Benin Teaching Hospital undertook the examinations. The questionnaire used for this study was the WHO/PBL eye examination record for children with blindness and low vision.[10] The bio-data was taken as well as history of visual loss, family history of blindness, consanguinity and the presence of any additional impairments or diseases (eg, cognitive, physical or hearing impairment and epilepsy). Additional relevant information was collected from class teachers, care assistants in the school as well as a few parents that could be reached on telephone. Pertinent information related to school enrolment, availability of necessary facilities and challenges of blind school education were also obtained from informal interviews with teachers in the schools and by observation.

The definitions of blindness and visual impairment (BL/VI) used in the form followed the International Statistical Classification of Diseases and Related Health Problems, (ICD-10): 54. Blindness was defined as presenting visual acuity of <3/60 in the better eye, severe visual impairment <6/60-3/60, visual impairment <6/18-6/60, and normal vision 6/18 or better. Anterior and posterior segment examination were performed and objective and subjective refraction were carried out in children with VA <6/18, in whom there was no anatomical cause of blindness/SVI that precluded refraction. All data were recorded on a WHO/Prevention of Blindness (WHO/PBL) form. Anatomical and aetiological classifications of blindness were done using the coding instructions in the forms. The WHO/ PBL form classifies causes of blindness /low vision anatomically, based on the location/ structure in the eye that is affected, namely; whole globe, cornea, lens, uvea, retina, optic nerve and other (not listed). Causes of blindness/ SVI is classified aetiologically as due to 5 factors; hereditary diseases, intrauterine factors, perinatal/ neonatal factors, postnatal/infancy/childhood factors and factors that cannot be determined (unknown factors). Blindness/ SVI is also classified as avoidable if the causes of blindness/ SVI are potentially preventable or treatable by public health measures or by direct optical, medical and/ or surgical interventions. Those with treatable causes of blindness or in need of further evaluation for ophthalmic, systemic or psycho-social conditions were brought to the attention of the school authorities and appropriately referred to relevant facilities to access care.

The study conformed to the ethical principles of the Helsinki declaration. Data were analyzed using the (WHO/PBL ERCB) M V.1.2.75 software and Microsoft Excel. The data are presented in frequency tables on causes at the level of the person, not eyes.

Results

A total of 36 students were reportedly enrolled in all three schools for blind education in Benin City at the time of the study. Thirty students were seen and examined during the survey, and data analyzed in 29 students who met the inclusion of being blind before the age of 16 years irrespective of age. Thirteen (44.8%) of the students were less than 16 years while 16

(55.2%) were 16 years and older. The mean age of all students was 15.2 +6.3 years with age range 6 - 30 years. There were 20 males and 9 females with a M: F ratio of 2.2:1.
Other socio-demographic information is shown on Table 1.

Table 1: Socio-demographic characteristics of students in the 3 schools for blind education.

Variables	Frequency (n = 29)	Percent
Age group (years)		
0 - 10	3	10.3
11 - 15	10	34.5
≥ 16	16	55.2
Mean age±SD (years)		
15.2±6.3		
Sex		
Male	20	69.0
Female	9	31.0
Age at onset of visual loss		
Since birth	12	41.4
First year of life	3	10.3
1 – 15 years	14	48.3
Family history		
Yes	6	20.7
No	20	69.0
Unknown	3	10.3

Age range: 6- 30 years

Table 2: WHO categories of visual loss, using best corrected visual acuity by sex and age group

WHO category	Vision in better eye (N = 29)	Sex		Age category in years.			Total
		Male	Female	0 – 10	11 – 15	≥16	N (%)
Severe visual impairment	<6/60-3/60	2(6.9)	1(3.4)	0	2(6.9)	1(3.4)	3 (10.3)
Blindness	<3/60 - Light perception	13(44.8)	3(10.3)	3(10.3)	6(20.7)	7(24.1)	16 (55.2)
Blindness	No light perception	5(17.2)	5(17.2)	0	2(6.9)	8(27.6)	10 (34.5)
Total		20(69.0)	9(31.0)	3(10.4)	10(34.5)	16(55.2)	29 (100.0)

Three students (10.3%) were in severe visual impairment category with VA between <6/60 – 3/60 and 26 (89.7%) in blind category with VA < 3/60. Ten students (34.5%) had no light perception.

Table 3: **Causes of Blindness/SVI by age group using anatomical site of abnormality.**

Anatomical Site	Students (N=29) 0 -15 years n=13 (%)	Students(N=29) ≥ 16 years n=16 (%)	Total (%)
Whole globe			
Phthisis	1 (3.4)	1 (3.4)	2 (6.9)
Glaucoma	0 (0.0)	1 (3.4)	1 (3.4)
Buphthalmos	2 (6.9)	1 (3.4)	3 (10.3)
Microphthalmos	1 (3.4)	1 (0.0)	2 (6.9)
Cornea			
Scar	1 (3.4)	4 (13.8)	5 (17.2)
Uvea (anterior segment dysgenesis/ aniridia)	**1 (3.4)**	**0 (0.0)**	**1 (3.4)**
Lens			
Cataract	2 (6.9)	2 (6.9)	4 (13.8)
Aphakia/Pseudophakia lens related	1 (3.4)	1 (3.4)	2 (6.9)
Complications	2 (6.9)	1 (3.4)	3 (10.3)
Sub-total	5 (17.2)	4 (13.8)	9 (31.0)
Optic nerve			
Atrophy	1 (3.4)	2 (6.9)	3(10.3)
Globe appears normal			
Refractive error	1 (3.4)	0 (0.0)	
Amblyopia	0 (0.0)	1 (3.4)	1 (3.4)
Cortical blindness	0 (0.0)	1 (3.4)	1 (3.4)
Sub-total	1 (3.4)	2 (6.9)	1 (3.4)
			3 (10.3)
Grand Total	**13 (44.8)**	**16 (55.2)**	**29 (100.0)**

Among the 9 students with lens-related disorders, 4 had un-operated cataracts (13.8%) with ages ranging from 10- 27 years. The 10-year-old child with bilateral cataracts and nystagmus was a sibling of an older child (aged 14) who had undergone cataract surgery 3 years earlier and had poor outcome. The parents have refused surgery for this younger sibling. Five students with cataracts had been operated, 2 were aphakic and 3 had intraocular lenses in-situ but they each had one or more complications which included amblyopia, occlusio pupillae, posterior capsular opacity, aphakic glaucoma and one case of pre-existing rubella retinopathy. Cataract surgery was done late

Table 4. Causes of SVI/BL by age groups using aetiological classification.

WHO Category	Students (N=29)		Total (%)
	0-15 years n=13	≥ 16 years n=16	
Hereditary	**2 (6.9)**	**3 (10.3)**	**5 (17.2)**
Intrauterine factor	**1 (3.4)**	**0 (0.0)**	**1 (3.4)**
Perinatal/Neonatal	**0 (0.0)**	**0 (0.0)**	**0 (0.0)**
Postnatal/infancy/childhood factors			
Measles	0 (0.0)	2 (6.9)	2 (6.9)
Harmful traditional practices	0 (0.0)	1 (3.4)	1 (3.4)
Ophthalmia neonatorium	1 (3.4)	0 (0.0)	1 (3.4)
Other	0 (0.0)	1 (3.4)	1 (3.4)
Sub-total	1 (3.4)	4 (13.8)	5 (17.2)
Cannot determine (unknown etiology)			
Cataract	3 (10.3)	2 (6.9)	5 (17.2)
Glaucoma/Buphthalmos	2 (6.9)	2 (6.9)	4 (13.8)
Abnormality since birth	2 (6.9)	4 (13.8)	6 (20.7)
Others	2 (6.9)	1 (3.4)	3 (10.3)
Sub-total	9 (31.0)	9 (31.0)	18 (62.0)
Grand Total	**13 (44.8)**	**16 (55.2)**	**29 (100.0)**

in all but one child who had surgery at age of 1 year and developed aphakic glaucoma postoperatively which was not managed. Refraction improved vision minimally in only one of the children who had aphakia.

Three (10.2%) of the students had additional impairments, two were hearing impairments and one was mental retardation. A total of 7 had a history of surgery, of which 5 were for cataract, one for glaucoma and one was an unknown procedure.
On the basis of anatomical classification, 22 (75.9%) had avoidable (preventable and treatable) causes of blindness.

On observation, two of the three schools had run down infrastructure and the staff complained of poor funding, poor maintenance and inadequate teaching materials especially of modern teaching aids for educating blind children. Staff believed that poor enrolment in the blind schools was largely due to lack of buses and adequate logistics to pick up blind children from home to attend school. However, they had

adequate number of teachers and care assistants with a student to teacher ratio of up to 3.5:1. One school had boarding facilities for the girls and a good number of the teachers and care assistants were old students that were also blind or visually impaired.

Discussion

Our findings were essentially similar to reports from recent studies of children in blind schools in other regions of Nigeria.[15-17] The causes of childhood blindness in these students were a mix, with lens-related causes being more common, closely followed by whole globe conditions (pthisis bulbi, buphthalmos /glaucoma, microphthalmos), corneal pathology and optic atrophy.[15-17] The report from south east Nigeria[15] showed the commonest causes of blindness/ SVI were lens related (33%), whole globe conditions (28.2%), followed by corneal lesions (21.8%). In Owo, western Nigeria, it was lens-related (24.2%), whole globe (19.4%), retina and optic nerve, (12.9%) respectively and corneal lesions (11.3%), while in northern Nigeria, cataract (lens) 25.3%, was also reported as the most common anatomical site of pathology.[16,17] In this study, at a disaggregated level, the causes of blindness/SVI were similar in both groups but corneal pathologies predominated in students older than 15 years than those younger than 16 years. Earlier studies [18-20] in schools for the blind in the same locations listed preventable conditions as corneal lesions [notably corneal scarring due to vitamin A deficiency, measles and harmful traditional eye medicines (HTEMs)] as the most common causes of blindness in children, whereas more recent studies[15-17] have listed lens related causes as the more common causes in the same clime. Our finding thus shows a similar trend of reduction of corneal pathology with age in the causes of blindness in children. Findings from a previous study in 2001 in Benin City[11] which showed corneal pathology in a higher proportion (42.8%) as the most common cause of blindness/SVI followed by lens-related causes (24.6%) further emphasizes this change in trend. This pattern has also been shown in studies in other developing countries in sub-Saharan Africa.[21-23] The reduction in corneal causes have been attributed to the improved national childhood immunizations and vitamin A supplementation programmes organised all over the country and in most of the developing countries.[24]

There was a significant proportion of children blind from cataracts in this region where there is a paediatric ophthalmology service. However, the reasons are not far-fetched; cost of accessing services is usually a major barrier to uptake of cataract surgery and costs in teaching hospitals are typically more expensive than state owned general hospitals. Other barriers that may be responsible are poor awareness of this facility, fear of surgery by parents for young children and distance from the facility. In a particular incidence affecting two children under 16 years from the same family in this blind school study, poor outcome of surgery in the older child acted as a de-motivator to the parents who then chose not to seek help for the younger child with cataract blindness. Surgery in the older child was done late, at 11 years, so outcome was already guarded and was likely to be poor due to amblyopia. In addition it was done in a secondary level hospital and follow- up care was abandoned for unknown reasons. The child apparently developed intense post-operative inflammation that was not treated and resulted in occlusio pupillae in one eye and pseudophakic glaucoma in the other eye. All these factors complicated the outcome of

surgery, resulting in permanent blindness. This singular case underscores the need for rigorous counseling of parents and care givers of children undergoing cataract surgeries to understand the peculiarities of childhood cataract; the need for early presentation, strict follow up after surgery and contact tracing for congenital hereditary cataracts.

No child was identified with measles or vitamin A deficiency- related pathology in the younger age group whereas 2 (6.9%) children with measles related corneal blindness were seen in older age group. This is probably due to better immunization coverage in the state since 2004.[14] However, lack of parental history and absence of medical reports could have underestimated the role of measles and VAD among either or both groups in this study. Although Nigeria is now a low- middle income country, we did not identify one single case of retinopathy-of- prematurity (ROP)- related cause of blindness as has commonly been reported from countries with middle-income socio-economic status.[25,26] It is likely that children who become blind from such causes may be from more affluent families who are able to access higher level neonatal care that can improve survival of prematurely born children who may suffer the complications of prematurity and low birth weight. Such children may be enrolled in normal schools where they study with sighted children or be privy to private, specialized tutorship, sponsored by affluent parents and will thus not be found in public schools for the blind.

Over 75% of the causes of blindness were avoidable causes showing that these children were needlessly blind and ought not to have ended up in blind schools if they got timely and appropriate intervention. This finding is comparable to reports from several parts of Africa and other developing countries where majority of the causes of blindness have been determined as avoidable causes.[15-23] This is an indication of the level of development of the economy. More advanced economies having more competent and effective health systems are able to identify and manage avoidable causes, and therefore they have higher rates of unavoidable causes of blindness.[24-26]

Recommendations

Health enlightenment about locally endemic diseases and their effects on the eyes should be aimed at particular risk groups or target audiences such as parents, pregnant women and community leaders. Examples include public education and health promotion activities such as jingles about measles, vitamin A deficiency to improve immunization coverage or about the possible dangers of traditional practices that endanger the child's sight. Training workshops can target mid and lower-level primary care health workers for early recognition and treatment of potentially blinding eye disorders in children such as congenital cataract and childhood glaucomas. Importantly more awareness needs to be created and referral pathways enhanced from primary, secondary and other tertiary facilities to the specialist paediatric ophthalmology centres to ensure better access and coverage of specialist child eye care services.

Legislation is a primary strategy for the prevention of some causes of childhood blindness. The best-known example is legislation on the application of the Credes' prophylaxis in some countries.[27] In our context, it may be necessary to institute legislation to ensure children are screened and allowed to receive whatever treatments are needed even if against misguided perceptions of parents. Keeping a child with treatable conditions such as cataract at home until they are considered 'old enough' is wrong and inimical to the rights and future of

that child, However, these issues tend to be contentious and will need advocacy as well as government's commitment of resources to take care of the child where the parent cannot.

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