WORLD VIEW

# Causes of childhood blindness: results from schools for the blind in south eastern Nigeria

**I R Ezegwui, R E Umeh, U F Ezepue**

*Br J Ophthalmol* 2003;**87**:20–23

Series editors: W V Good and S Ruit

See end of article for authors' affiliations

Correspondence to: Dr I R Ezegwui, Department of Ophthalmology, University of Nigeria Teaching Hospital Enugu, Nigeria; nducheya@yahoo.co.uk

Accepted for publication 15 July 2002

**Aim:** This cross sectional study was undertaken to identify the major causes of childhood severe visual impairment/blindness (SVI/BL) among students in schools for the blind in south eastern Nigeria with a view to offering treatment to those with remediable blindness.

**Methods:** 142 students attending three schools for the blind in the study area were interviewed and examined using the World Health Organization programme for prevention of blindness (WHO/PBL) childhood blindness proforma.

**Results:** By anatomical classification, the major causes of SVI/BL identified in the children (aged 15 years or less) were lesions of the lens (30.4%), corneal lesions (21.7%), whole globe lesions (mainly phthisis bulbi) (17.4%), and glaucoma/buphthalmos (10.9%). For the young adults (more than 15 years) these lesions accounted for 31.9%, 21.3%, 23.4%, and 8.5% of SVI/BL, respectively. For all the students, the commonest single diagnoses were cataract (23.5%) and corneal scarring (21.4%), of which 86.7% were caused by measles. By aetiological classification, childhood factors (38.6%) constituted the major cause of blindness: 37.0% in the children and 39.4% in the young adults. In 74.5% of all the students, blindness was considered avoidable.

**Conclusions:** A high proportion of childhood blindness in schools for the blind in south eastern Nigeria is avoidable. Development of paediatric ophthalmology in Nigeria to manage childhood cataract and glaucoma is advocated.

There are an estimated 1.4 million blind children worldwide.[1] Approximately three quarters of these live in the poorest regions of Africa and Asia. The burden of disability in terms of blind years in these children represents a major social, emotional, and economic burden for the children, the families, the communities, and the nation.

There are geographical variations in the major causes of childhood blindness.[2] Within a given country these causes vary with the passage of time. This reflects different levels of socioeconomic development and provision of healthcare services. Studies done in Nigeria[3–10] reveal that corneal opacity following measles and vitamin A deficiency (VAD), phthisis bulbi, cataract, trauma, and optic atrophy are leading causes of childhood blindness. Most of these are hospital based studies. Some of the causes identified in children from the northern part of Nigeria were not seen in children from the southern part of the country who attended the same clinic.[3] There is a need to identify the causes of childhood blindness in the different zones in Nigeria in order to target the limited resources to most important priorities in each zone.

The south east zone which is one of the six geopolitical zones of Nigeria comprises five states. The greater numbers of people in this zone are Igbos and reside in rural areas. Surveys from other parts of the world have shown that significant numbers of children in schools for the blind or special education have conditions which may be improved by surgery.[11] Such children need to be identified and treated. This study aims to determine the causes of childhood severe visual impairment/blindness (SVI/BL) among students in schools for the blind in south eastern Nigeria with a view to offering treatment to those with remediable causes.

## SUBJECTS AND METHODS

There are three schools for the blind in south eastern Nigeria located at Oji River, Enugu State; Isulo, Anambra State; and Afara, Umuahia Abia State. The first two are for blind and deaf children while the third one is exclusively for the blind. This cross sectional study was carried out in all three schools between March 1999 and January 2000.

Ethical clearance was obtained from the medical research ethics committee of the University of Nigeria Teaching Hospital, Enugu, south eastern Nigeria. All students aged 15 years or less in the schools were included in the study. Students older than 15 years but who became blind before that age were included. Informed consent was obtained from each school's headmistress/administrative secretary as well as each student at the time of interview/examination. After preliminary contacts were made with the schools a working list of those to be interviewed and examined was prepared for each school.

The WHO/PBL eye examination record for children with blindness and low vision form[12] was used to collect the data according to the coding instructions. All the children were examined by one of the authors (IRE). Uniocular and binocular visual acuity (VA) was measured for each student using the Snellen's illiterate E chart. If the VA was less than 3/60, each eye was tested for ability to perceive light. Pinhole VA was assessed and those who improved were refracted. Anterior segment examination was done with torchlight and a simple magnifying loupe (×2.5). The pupils were dilated except where inappropriate (for example, phthisis bulbi, large central corneal opacity precluding view of the fundus). The cause of visual loss was recorded using the anatomical and aetiological classification in the form. Any required therapeutic interventions were recorded. Children identified as having treatable causes of blindness were referred to eye clinics of secondary or tertiary healthcare institutions nearest to them.

Data collected were entered into an IBM compatible computer from where frequency charts and distributions were generated. The causes of SVI/BL in those aged 15 years or less (children) were documented and compared with the causes in those older than 15 years (young adult).

**Table 1** WHO categories of vision among the students

| WHO category | Level of vision | No of students | % |
|---|---|---|---|
| 1 No impairment | 6/6–6/18 | 0 | 0 |
| 2 Visual impairment | <6/18–6/60 | 2 | 1.4 |
| 3 Severe visual impairment | <6/60–3/60 | 4 | 2.8 |
| 4 Blind | <3/60–PL | 77 | 54.3 |
| 5 Blind | NPL | 59 | 41.5 |
| Total | | 142 | 100 |

PL = perception of light, NPL = no perception of light.

**Table 2** Anatomical sites of abnormality leading to SVI/BL

| Anatomical site | Number | % |
|---|---|---|
| Whole globe | 30 | 21.4 |
| Glaucoma/buphthalmos | 13 | 9.3 |
| Cornea | 30 | 21.4 |
| Lens | 44 | 31.4 |
| Uvea | 2 | 1.4 |
| Retina | 11 | 7.9 |
| Optic nerve | 10 | 7.2 |
| Total | 140 | 100 |

### Definitions

(1) Visual loss was classified according to the WHO's categories of visual impairment.[13]

(2) Avoidable blindness: Conditions that are amenable to primary prevention (for example, by measles and rubella immunisation) and those that are treatable (visual loss can be prevented by early diagnosis and prompt treatment).

## RESULTS

There were 163 eligible students, out of which 142 were examined. One student declined to be interviewed and examined while the rest were absent from the schools at the time of the visits. Out of the 142 students, two had visual impairment (VA<6/18–/60) and were excluded from all analyses apart from VA distribution. The age range was 8–33 years: 46 students (32.9%) were aged 8–15 years while 94 (67.1%) were older than 15 years. More males (80, 57.1%) than females (60, 42.9%) were examined.

The distribution of the visual acuities is shown in Table 1. One hundred and thirty six students (95.8%) were blind. With refraction, five students (3.5%) were corrected from category 4 to 2 while one student (0.7%) was improved from category 3 to 2. These were mostly aphakes.

### Anatomical causes of visual loss (Tables 2 and 3)

#### Whole globe

For all the students examined 30 (21.4%) had whole globe lesions: eight (17.4%) were aged 15 years or less and 22 (23.4%) were older than 15 years. Most of these were due to phthisis bulbi, 17 (12.1% of all the study subjects)—five (10.9%) in children and 12 (12.7%) in young adults. Other anomalies of the globe (anophthalmos, microphthalmos, and disorganised globe accounted for the rest.

#### Glaucoma/buphthalmos

These accounted for 13 (9.3%) of the SVI/BL—five (10.9%) in children and eight (8.5%) in young adults. Drainage surgery had been performed on six (46.2%) of the students.

**Table 3** Anatomical site of abnormality leading to SVI/BL by age groups

| | ≤15 years | | >15 years | |
|---|---|---|---|---|
| Anatomical site | No | % | No | % |
| Whole globe | 8 | 17.4 | 22 | 23.4 |
| Glaucoma/buphthalmos | 5 | 10.9 | 8 | 8.5 |
| Cornea | 10 | 21.7 | 20 | 21.3 |
| Lens | 14 | 30.4 | 30 | 31.9 |
| Uvea | 0 | 0 | 2 | 2.1 |
| Retina | 5 | 10.9 | 6 | 6.4 |
| Optical nerve | 4 | 8.7 | 6 | 6.4 |
| Total | 46 | 100 | 94 | 100 |

#### Cornea

Corneal scarring accounted for visual loss in 30 students (21.4%): 10 (21.7%) in children and 20 (21.3%) in young adults. This was preceded by measles in 86.7% of all the cases—in 70% of the children, and 95% of the young adults.

#### Lens

Cataract (33, 23.6%) was the single commonest cause of SVI/BL—10 (21.7%) in children and 23 (24.4%) in young adults. Uncorrected aphakia with associated amblyopia accounted for a further seven (5.0% of all the students)—four (8.7%) in children, and three (3.2%) in young adults, while four students (2.9%), all young adults, became blind from complications of cataract surgery. In 21.2% of cases of cataract there was associated bilateral microphthalmos. Twelve students, one aged 13 years and the rest 17–26 years with cataract, had visual acuity of NPL.

#### Retina

Seven students (5.0%)—two (4.3%) children and five (5.3%) young adults—had retinitis pigmentosa. Among these is one with possible Bardet–Biedl syndrome, a 22 year old girl, obese with polydactyly and questionable mental status.

#### Optic nerve

Of the 10 students (7.1%)—four (8.7%) children and six (6.4%) young adults with optic atrophy—one had hydrocephalus and another a previous craniotomy scar, though the indication for the craniotomy could not be ascertained.

Among the children the major anatomical sites of SVI/BL were lesions of the lens 30.4%, lesions of the cornea 21.7%, whole globe lesions 17.4%, and glaucoma/buphthalmos 10.9%. Among the young adults, these four still constituted the major cause of SVI/BL accounting for 31.9%, 21.3%, 23.4%, and 8.5% of SVI/BL respectively.

### Aetiology of visual loss (Tables 4 and 5)

Childhood factors constituted the major aetiology of blindness. These comprised measles 64.8%, trauma 18.5%, and harmful traditional eye medication 16.7%. They accounted for 37.0% and 39.4% of SVI/BL among the students aged 15 years or less and those more than 15 years respectively. Conditions due to perinatal factors such as retinopathy of prematurity (ROP) were not encountered in either age group.

### Avoidable blindness

Table 6 shows the distribution of avoidable blindness. The majority (74.5%) of the SVI/BL was avoidable.

On therapeutic interventions needed, spectacles for refractive errors were recommended for six students (4.3%) and provision of low vision aid (LVA) for a further 11 (7.9%). Surgical intervention (cataract extraction and selected cases of optical iridectomy) was advocated for 25 students (17.9%).

**Table 4** Causes of SVI/BL by aetiological category

| Aetiological category | Number | % |
|---|---|---|
| Hereditary disease | 21 | 14.9 |
| Intrauterine factor | 11 | 7.9 |
| Perinatal factor | 0 | 0 |
| Childhood factor | 54 | 38.6 |
| Unknown | 54 | 38.6 |
| Total | 140 | 100 |

**Table 5** Causes of SVI/BL by age groups using aetiological classification

| | ⩽15 years | | >15 years | |
|---|---|---|---|---|
| Aetiological category | No | % | No | % |
| Hereditary disease | 9 | 19.6 | 12 | 12.7 |
| Intrauterine factor | 2 | 4.3 | 9 | 9.6 |
| Childhood factor | 17 | 37 | 37 | 39.4 |
| Unknown | 18 | 39.1 | 36 | 38.3 |
| Total | 46 | 100 | 94 | 100 |

**Table 6** Causes of avoidable blindness among students

| | No of students | % |
|---|---|---|
| Preventable causes: | | |
| Measles | 35 | 25 |
| HTEM | 10 | 7.2 |
| Trauma | 10 | 7.2 |
| Rubella | 11 | 7.9 |
| Subtotal | 66 | 47.3 |
| Treatable causes: | | |
| Cataract | 21* | 15 |
| Glaucoma/buphthalmos | 13 | 9.3 |
| Corneal opacity | 4 | 2.9 |
| Subtotal | 38 | 27.2 |
| Total avoidable | 91 | 74.5 |

HTEM = harmful traditional eye medication.
*Excludes 12 students with VA of NPL in both eyes.

## DISCUSSION

Data from surveys from schools for the blind, though subject to selection bias, have the major advantage that many children can be examined for causes of blindness by one or two examiners using standard methods. There was not much difference in the causes of SVI/BL anatomically and aetiologically among the students aged 15 years or less and those older than 15 years in this study. This may be because the National Programmes on Immunisation (NPI) and vitamin A supplementation, which are expected to influence the causes of childhood blindness, are relatively new programmes.

Cataract was the single commonest cause of visual loss in the current study. This corresponds to the findings of other Nigerian[10] and African[14 15] authors. Some of these children probably had congenital cataract that was present at birth. Others may have had developmental cataract. These children were not identified and offered surgical treatment, rather they were enrolled into special education. Children admitted into special education should be examined compulsorily by ophthalmologists before such admission. None the less, identifying cataract blind children at this stage is rather late since the outcome of surgery is often poor once abnormal foveolar function develops.[16 17]

Options for earlier detection will include training of community level workers who can identify a white pupil in a child and refer promptly to an ophthalmologist,[18] preschool vision screening in nursery schools in the communities, and health education for the mothers to take their children noticed to have defective vision to a trained community eye health worker immediately for evaluation and prompt referral.

Cataract is the most important cause of treatable childhood blindness worldwide.[19] Some authors have argued that restoring the sight of one cataract blind child is equivalent to restoring the sight of 10 elderly adults blind from cataract.[20] Thus, childhood cataract deserves special attention. For optimal results, management of cataract in children requires a team of well trained and well equipped personnel.[18] This would include ophthalmologists trained in paediatric ophthalmology, anaesthetists skilled in handling neonates and young children, trained ophthalmic nurses, refractionists, and paramedics. The Vision 2020 programme identifies training of paediatric ophthalmologists in developing countries as one of the strategies to control childhood blindness.[18 21] In a developing country like Nigeria such an approach might entail establishment of referral centres designated centres of excellence in paediatric ophthalmology in each of the health zones of the country.

Twelve students with cataract had visual acuity of NPL. These could have been the result of toxoplasmosis or some undiagnosed posterior segment lesion, as noted elsewhere.[22] Perhaps preventive measures in mothers during pregnancy or in the children at birth may have reduced this number of blind from these causes.

Corneal scarring and phthisis bulbi together constituted a major cause of childhood blindness in the present study. Other authors have documented a similar trend.[14 23–27] Corneal opacity in blind schoolchildren does not assess the current prevalent diseases that led to them. Some of the students in this study were older than 15 years but became blind in the first 5 years of life. It was a major cause of SVI/BL in all the age groups in this study. Corneal scarring is often associated with measles and vitamin A deficiency. With improved immunisation coverage, the incidence of measles related corneal ulcer has been reported to be on the decline.[28] A population survey[29] of childhood eye diseases in south eastern Nigeria documented no child with a previous history of measles infection. Mass distribution of vitamin A has been included in the National Programme on Immunisation (NPI) in Nigeria. These preventive strategies should be strengthened to further reduce the incidence of measles/VAD related corneal scarring.

Glaucoma/buphthalmos was responsible for 9.3% of childhood blindness. Nearly half (46.2%) of the children had previous filtration surgery. One cannot audit these surgeries from this study. The eyes of children respond differently from those of adults to surgical treatment.[18] Therefore, children with glaucoma/buphthalmos should be treated in referral centres as highlighted above.

As is the experience in other African countries,[14 23–27] by aetiological classification, childhood factors were the leading cause of blindness in this study. They were the leading cause in all the age groups. Perinatal conditions such as retinopathy of prematurity (ROP) were not encountered. No systematic studies of ROP have yet been carried out in our study area although only the tertiary centre has facilities for the care of low birthweight babies.

However, as the standard of our neonatal care services improves and more centres are established for their care, very low birthweight/low birthweight neonates who survive may later present with ROP.

Cataract from rubella is preventable. Rubella was suspected to be responsible for blindness in 7.9% of the students in this series. To the best of the authors' knowledge systematic rubella immunisation is not practised in Nigeria currently. The

World Health Organization cautions that information on the epidemiology of rubella in developing countries needs to be available before the implementation of an immunisation programme.[30] This is an area for future operational research.

### Special education in south eastern Nigeria

Special education for the blind is still being developed in south eastern Nigeria. There are only three schools for the blind in the south eastern zone. This is clearly not adequate for the number of children who need them. Even the parents of the children who need these schools do not like to send them there. There is a social stigma associated with blindness in children. Other authors have reported children with normal vision (WHO definition) in blind school surveys.[14 22 25] Such children had uniocular blindness or moderate refractive errors. In the current study no child with normal vision was found. Apparently because of the associated stigma, parents only resort to special education for the blind when there is no functional vision to cope with education in sighted schools.

More than half of the students in this study were older than 15 years. Comparatively in the same zone normal sighted children enter primary schools at much younger ages. Some of these students were beggars who enrolled in the schools because they were aware of the existence of special education for the blind. Another handicap is that schools for the blind in south eastern Nigeria are residential schools. Parents may not feel comfortable sending their 5 or 6 years old child to a boarding school. The trend therefore, should be to encourage integrated education for blind children as practised in some industrialised countries.[14 31]

## CONCLUSION

The major causes of childhood SVI/BL in schools for the blind in south eastern Nigeria are cataract, corneal scarring, phthisis bulbi, and glaucoma/buphthalmos. The majority (74.5%) of this blindness is avoidable. There is a need to strengthen current primary preventions strategies while tertiary referral centres for paediatric ophthalmology should be set up in the different health zones of the country to manage childhood cataract and glaucoma.

## ACKNOWLEDGEMENTS

The authors are grateful to the administrative secretaries/headmistresses of the schools visited. We are also indebted to Roche African Research Foundation for their grant.

### Authors' affiliations

**I R Ezegwui,** Department of Ophthalmology, Federal Medical Centre, Abakaliki, Nigeria
**R E Umeh, U F Ezepue,** Department of Ophthalmology, University of Nigeria Teaching Hospital, Enugu, Nigeria

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