Original Research Article

TREND, PATTERN AND PRESENTATION OF VISUAL IMPAIRMENT AND BLINDNESS AMONG STUDENTS OF SCHOOLS FOR THE BLIND IN SOUTH-EAST NIGERIA

Abstract

Introduction

The prevalence and distribution of major causes of blindness in children vary based on the availability of primary health care and eye care services, and under-5 mortality rates amongst others. Irrespective of the aetiology, blind children have a lifetime to live with the disability and this places enormous pressure on the family unit and the society.

Data on the magnitude of blindness is usually gotten from schools for the bind.

This study aimed to identify the recent trend, and presentation of visual impairment and blindness among students in schools for the blind located in southeast Nigeria.

Methods

This was a cross sectional descriptive study conducted among visual impaired students in schools for the blind in south east, Nigeria. A total of 92 students were examined from there randomly selected schools out of the six schools in this region.

Results

There was a male to female ratio of 1.3:1, an age range of 8-32 years with a mean age of 18.4 ± 6.4 years. Majority of the students (85.9%) were blind with visual acuity <3/60, and 14.1% had visual impairment.

Glaucoma was the leading cause of blindness followed by cataract and most known causes of blindness occurred in childhood.

Conclusion

Most of the causes of blindness were from preventable and treatable causes. Increasing the availability of specialized eye care services for children and improving primary health services will reduce the prevalence of blindness due to avoidable causes.

Key Words: Visual Impairment, Trend, Presentation, Blind schools

Introduction

Studies have shown that there are geographical variations in the prevalence and major causes of childhood blindness.[1,2] Within a given country, these causes may vary with time. The prevalence and distribution of major causes of blindness in children also vary according to socioeconomic development, availability of primary health care and eye care services and under-5 mortality rates.[2,3,4] Irrespective of the trend, blind children have a lifetime to live with the disability. 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 at large.[5]

Most data on major causes of blindness and visual impairment are gotten from examining children in schools for the blind. In a survey of visual impairment in children attending the Royal School for the blind, in Edinburgh,[6] perinatal related blindness (40%), hereditary disease (26%) and developmental factors (26%) formed the three largest etiological categories. In a similar study done in Auckland, New Zealand,[7] the main causes of blindness were cerebral visual impairment in 61(42.4%) children, Optic nerve atrophy in 18(12.5) children, and retinal dystrophy in 13(9.0%). In Asia, lesions affecting the whole globe was the commonest anatomical site of visual loss (25.5%)[8] While the aetiology was unknown in 52.9%, hereditary factors were responsible for 30.7% blindness, and childhood causes for 14% of the study population. A similar report was noted in Sri Lanka.[9] In India,[10] corneal staphyloma, corneal scar and phthisis bulbi (mainly attributable to vitamin A deficiency) in 26.4%; microphthalmos, anophthalmos and coloboma in 20.7%; retinal dystrophies and albinism in 19.3%; and cataract, uncorrected aphakia and amblyopia in 12.3% were the major causes of severe visual impairment and blindness.

In a study carried out among 142 students attending schools for the blind in South-Eastern Nigeria,[5] the major causes of severe visual impairment and blindness identified in the children (aged 15 years or less) were lesions of the lens (30.4%), corneal lesions (21.7%), whole globe lesions (17.4%) mainly phthisis bulbi, and corneal scarring (21.4%). Similar to other studies in Nigeria.[11,12,13] Glaucoma/buphthalmos (22.2%), corneal lesions (20%), infection (13.2%) were the major causes of vision loss identified in other studies.[13,14] In contrast, other studies in Nigeria reported bilateral measles keratopathy/Vitamin A deficiency (29.1%),[15] retinal disorders (30.8%)[16] as the most common cause of blindness. Other African countries have also reported corneal lesions, lens disorders, and optic nerve lesions as the commonest causes of blindness.[17,18]

Majority (53%) of the students became visually impaired within their first year of life; 18% by the age of 5 years and 29% between 6-15years. Most of the causes of blindness were avoidable.[17] This was corroborated in other studies with prevalence ranging from 68%[19] 77.7%.[5,14] Lower values (48.7%,37%, 37.4%,and 15%) were reported in India, Nepal, and China.[8,10,20,21] Treatable causes of blindness were also reported in Nepal(16.14%),[20] and China (22.5%).[8] This implies that many children with potential vision will live out their years in blindness if visual screening is neglected in schools. This study will aid in identifying the causes, prevalence, and pattern of presentation of visual impairment and blindness in South East Nigeria. It will also reveal if there are variations in the trend of blindness and visual impairment in this region since the last study done more than a decade ago. The results will provide information that will help in preventive and advocacy services.

Materials and Methods

South-Eastern Nigeria has five schools for the blind located in each of the states. They are Akpodim Rehabilitation Centre, Mbaise, Special Education Center, Oji River, School for the Blind Opefia, Izzi, School for the Blind Afara, Umuahia, and Basden Memorial Special Education Centre, Isulo. This study was conducted in 3 of the five schools for the blind randomly selected:

- Special Education Centre Oji River, Enugu State.
- School for the blind Afara, Umuahia, Abia State.
- Basden Memorial Special Education Centre Isulo, Anambra State.

The study used a cross-sectional, descriptive, design to assess and examine 92 students enrolled in the 3 schools within the study period. A minimum sample size of 64 participants was calculated using the Kish and Leslie formula.[22] Students were included in the study if they are registered in the school, have no other disability, and give consent to participate.

Ethical Considerations

Ethical clearance was obtained from the Medical Research Ethics Committee of the Federal Medical Center, Owerri, Imo State. Approval was gotten from the school authorities and informed written consent from each student.

Pilot Study

A pilot study was carried out on 20 visually impaired students at Federal Medical Centre, Owerri, Imo State to assess the validity of the study tool.

Data Management

Data Collection

The International Centre for Eye Health's (ICEH) standardised form[23] developed for reporting causes of blindness and low vision in children was used for data collection in this study. The form had sub-sections on participants' serial number, personal details, visual assessment, general assessment, previous eye surgery, eye examination (site of abnormality leading to blindness and etiology of blindness), refraction/low vision aid assessment, action needed and prognosis for vision.

Visual acuity for distance was measured using the LogMAR 'E' tumbling visual acuity test chart placed at a distance of 4 meters and that for near was assessed with the Rayner Near Charts placed 25 cm away from the eye. The World Health Organisation (WHO) classification of the severity of visual impairment was used to classify visual impairment and blindness into:

Category 1 (No / Mild impairment) - Best corrected visual acuity in the better eye equal to or better than 6/18.

Category 2 (Moderate visual impairment) - Worse than 6/18 to 6/60.

Category 3(Severe visual impairment) - Worse than 6/60 to 3/60.

Category 4(Blindness (near-total) worse than 3/60 to Perception of Light.

Category 5 (Blindness (total) No Perception of Light.

The assessed visual acuity was converted to Snellens' equivalents before it was recorded in the WHO proforma. Ocular examination was done after a brief history was taken. Pen torch, handheld slit lamp examination, colour vision, contrast sensitivity, and confrontational visual field tests were done.

Data Analysis

Data collected was analysed using the statistical package for social sciences (SPSS) version 21 and presented with tables and charts.

Results

Forty three (74.1%) students from school for the blind Afara, Umuahia, 21 (77.4%) students from Basden Memorial Special Education Centre, Isulo and 28 (71.8%) students from Special Education Center, Oji River participated in the study. There was a male to female ratio of 1.3:1, an age range of 8-32 years with a mean age of 18.4 ± 6.4 years.

Table 1: Age Distribution of the 92 students

Age (years)	Number	Percent
≤10	12	13.0
11 - 15	24	26.1
16 - 20	18	19.6
21 - 25	23	25.0
26 - 30	13	14.1
31 - 35	2	2.2
Total	92	100.0

The commonest age group was 11-15 years.

Table 2: Visual Acuity of the 92 Students

Visual Acuity (right eye)	Frequency (%)	Visual Acuity (Left eye)	Frequency (%)
< 6/18 - 6/60 (LogMAR 0.5-1.0)	0 (0.0)	< 6/18 - 6/60	0 (0.0)
< 6/60 - 3/60 (LogMAR <1.0-1.3)	3 (3.3)	< 6/60 - 3/60	2 (2.2)
< 3/60 - perception of light (LogMAR <1.3 to PL)	31 (33.7)	< 3/60 - PL	35 (38.0)
No light perception	58 (63.0)	No light perception	55 (59.8)

*PL=Perception of light. Majority of the students had VA <3/60.

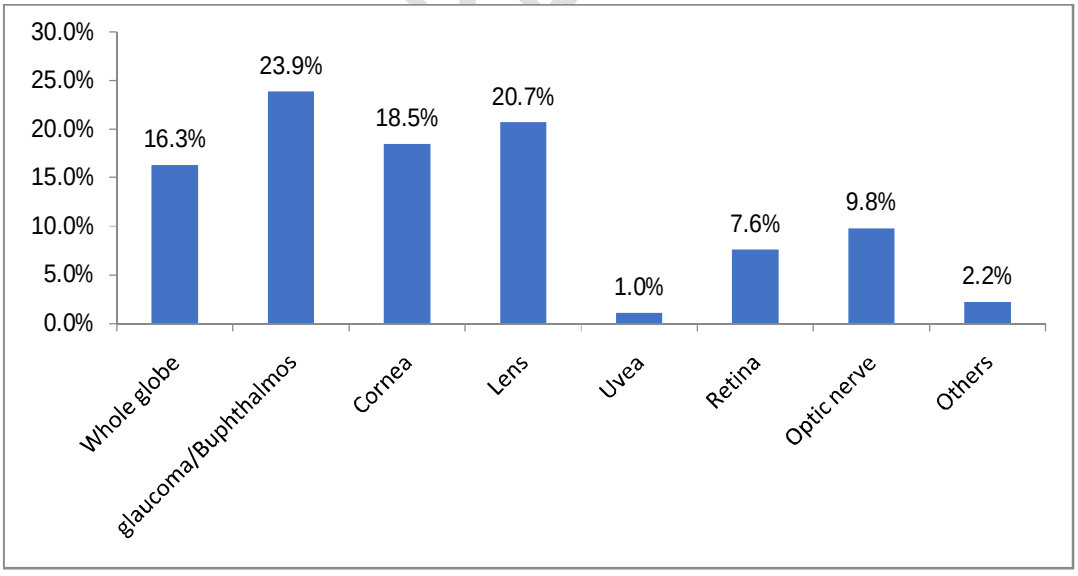

Figure 1: Primary Anatomic Site of Abnormality

Fig 2 shows: Abnormality of the whole globe was seen in 15 students. These were mainly from phthisis bulbi 9(9.7%). Microphthalmos, anophthalmos and enucleation accounted for the remaining 6(6.6%). Glaucoma/buphthalmos was responsible for 22(23.9%) of the cases and 4 (18.2%) of these students had had drainage surgery. Cornea was primarily involved in 17(18.5%) cases. The causes included anterior staphyloma 2(2.1%), corneal opacity 7(7.6%), keratoconus 2(2.1%), microcornea 2(2.1%), exposure keratopathy 1(1%) and use of traditional eye medication 3(3.2%). Nine (9.8%) of these students reported to have had measles infection, two (2.2%) students had cortical blindness.

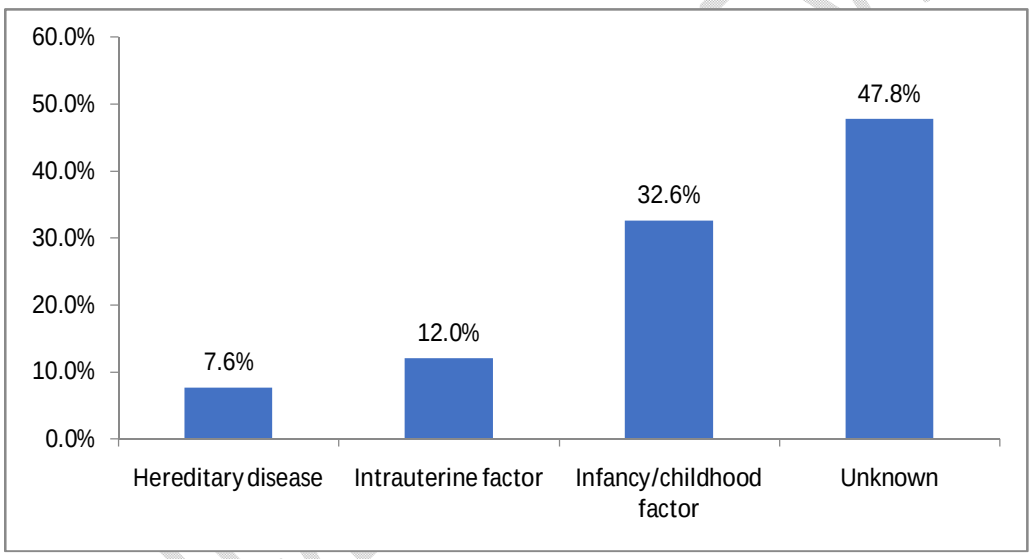

Figure 2: Aetiology of visual loss

Fig 3 shows: Childhood factors constituted the highest known aetiology of visual loss in the students. Aetiology was unknown in 47.8% of the cases. There was no perinatal factor reported.

Table 3: Avoidable causes of visual loss

Avoidable causes	Number	(%)
Preventable		
Measles	9	9.8
Trauma	2	2.2
HTEM	3	3.3
TORCHES	1	1.1
Treatable		
Glaucoma/buphthalmos	22	23.9
Cataract	20	21.7
Corneal lesions	4	4.3
Retinal detachment	3	3.3
Total	64	69.6

*HTEM = Harmful traditional eye medication, TORCHES= Toxoplasmosis, Rubella, Cytomegalovirus, Herpes simplex virus infections.

Table 3 shows: Overall, 64 (69.6%) of the causes of visual loss in the students of the schools for the blind studied were avoidable. Cataract and glaucoma were the most common treatable causes of visual loss.

Table 4: Age at onset of visual loss

Age (years)	Number	Percent
Born blind	19	20.7
1st year	11	12.0
1 - 15 years	59	64.1
Unknown	3	3.2
Total	92	100.0

Table 4 shows: Almost all the students developed visual problems at birth or early years of childhood.

Discussion

Most of the available data on the causes of childhood blindness from developing countries have been obtained from examining children in schools for the blind, since the number of blind children identified in community surveys is generally very small. It is therefore not cost effective to conduct such surveys as large sample sizes would be needed.[11, 24]

This study surveyed 92 students from 3 schools for the blind in South-Eastern Nigeria made up of 52(57%) males and 40 (43%) females. The higher number of males in schools for the blind was also reported in similar studies in Nigeria and some other African countries.[12,25,26] This might not necessarily mean a higher incidence of visual loss in males, as male to female visual impairment prevalence ratio of 1:1.5-2.2 indicate more likely hood of females having

visual impairment than males in all regions of the world.[27] It might rather be a reflection of the greater importance accorded to male child education than females in the studied region. The mean age of 18.4 years ± 6.4 (age range 8 -32 years) was similar to findings in other studies.[11,12,15] There are few schools for the blind sub serving the whole South-East Nigeria and they are all boarding schools hence, parents may find it difficult to allow their visually challenged child out of their sight at a young age.

Visual Impairment and Blindness

Similar to studies reported within and outside Nigeria, majority (85.9%) of the students were blind and only 14.1% had visual impairment.[6,8,10,15, 17, 20, 25]

None of the students as in other studies in Nigeria[5,25] had normal/ mild visual impairment in contrast to some studies in developed countries. [6,9] The social stigma associated with visual loss in this part of the world unlike some other countries where normal sighted children go to schools for the blind probably so they can benefit from the free eye care, education, accommodation, and feeding may account for this disparity in findings.[25]

Almost all the students reported to have developed visual loss at birth or early childhood. Some earlier studies also reported similar finding.[12, 14, 18, 28] This buttresses the need for early detection of childhood ocular conditions and prompt referral to appropriate institutions. These blind children have a lifetime of disability to live with this condition thus Ophthalmologists should be better equipped to handle childhood blindness and provide eye care services to meet the visual needs of these children especially those with some residual vision.

Causes of Visual Impairment and Blindness

Glaucoma was the major cause of visual loss followed by pathologies of the lens, cornea and whole globe. Some of the cases of glaucoma were familial as almost one quarter of the

students with glaucoma/buphthalmos had a positive family history of glaucoma. Similar reports have been documented[14] This may be attributed to the recent advances in microsurgical cataract techniques and increased early diagnosis of cataract at the expense of glaucoma.[14] It could also be due to the high failure rate of glaucoma surgeries in blacks as it was noticed that a good number (36.4%) of those with glaucoma/buphthalmos in this study had had glaucoma surgery. This is corroborated by a study done by Ezegwui et a[5] who noted that nearly half of the children with glaucoma in their study had had previous filtration surgery. There is also the issue of late presentation in our environment which may be due to poor public awareness about the disease.[29] Glaucoma is a major cause of visual loss in blacks and Nigeria being one of the most populous black nations is not spared. Furthermore, according to the last national survey on blindness and visual impairment, the South-East was reported to have the highest prevalence of glaucoma blindness in Nigeria.[30]

Lens related lesions were another important cause of visual loss in the present study ranging from unoperated cataract, failure of optical correction and complications of surgery. This was also a common finding in some other studies in Africa[11, 13, 25] and could be a reflection of the unsatisfactory result of management of childhood cataract with the need for necessary basic facilities and skilled personnel in management of congenital or developmental cataract in developing countries. There is also the issue of late presentation which could be attributed to the belief that the child has to grow older for surgery to be done as well as lack of skills for early detection of cataract cases by those close to these children. [3,24, 31]

Corneal lesions were also one of the major causes of visual loss in the studied population. More than half of which were due to post measles keratopathy. Although visual loss due to corneal pathologies remain a major cause of visual loss in children in developing countries,

[12,15, 10, 28, 32] compared to an earlier study in South-Eastern Nigeria ,[5] visual loss due to corneal causes showed a slight decrease in the present study. This decrease in blindness due to corneal lesions was corroborated by results from other studies done in Africa;[25,33] Corneal disease and Vitamin A deficiency related blindness was reported as an unusual finding in some studies in Asia,[9,34] Europe[6] and America.[35] This decrease in Nigeria is probably a reflection of the effect of the expanded programme on immunization (EPI) against measles and other diseases as measles immunization coverage continues to improve in the country with the highest coverage reported in South-Eastern Nigeria especially Enugu state.[36] Gogate et al[19] also opined that vitamin A supplementation coverage has increased and blindness related to Vitamin A Deficiency has been virtually eliminated in many developing countries. The increased use of social media for health education and dissemination of information on dangers of harmful traditional practices and good nutrition may have also played a role.

Very few cases of visual loss were caused were by retinal pathologies. This is unlike the report in middle and high income countries where conditions of the retina mainly from ROP were the major causes of visual loss.[6, 37]This finding was reported to be due to the rapid development of the region and decreasing under 5mortality.[6] Vision loss from retinal disorders may increase in the future as many preterm babies are surviving due to the improvement in neonatal care in Africa.

Hereditary diseases contributed the least to causes of visual loss in the present study. This is in contrast with reports from Sri Lanka[9] and India[34] where hereditary diseases accounted for more than one third and almost half of the causes of visual loss respectively. The authors reported that it was probably due to the high level of consanguineous marriages in some regions of the country as about one quarter of marriages are said to be consanguineous in Sri

Lanka. In Nigeria, consanguineous marriage is not a common practice as many religious and cultural practices in the country frown at it.

Almost half of the cases of visual loss were of unknown aetiology, and this is consistent with results from some other studies in developing countries.[17, 38, 8, 14] This probably show the unmet need for increased diagnostic facilities available to the eye care profession and researchers in the country.[14]

Aetiological Trends in Visual Loss

The frequency of the different causes of visual loss in this population differs slightly from an earlier study in Southeast Nigeria eighteen years prior to the index study.[5] They reported that cataract was the major cause of visual loss in the students followed by corneal scar, then whole globe abnormalities. A similar study[12] carried out at the same period in southwest, Nigeria also reported corneal scar, followed by cataract as the commonest causes of visual loss. However, this study also included findings from 3 regular schools. Lens disorders was also reported as the commonest cause of visual loss within the same decade in another study in southwest, Nigeria.[11] Towards the end of this 2000-2010 decade, and in the early part of the following decade (2010-2020), cataract, glaucoma, and corneal disorders remained the top 3 disorders causing visual loss [14,13,15] with cataract,[13] and corneal disorders [15]respectively leading in south west, and glaucoma in the south east.[14] In the index study which was also conducted in the south east and in the same decade as the latter, glaucoma (23.9%) was the leading cause of visual loss followed by lens related disorders (20.7%). The decreasing number of cataract blindness may be as a result of increasing number of trained Paediatric Ophthalmologists in the management of congenital and developmental cataract in this region. It has been reported that there is a 4-5-fold increase in the number of Ophthalmologists in Africa in the last 20 years.[19] However, cataract still remains a major contributor to visual loss[11, 13] probably due to the peculiarities of childhood cataract management and the long

term follow up needed. Moreover, there is still more to be done in personnel development to meet the WHO recommendation of one Paediatric Ophthalmologist per 10 million people by 2020.[3] The treatment for congenital glaucoma is surgery. Many patients still have the erroneous belief that glaucoma is not amenable to surgery. Aggressive health education, good surgical skills, and testimonies of successful surgical outcomes will contribute to reversing this trend.

Most of the causes of visual loss in this study were potentially avoidable. Similar studies in Nigeria and Africa[12,17,25] also reported that most of the causes of visual loss were preventable and treatable. In Asia [8, 10, 21] however, the little decrease noticed in vision loss due to avoidable causes was attributed to improving primary health care and socioeconomic development in the area.

The causes of visual loss in these children are largely avoidable and amenable to primary, secondary, and tertiary preventive measures.

Treatable causes like cataract and glaucoma were seen to contribute enormously to visual loss in these students probably because the parents were not aware of places to seek help or because of the high cost of treatment. It could also be due to fear of surgery probably related to poor surgical outcome of acquaintances.

Timing of Visual Impairment and Blindness

Most of the known causes of visual loss were from childhood aetiology occurring between 1-15 years of age. Similar findings were also reported in studies in other African countries.[20, 32, 39] Unlike in high income countries where visual loss related to perinatal diseases such as retinopathy of prematurity (ROP) constitute most of the causes of visual loss,[8] there was no reported perinatal cause of visual loss in the present study. This finding though agrees with

other studies in Africa and Asia, [9,34] however ROP is becoming a public health problem in some middle-income countries.[40] With respect to blindness due to ROP, countries are grouped into 3:[41,42]

- A group with excellent neonatal care, low infant mortality rate (<8/1000 live births) and low incidence of ROP.
- Middle income countries with infant mortality rate between 8-60/1000 live births, in this group ROP can account for up to 60% of childhood blindness.
- Low-income countries with high infant mortality (>60/1000 live births) thus most premature babies die before development of ROP.[41]

Nigeria falls into this third group in terms of blindness due to ROP. This is corroborated by the fact that ocular abnormalities have been reported to be common among people from low socioeconomic background and incidentally, most students in schools for the blind are largely from the rural communities.[26] These areas are associated with inadequate neonatal care, higher mortality of premature children and therefore low incidence of ROP.[43] However ROP is not uncommon in Nigeria as a study in one of the Tertiary hospitals reported a prevalence of 47.2%.[42] This incidence will probably increase as surveillance and referral of premature babies to tertiary institutions with good neonatal care improves.

Limitations

It is important to note that, studies done in schools for the blind have their limitations as children enrolled in these schools became blind five or more years prior to their enrolment and therefore may not reflect the current pattern of causes of childhood blindness.[19]

Conclusion

Majority of the students studied had severe visual impairment/blindness (SVI/BL). Glaucoma, cataract, and corneal disorders were still the commonest causes of visual loss in southeast, Nigeria. However, glaucoma was the leading cause of visual loss in the past

decade (2010-2020) followed by cataract, and corneal disorders unlike the previous decade (2000-2010) where cataract followed by corneal disorders were reported as the commonest causes of visual loss in the schools for the blind.

Blindness among these students occurred mostly during childhood and were largely avoidable.

Recommendations

Increasing the availability of specialized eye care services for children by training more Paediatric Ophthalmologists as well as continued health education, and improvement of primary health services will reduce the prevalence of blindness due to avoidable causes.

References

1. Foster A. Childhood blindness. Eye 1988; 2:527–536.
2. Preventing blindness in children: report of a WHO/IAPB scientific meeting. Geneva, World Health Organization, 2000 (WHO/PBL/00.77).
3. Gilbert C, Foster A. Childhood blindness in the context of VISION 2020 - The Right to Sight. Bull World Health Organ. 2001; 79(3):227–232.
4. Steinkuller PG, Du L, Gilbert C, Foster A, Collin M.L et al. Childhood blindness. J AAPOS. 1999 Feb; 3(1):26–32.\
5. Ezegwui I.R, Umeh R.E, Ezepue U.F. Causes of childhood blindness: results from school for the blind in South Eastern Nigeria. Br J Ophthalmol. 2003; 87:20–23.
6. Alagaratnam J, Sharma T.K, Lim C.S, Fleck B.W.A survey of visual impairment in children attending the Royal Blind School, Edinburgh using the WHO childhood visual impairment database. Eye Lond. 2002 Sep; 16(5):557-561.
7. Chong C.F, McGhee C.N, Dai S. A Cross-sectional Study of Prevalence and Etiology of Childhood Visual Impairment in Auckland, New Zealand. Asia Pac J Ophthalmol Phila. 2014 Dec;3(6):337-342.
8. Hornby S, Xiao Y, Gilbert C, Foster A, Wang X et al. Causes of childhood blindness in the People's Republic of China: results from 1131 blind school students in 18 provinces. Br J Ophthalmol. 1999 Aug; 83(8): 929–932.
9. Eckstein M.B, Foster A, Gilbert C.E. Causes of childhood blindness in Sri Lanka: results from children attending six schools for the blind. British Journal of Ophthalmology 1995; 79: 633-636.
10. Rahi J.S, Sripathi S, Gilbertand C.E, Foster A. Childhood blindness in India: Causes in 1318 blind school students in nine states. Eye 1995; 9: 545–550.

11. Omolase C.O, Aina A.S, Omolase B.O,Omolade E.O. Causes of blindness and visual impairment at the school for the blind Owo, Nigeria. Ann Ib Postgrad Med. 2008 Jun; 6(1): 49–52.

12. Ajibode H.A, Onabolu O.O, Oluyadi F.O. Causes of blindness among blind students in Ogun state, Nigeria. Nigerian journal of clinical practice June 2003; 6(1):17-19.

13. Fadamiro O.C. Causes of blindness and career choice among pupils in a blind school; South Western Nigeria. Annals of African medicine. 2014; 13:16-20.

14. Okoye O.I, Aghaji A.E, Ikojo I.N. Visual loss in a school for the blind in Nigeria. Niger J Med. 2009 Sep; 18(3):306-310.

15. Mosuro A.L, Ajaiyeoba A.I, Bekibele C.O,Eniola M.S, Adedokun B.A. Survey of low vision among students attending schools for the blind in Nigeria; A descriptive and interventional study. Middle East Afr J Ophthalmol 2012 Oct;19(4):382-391.

16. Akinsola F.B, Ajaiyeoba A.I. Causes of low vision and blindness in children in a blind school in Lagos Nigeria. West Afr J Med 2002 Jan;21(1):63-65.

17. Kello A.B,Gilbert C. Causes of severe visual impairment and blindness in children in schools for the blind in Ethiopia. Br J ophthalmol.2003 May;87(5):526-530.

18. Ntim-Amponsah C.T, Amoaku W.M. Causes of childhood visual impairment and unmet low-vision care in blind school students in Ghana. Int Ophthalmol. 2008 Oct; 28(5):317-323.

19. Gogate P, Kalua K, Courtright P. Blindness in Childhood in Developing Countries: Time for a Reassessment? Journal pmed. 2009;

20. Kansakar I, Thapa H.B, Salma K.C, Ganguly S, Kandel R.P et al. Causes of vision impairment and assessment of need for low vision services for students of blind schools in Nepal. Kathmandu Univ Med J (KUMJ) 2009 Mar; 7(25):44-49.

21. Hornby S.J, Adolph S, Gothwal V.K, Gilbert C.E, Dandona L et al. Evaluation of children in six blind schools of Andhra Pradesh. Indian J Ophthalmol. 2000 Sep; 48(3):195-200.

22. Essentials of Medical Statistics. Int J Epidemiol (2004) 33 (6): 1418-1419.

23. Gilbert C, Foster A, Negrel D, Thylefors B. Childhood blindness: a new form for recording causes of visual loss in children. Bull World Health Organ 1993; 71(5):485–489.Kirkwood BR, Sterne JA.

24. World Health Organization Blindness and Deafness Unit, International Agency for the Prevention of Blindness. Preventing blindness in children: Report of a WHO/IAPB scientific meeting. Geneva: 2000; p. 1. Available at: http://www.who.int/iris/handle/10665/66663; Date Accessed Feb.2016.

25. Stelmack J.A, Tang C, Wei Y. The Effectiveness of Low-Vision Rehabilitation in 2 Cohorts Derived From the Veterans Affairs Low-Vision Intervention Trial. Optometry and Vision Science: May 2001; 78(5) 335-342.

26. Isawumi M, Akinsola. Ocular Health Status and Causes of Enrolment into Special Schools in Osun State, Nigeria. Zahedan J Res Med Sci. 2016 December; 18(12): 1-6.

27. Pascolini D, Mariotti S.P, Pokharel G.P, Pararajasegaram R, Etya'ale D, Negrel A.D, Resnikoff S. 2002 global update of available data on visual impairment: a compilation of population-based prevalence studies. Ophthalmic Epidemiol. 2004; 11:67–115

28. Ganesh S, Sethi S, Srivastav S, Chaudhary A, Arora P. Impact of low vision rehabilitation on functional vision performance of children with visual impairment. Oman J Ophthalmol. 2013 Dec; 6(3): 170–174.

29. Olusanya BA, Ugalahi MO, Malomo MO, Baiyeroju A. Trabeculectomy for congenital glaucoma in University College Hospital, Ibadan: A 7 year review of cases. Niger J Ophthamol 2015;23:44-47

30. Kyari F, Gudlavalleti MV, Sivsubramaniam S, Gilbert CE, Abdull MM et al. Prevalence of blindness and visual impairment in Nigeria: the National Blindness and Visual Impairment Study. Invest Ophthalmol Vis Sci. 2009 May;50(5):2033-2039

31. WHO. Global initiative for the elimination of avoidable blindness. Geneva: 1998; pp. 1-2. Available at: http://www.who.int/iris/handle/10665/63748; Date Accessed: Sept. 29, 2016.

32. Gilbert C. E, Wood M, Waddell K, Foster A .Causes of childhood blindness in east Africa: results in 491 pupils attending 17 schools for the blind in Malawi, Kenya and Uganda. Ophthalmic Epidemiol 1995; 2:77–84.

33. Njuguna M, Msukwa G, Shilio B, Tumwesigye C, Courtright P et al. Causes of Severe Visual Impairment and Blindness in Children in Schools for the Blind in Eastern Africa: Changes in the Last 14 Years. Ophthalmic epidemiology 2009; 16: 151-155.

34. Krishnaiah S, Rao S.B, Narasamma K.L, Amit G. A survey of severe visual impairment in children attending schools for the blind in a coastal district of Andhra Pradesh in South India. Eye Lond. 2012 Aug; 26(8): 1065–1070.

35. Heijthuijsen A.A, Jiawan D, Tanck M, Verhoeff J. Causes of severe visual impairment and blindness in children in the Republic of Suriname. British Journal of Ophthalmology 2013; 97:812-815.

36. Ophori E.A, Tula M.Y, Azih A.Z, Okojie R, Ikpo P.E. Current Trends of Immunization in Nigeria: Prospect and Challenges. Trop Med Health. 2014 Jun; 42(2): 67–75.

37. Limburg H, Gilbert C, Hon D. Prevalence and causes of blindness in children in Vietnam. 2012 February; 119(2):355-361.

38. Pal N, Titiyal J.S, Tandon R, Vajpayee R.B, Gupta S, Murthy G.V. Need for optical and low vision services for children in schools for the blind in North India. Indian J Ophthalmol. 2006; 54:189–193.

39. Foster A, Sommer A. Corneal ulceration, measles, and childhood blindness in Tanzania. Br J Ophthalmol May 1987; 71(5): 331-343.

40. Gilbert C, Fielder A, Gordillo L. Characteristics of infants with severe retinopathy of prematurity in countries with low, moderate, and high levels of development: implications for screening programs. International NO-ROP Group Paediatrics. 2005 May; 115(5):518-25.

41. Gilbert C. Changing challenges in the control of blindness in children. Eye 2007 March; 21(2):1338–1343.

42. Adio AO, Ugwu RO, Nwokocha CG, Eneh AU. Retinopathy of Prematurity in Port Harcourt, Nigeria. ISRN Ophthalmology. 2014; 2014(4) 1-6.

43. Adio A. O, Komolafe R.D. The state of peadiatric eye care in Nigeria:Asituational review and call for action. Nigerian health journal March 2013; 13(1): 1-5